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Prosody in Language Contact: French and Vietnamese

Vera Scholvin

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Prosody in Language Contact: French and Vietnamese

A Dissertation

Submitted in Partial Fulfilment of the Requirements for the Degree of

Dr. Phil.

by Vera Scholvin

to the Department of Romance Philology of Freie Universität Berlin

under Co-Supervision with

LACITO, CNRS – Université Sorbonne Nouvelle

Berlin, 2021

First supervisor: Judith Meinschaefer, Freie Universität Berlin

Second supervisor: Alexis Michaud, Université Sorbonne Nouvelle

For those who do not find their full names in this page: it is for reasons of privacy that I do only write the full names of my colleagues who work in the same or a similar field.

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Abstract in English, French, Vietnamese, and German

In this thesis, we are dealing with prosodic language contact between the languages Vietnamese and French. This pair of languages is interesting in that both languages are prosodically very different and have very interesting prosodic properties individually. While in Vietnamese each syllable is assigned a lexical tone, French is not a lexical tone language. On the other hand, French has consonant clusters and a larger coda consonant inventory than Vietnamese. Regarding syllable structures, both languages are typologically atypical, in different respects.

Our research is devoted to different language contact situations as well as to both directions of language contact. The starting point of our experimental research is the observation of French loanwords in Vietnamese. In this context, we examine prosodic adaptation patterns that speakers have undertaken to adapt the loanwords to Vietnamese. The focus is on the repair of structures that are illicit in Vietnamese: consonants in certain positions in the syllable are replaced or deleted, consonant clusters are dissolved by epenthesis or by deletion of one of the two consonants, syllable boundaries are shifted, consonants or consonant slots in certain syllabic structures are doubled, and tones are assigned to syllables according to certain patterns.

The aim of our experimental investigations then is to find out whether similar or different patterns occur in an instantaneous situation of language contact. Monolingual speakers of Vietnamese are exposed to French stimuli and asked to reproduce them in three different conditions. We have additionally conducted the same experiment with learners of French whose first language is Vietnamese. The experimental data show many similar patterns to the loanword data. However, the data from monolingual speakers in particular display much more variability. Finally, we reverse the direction of language contact: native speakers of French are asked to reproduce Vietnamese stimuli. In this case, the question is whether certain patterns can be reversed in the opposite direction, which can partly be observed.

With the help of the present work, we can gain a deep understanding of systematicity and variability in borrowing and second language acquisition. We conclude that from a phonological perspective, there are many similarities between the two fields of prosodic language contact, and we suggest, for the phenomena under consideration, to understand some aspects in their complexity in a gradual rather than a categorical way.

Le présent travail s'intéresse au contact prosodique entre le vietnamien et le français. Cette paire de langues est intéressante dans la mesure où les deux langues sont très différentes et qu'elles ont des propriétés prosodiques très intéressantes si on les considère individuellement. Alors qu'en vietnamien, un ton lexical est attribué à chaque syllabe, le français n'est pas une langue à ton lexical. En revanche, le français connaît des groupes de consonnes et présente un plus grand inventaire de consonnes finales que le vietnamien. En ce qui concerne les structures syllabiques, les deux langues sont en partie typologiquement atypiques de différentes manières.

Notre recherche se consacre à différentes situations de contact linguistique ainsi qu'aux deux directions du contact linguistique. Le point de départ de nos recherches expérimentales est l'observation des mots d'emprunt français en vietnamien. Nous examinons les patrons d'adaptation prosodique que les locuteurs ont mis en place pour adapter les mots d'emprunt au vietnamien. Dans ce contexte, notre attention se porte sur la réparation de structures qui sont interdites en vietnamien : les consonnes dans certaines positions dans la syllabe sont remplacées ou supprimées, les groupes de consonnes sont décomposés par épenthèse ou par la suppression d'une des deux consonnes, les frontières syllabiques sont déplacées, les consonnes ou les positions consonantiques sont doublées dans certaines structures syllabiques et des tons sont attribués aux syllabes selon certains patrons. L'objectif de nos recherches expérimentales est de déterminer si des tendances similaires ou différents apparaissent dans une situation actuelle de contact linguistique. On présente des stimuli français à des locuteurs et locutrices monolingues du vietnamien et on leur demande de les reproduire dans trois conditions différentes. Les données expérimentales montrent de nombreux patterns similaires aux données des emprunts. Cependant, les données des locuteurs monolingues en particulier présentent beaucoup plus de variabilité. Nous avons réalisé la même expérience avec des apprenants de français dont la première langue est le vietnamien. Enfin, nous inversons la direction du contact linguistique : des locuteurs natifs du français sont invités à reproduire des stimuli vietnamiens. Dans ce contexte, nous nous intéressons à la question de savoir si certains patterns peuvent être inversés, ce qui se produit partiellement.

Grâce à ce travail, nous pouvons nous faire une idée approfondie de la systématique et de la variabilité dans les processus d'emprunt et dans l'acquisition d'une deuxième langue. Nous pouvons conclure qu'il existe de très nombreuses similitudes entre les deux domaines de contact linguistique prosodique d'un point de vue phonologique et nous proposons, pour les phénomènes considérés, de comprendre certains aspects dans leur complexité de manière graduelle plutôt que catégorielle.

Trong luận án này, chúng tôi đề cập đến âm vị học điệu tính trong sự tiếp xúc ngôn ngữ giữa hai ngôn ngữ - tiếng Việt và tiếng Pháp. Cặp ngôn ngữ này thú vị ở chỗ cả hai ngôn ngữ không chỉ rất khác nhau về điệu tính mà còn có những đặc tính riêng lẻ về điệu tính. Nếu như mỗi âm tiết trong tiếng Việt được gán một vỏ âm thanh ngữ nghĩa thì trong tiếng Pháp không có điều này. Mặt khác, tiếng Pháp có các tổ hợp phụ âm và kho phụ âm coda lớn hơn tiếng Việt. Về cấu trúc âm tiết, cả hai ngôn ngữ đều không điển hình về mặt loại hình, ở những khía cạnh khác nhau.

Nghiên cứu của chúng tôi dành cho vài tình huống tiếp xúc ngôn ngữ khác nhau cũng như cho cả hai hướng tiếp xúc ngôn ngữ. Xuất phát điểm nghiên cứu thực nghiệm của chúng tôi là quan sát các từ vay mượn tiếng Pháp trong tiếng Việt. Cụ thể, chúng tôi xem xét các mô hình điều chỉnh ngữ điệu tính mà người nói đã thực hiện để điều chỉnh các từ vay mượn từ tiếng Pháp sang tiếng Việt. Trọng tâm là điều chỉnh (hoặc chỉnh sửa) các cấu trúc không thể dùng trong tiếng Việt: Phụ âm ở một số vị trí nhất định trong âm tiết bị thay thế hoặc xóa bỏ, các phụ âm bị lược bỏ hoặc người nói lược bỏ một trong hai phụ âm, ranh giới âm tiết bị dịch chuyển, phụ âm hoặc phụ âm các vị trí trong cấu trúc âm tiết nhất định được nhân đôi và thanh điệu được gán cho âm tiết theo các mẫu nhất định. Mục đích của các cuộc điều tra thí nghiệm của chúng tôi là tìm hiểu xem các mô hình tương tự hay khác nhau xảy ra trong một tình huống tiếp xúc ngôn ngữ tức thời. Những người nói đơn ngữ tiếng Việt tiếp xúc với các kích thích của tiếng Pháp và được yêu cầu tái tạo chúng trong ba điều kiện khác nhau. Chúng tôi cũng đã tiến hành thí nghiệm tương tự với những người học tiếng Pháp có ngôn ngữ mẹ đẻ là tiếng Việt. Dữ liệu thí nghiệm cho thấy nhiều mẫu tương tự với dữ liệu từ vay mượn. Dữ liệu thí nghiệm lời nói tự phát nhiều biến đổi hơn so với dữ liệu từ vay mượn. Cuối cùng, chúng tôi đảo ngược hướng tiếp xúc ngôn ngữ: Những người nói tiếng Pháp bản ngữ được yêu cầu tái tạo các kích thích tiếng Việt. Trong trường hợp này, câu hỏi đặt ra là liệu các mẫu nhất định có thể đảo ngược theo hướng ngược lại hay không, điều này có thể được quan sát một phần.

Với sự trợ giúp của công việc hiện tại, chúng ta có thể hiểu sâu hơn về tính hệ thống và tính đa dạng trong việc vay mượn và thụ đắc ngôn ngữ thứ hai. Chúng tôi kết luận rằng từ góc độ âm vị học, có nhiều điểm tương đồng giữa hai lĩnh vực tiếp xúc ngôn ngữ có điệu tính, và vì thế chúng tôi đề nghị, đối với các hiện tượng đang được xem xét, nên hiểu một số khía cạnh trong sự phức tạp của chúng theo cách dần dần thay vì phân loại.

Im Rahmen der vorliegenden Arbeit beschäftigen wir uns mit prosodischem Sprachkontakt. Das Sprachpaar Vietnamesisch Französisch ist insofern interessant, als dass beide Sprachen sehr unterschiedlich sind als auch einzeln betrachtet interessante prosodische Eigenschaften haben. Während im Vietnamesischen jeder Silbe ein lexikalischer Ton zugewiesen wird, ist Französisch keine Sprache mit lexikalischem Ton. Dafür hat Französisch Konsonantengruppen und ein größeres Auslautkonsonanteninventar als Vietnamesisch. Was Silbenstrukturen angeht, sind beide Sprachen auf unterschiedliche Weisen zum Teil typologisch untypisch.

Unsere Forschung widmet sich unterschiedlichen Sprachkontaktsituationen sowie beiden Richtungen des Sprachkontaktes. Als Ausgangspunkt unserer experimentellen Untersuchungen dient die Betrachtung französischer Lehnwörter im Vietnamesischen. Hierbei schauen wir uns prosodische Adaptationsmuster an, die von Sprecherinnen und Sprechern vorgenommen wurden, um die Lehnwörter an das Vietnamesische anzupassen. Dabei stehen im Fokus die Reparatur von Strukturen, die im Vietnamesischen verboten sind: Konsonanten in bestimmten Positionen in der Silbe werden ersetzt oder getilgt, Konsonantencluster durch Epenthese oder durch Tilgung eines der beiden Konsonanten aufgelöst, Silbengrenzen verschoben, Konsonanten oder Konsonantenslots in bestimmten silbischen Strukturen verdoppelt, und Silben werden nach bestimmten Mustern Töne zugeordnet. Ziel unserer experimentellen Untersuchungen ist es nun, herauszufinden, ob in einer aktuellen Situation von Sprachkontakt ähnliche oder andere Muster auftreten. Monolingualen Sprechern und Sprecherinnen des Vietnamesischen werden französische Stimuli vorgespielt und sie werden gebeten, diese in drei verschiedenen Konditionen zu reproduzieren. Das gleiche Experiment ist zusätzlich mit Lernenden des Französischen durchgeführt worden, deren Erstsprache Vietnamesisch ist. Die experimentellen Daten zeigen viele ähnliche Muster zu den Lehnwortdaten. Allerdings weisen insbesondere die Daten von monolingualen Sprecherinnen und Sprechern sehr viel mehr Variabilität auf. Schließlich drehen wir die Richtung des Sprachkontaktes um: Native Sprecherinnen und Sprecher des Französischen werden gebeten, vietnamesische Stimuli zu reproduzieren. Hierbei interessiert uns die Frage, ob sich bestimmte Muster in die entgegengesetzte Richtung umkehren lassen, was zu Teil zu beobachten ist.

Mithilfe dieser Arbeit können wir einen tiefen Eindruck in Systemhaftigkeit und Variabilität bei Entlehnungen und im Zweitspracherwerb gewinnen und stellen abschließend fest: Es gibt aus phonologischer Perspektive sehr viele Gemeinsamkeiten zwischen beiden Feldern des prosodischen Sprachkontakts und es bietet sich für die betrachteten Phänomene an, einige Aspekte in ihrer Komplexität eher graduell als kategoriell zu verstehen.

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1. Introduction

Prosodic language contact is an extremely wide-ranging field to which current research devotes much attention. This is, among other things, due to technological advances and an increasing awareness of the linguistic diversity of the societies we live in. Through our work, we aim to offer a modest contribution to current debates, investigating universal principles and language-specific problems, systematicities, and variability. The consideration of various potential influencing factors and results will show us again how complex and multi-layered language is, solely by examining a very specific and small aspect of prosodic language contact.

In this thesis, we consider two directions of language contact for the pair Vietnamese French: native speakers of Vietnamese get in contact with French speech material and native speakers of French with Vietnamese speech material. Also, we draw on different datasets and consider them from the theoretical perspectives of loanword borrowing and second language acquisition. Our investigation takes place mainly from a phonological perspective, but phonetics is also included. To pave the way for readers to enter detailed elaborations, we start with mentioning the major concepts on which our work is based. For this purpose, we briefly explain what we mean by language contact and by prosody. Subsequently, we turn to the two languages Vietnamese and French and explain why these two languages are so interesting for prosodic language contact studies. Finally, we identify the general major research questions, against the background of which we address various smaller and more concrete research questions.

The term *language contact* must be seen as an abstraction. It is not literally the languages themselves which are the actors but instead the speakers of these languages. The term has been coined by Weinreich (1953) and later reached a greater audience through influencing works by Thomason and Kaufman (1988) and Thomason (2001, 2006). According to Thomason (2010), language contact covers situations in which there is an interaction between speakers or language material and speakers. An important characteristic of language contact is that it often induces language change to some degree, even if it is only for a short duration (cf. Hickey 2010). In this sense, contact induced language change is a diachronic process: it can evolve over a timespan of decades and centuries and involve a whole speech community. But according to our understanding, it can also happen synchronically in a given moment in time without a stabilization and involve only a small number of speakers, with various degrees between the two extremes. In this thesis, we have a look at two different points of this continuum.

Prosody is referred to in our work as *suprasegmentals*, and we use both terms as synonyms to cover the following aspects: all phonetic and phonological phenomena which go beyond single segments, among them the organization of segments into syllables as well as intonation, stress, and tone. In our work, we focus on the prosodic aspects of the organization of segments into syllables. But to have a good understanding of syllabic structures, we also need to understand segments, which is why we also devote parts of our studies to segments. Still, we always consider these segments with respect to which syllabic structure they can be part of. It is important for the understanding of our work that not all segments can stand in all positions within a syllable: some consonants are only in the onset and others only in the coda. Likewise, depending on the language, the combinations of segments is only possible in certain syllabic structures. In this fashion, prosodic aspects are linked to segmental aspects. In the sense of Meinschaefter (2003, cf. also Clements, 1990), a connection between segmental and suprasegmental structure can be made with the help of the concept of sonority from both a phonetic and phonological stance. Sonority, among others, plays an important role in syllabification. We will look at how different segments are structured into syllables in both languages although syllable structures in both languages obey the principle of sonority hierarchy (cf. Vennemann 1988). Additionally, the issue of syllabification is rediscussed under the perspective of language contact. Another link between segmentals and suprasegmentals is lexical tone as it occurs in Vietnamese, where the domain of tone is the rhyme of a syllable. A salient link between tone and segments in Vietnamese is the distribution according to which syllables with a plosive coda cannot be assigned tones which are assigned to other syllables. This way, segmentals and suprasegmentals are closely related by several phenomena and processes universally and specifically in the two languages under investigation.

Vietnamese is not only an interesting language from the perspective of prosodic language contact as it has become a tone language due to language contact (Michaud & Sands, 2020; Kingston, 2011; Thurgood, 2002; Hauricourt, 1954). Also, many others among its current segmental and suprasegmental features arose from language contact, among them parts of the consonantal system (Ferlus 2014). Noteworthy is also the fact that language contact arguably played a major role in the disappearance of consonant clusters. In this respect, Vietnamese is different from many other languages of the Austroasiatic family and shares more similarities to Chinese varieties and branches of the Tai-Kadai family, which are geographically close but do not belong to the same family. Coincidentally, the above-mentioned features of Vietnamese that are due to contact-induced language change are also among the features that make Vietnamese and French so particularly different: French is a language in which lexical tone is

absent, but consonant clusters are common. Additionally, not only consonant clusters are an aspect which distinguishes the two languages, but they also differ in the inventory of single segments, especially in that the French coda inventory is much larger than the very restricted Vietnamese one. Despite these differences to Vietnamese, French is also a very interesting and typologically atypical language in terms of syllabification. And this is the last aspect we concentrate on: two very interesting languages in terms of syllable structure come in contact and phonological processes such as gemination arise which are not associated to Vietnamese, and which only marginally occur in French.

French is not only an interesting language due to its segmental and suprasegmental features, but its colonial past has meant that it is spoken in different parts of the world and that a wide range of language contact phenomena can be studied for French. Unlike many other languages spoken in former colonies, the traces left by French in Vietnamese are extremely small, and we will also explain the reasons for this in a few moments. Also, French no longer plays a particularly important role in today's Vietnam, as first the foreign language Russian and nowadays English have become much more influential in Vietnamese society. In our work, we will consider some of these marginal traces of French by examining prosodic patterns of loanwords. We continue by enlarging our focus to experimental approaches and considerations of second language acquisition of Vietnamese by speakers of French and French by speakers of Vietnamese. The results in turn are applicable to language teaching.

To conclude, we can contribute by providing new insights into prosodic aspects of the two languages, as specific properties may be better visible in a language contact setting than by considering each language isolated. Second, we will be able to consider in which ways universal mechanisms of prosodic language contact emerge in the specific situations under investigation. This thesis is structured in the following way: after this introduction, we provide background information in 2. We continue with an overview of the empirical studies in 3. and subsequently present the studies themselves in 4., 5. and 6. While 4. is devoted to French loanwords in Vietnamese, 5. and 6. are experimental studies. The difference between the two is the direction of language contact: in 5., French stimuli are reproduced by speakers of Vietnamese while in 6. Vietnamese stimuli are reproduced by speakers of French. A discussion follows in 7., including the presentation of a unified theoretical model for borrowing and second language acquisition contexts and a detailed comparison of the different datasets and independent variables. Among these variables are the speaker group with monolinguals on the one hand and speakers with second language knowledge on the other, to mention just one. Our results are

finally summarized in 8. Hoping we have caught the reader's interest; we deliver in the following chapter background information which is necessary to understand our investigation.

2. Background

In this chapter, we provide all the information which is necessary to understand and contextualize the studies of our work. After a short historical embedding of the language contact situation we are considering, we look at two aspects of prosodic language contact, namely borrowing and second language acquisition. We consider these aspects first from a general theoretical stance and finally for the concrete languages under investigation, Vietnamese, and French, after having delivered the relevant segmental, suprasegmental and some morphological aspects of the two languages. The information we provide in this chapter is very divergent, ranging from historical events that have led to language contact to core linguistic, very fine-grained considerations. We find it important to include all these divergent topics, as prosodic language contact is a very complex and broad field.

Nevertheless, we will keep the historical part short and shrink the complexity of Vietnamese French history to a few pages, leaving a deeper analysis to historians. Still, we want to keep readers informed about the most important facts, since the colonial past still shapes our world today and has also led to the fact that there are fewer loanwords from Vietnamese in French than vice versa and fewer French Vietnamese learners than vice versa. This in turn means that linguistic research also often goes in one direction rather than the other, a fact we try to balance out a little bit in this thesis, as the other direction is also worth considering.

More space than to historical facts is given in this chapter to the topics of loanword borrowing and second language acquisition as language contact phenomena. Furthermore, we will go into detail on core linguistic research findings on the two languages French and Vietnamese, which are crucial for understanding the present work: segmentals, supasegmentals and selected morphological aspects. Finally, we will mention previous work on French Vietnamese language contact and summarise findings which are relevant to our work. These can be understood thanks to the information previously provided on theoretical considerations of language contact phenomena and core linguistic considerations of the two languages investigated.

In 2.1., we consider language contact, embed it in a historical context, and then deliver an overview of general theoretical considerations about borrowing processes leading to loanword adaptations as well as second language acquisition. We continue by looking at the linguistic domains of segmental and suprasegmental phonology, considering also phonetic issues, as well

as some aspects of morphology in 2.2. Finally, we summarize the results of previous work on prosodic language contact between French and Vietnamese in 2.3.

2.1. Language contact

In this section, we will present general theoretical concepts of two different language contact situations: on the one hand, we consider borrowing processes which take place in loanword adaptation and on the other hand, we look at foreign and second language acquisition. We summarize general theoretical debates on both issues and explain how they are linked to each other. As our work is devoted to prosody in language contact, we will give more room to issues related to prosody. Also, as prosodic, namely suprasegmental aspects are linked to segmental aspects or can often be better understood when segmental patterns are understood, we also consider phonological and phonetic research focussing on segmental aspects in loanword adaptation and second language acquisition. Finally, we present previous literature in these contexts for the language pair Vietnamese French. But before considering language contact, some words must be said about the history of the two countries Vietnam and France. Therefore, we start this section with a brief historical contextualization.

2.1.1. Historical contextualization

The present work aims at exploring language contact which would in parts have not taken place in this way without colonisation. This section will therefore focus on the unequal and brutal circumstances under which language contact between French and Vietnamese happened. These circumstances are partly reflected in the loan vocabulary and for loans like *bôi* (*bàn*) ‘waiter’ from French *boy* with English origin *boy*, or *xà lim* from French *cellule* ‘cell’ prison, we can imagine which stories stand behind each loanword and how they reflect colonial history. In this section we will recall to what extent the singular histories of the individual loanwords, which give an idea of the circumstances mentioned above, belong to the larger historical context of colonisation. We do not want to ignore this context in our work, especially since it is often made invisible or at least underrepresented in the historiography of the countries that once acted as colonizers: “Pour bien des historiens, français ou non, la colonisation n'appartient pas vraiment à l'histoire de l'hexagone [For many historians, whether French or not, colonisation does not really belong to the history of France]” (Brocheux & Hémery, p. 7). This is true not only of the French, but also, by analogy with the French, of any other postcolonial context, including the German¹. In the selection of the quotation, therefore, France is only the focus of

¹ As the author of this work is German, she does not want to present an inglorious chapter in French history without mentioning her own country's equally inglorious, even though less extensive colonial chapter of history.

attention, since we limit ourselves to the French context in the framework of this thesis. This chapter not only provides a general historical perspective on our topic of interest, but in addition, and of particular importance for the linguistic content of this work, provides information on how language contact may have taken place.

The main reference works on which this chapter is based are Nguyễn Khắc Viện (1999/2004), and Lê Thành Khôi (1955). To complete the picture, Brocheux & Hémery (2001) and Dalloz (1987) are also considered, and to go deeper into the subject of education, Trịnh Văn Thảo (1995, 1993). Thus, Vietnamese, and French perspectives are included, with a focus on Vietnamese perspectives. The reference works are first described briefly before giving an outline of Vietnamese and French history of colonization.

The works of Trịnh Văn Thảo are specifically devoted to the French educational system in Vietnam. In Dalloz (1987) the author focuses on the period of *Indochina War /Chiến tranh Đông Dương* (1945-54). This book takes a clearly French-centred position. In Brocheux and Hémery (2001), the title *Indochine: La colonisation ambiguë* already reveals the authors' point of view: with their multi-faceted book, they attempt a differentiated view beyond colonial glorification and colonial criticism. However, it is questionable whether this view does justice to reality, and so the choice of title has been criticised:

Un premier point me paraissant discutable est l'idée avancée dans le titre de l'ouvrage que la colonisation est ambiguë. Elle me semble, au contraire, l'archétype de l'entreprise de domination brutale fondée sur une force armée supérieure

[A first point that seems questionable to me is the idea put forward in the title of the book that colonisation is ambiguous. To me, it seems instead to be the archetypal enterprise of brutal domination based on a superior armed force]. (De Gantès, 2004).

Furthermore, de Gantès (2004) criticises the fact that in this book, too, the colonised are partly relegated to the background of the colonialists. This is different in the two main reference works of the Vietnamese authors. First, they not only devote themselves to Vietnamese and French history but embed it in a continuity of the entire history of Vietnam. Furthermore, Vietnamese voices are given a much larger space. Nguyễn Khắc Viện, a marxist and anti-colonialist, was awarded the Grand Prix de la Francophonie de l'Académie Française in 1992 and the Vietnamese State Prize in 2001. Lê Thành Khôi is professor emeritus of the University Paris V

This cannot be attributed to a less inhumane attitude towards the colonised, but to the mere fact that Germany as a nation began to exist much later than France and therefore had less time and opportunities for colonial activity. An interesting film which involves German activities in forced labour by Vietnamese people during world war II is *Công Bình, la longue nuit indochinoise* by Lê (2013), which is inspired by Daum (2009).

"Descartes" and UNESCO advisor and was likewise awarded the Grand Prix de la Francophonie in 2003, as well as the Phan Châu Trinh Culture Prize in 2012.

Compared to the almost a millennium of Chinese domination (111 BC to 938 AD), the French colonial period is only a short chapter in Vietnamese history. The cultural influence of China, especially the imprint of a Confucian value system with strict hierarchical orders, has thus left far more traces in Vietnamese society than the cultural influence of France. This is also reflected in modern Vietnamese: Chinese has influenced Vietnamese much more extensively, whereas only a relatively small amount of French loans persists in the Vietnamese lexicon until today as we will see later.

In the 16th century, French and Portuguese missionaries started activity in the territory of the present-day Vietnam, mainly in the south. Two centuries later, in 1858, the French military began conquering Vietnamese territory. The conservative policy of Emperor Tự Đức and his successor Minh Mạng was anti occidental, but because of their regressive orientation, they were unable to defend themselves against the French military. This way, the southern part of what is now Vietnam was occupied by Napoleon III from 1862 to 1867 and became the French colony of *Cochinchine*. Later, other areas were also annexed as protectorates under the names *Tonkin* and *Annam*, and merged, together with Laos and Cambodia, to form the colony of *Indochina*.

The military conquest of Vietnam, begun in 1858, was officially completed in 1885. Due to the numerous resistances, this war of conquest only finished in 1896. From then on, a classic colonial regime was established. The Indochinese Union was complete in 1907 with the conquest of Laos. Lê (1955) describes it as an artificial creation without historical or geographical justification, without a proper government with the usual organs, whose total budget was generated by unfair taxes and customs duties and the monopoly on opium, alcohol and salt, the majority of which went to France and made industrialisation impossible. Democratic freedoms such as those of opinion and the press existed in none of the territories.

Before the Second World War, there were no more than 43,000 people of European origin in Indochina, with about 25 million natives making up most of the population. While some members of the bourgeoisie profited from the capital generated, the majority of the population was exploited, especially the so-called *tá điề̀n*, peasants who had been deprived of their land, and the agricultural workers who began to develop a proletarian class consciousness because of the brutal working conditions: for example, the construction of the Yunnan Hà Nội railway line costed 25,000 of 80,000 workers their lives. In 1929, about 220,000 labourers worked in

mines, factories and on plantations. Many of them died in inhumane conditions; if they tried to escape, they were caught by a cruel police force. Trade unions were banned, and strikes were punished with imprisonment, torture, and deportation (cf. K. V. Nguyễn, 1999, where numbers are taken from). Still, the number of strikes increased and in December 1936 alone, there were 50,000 strikes (cf. Lê, 1955). Members of the bourgeoisie, who had access to modern education and some of whom had studied in France, also saw the imbalance and a large proportion of these agreed with other parts of the population in rejecting colonialism. The general standard of living of the non-European population was markedly low and slight increases were based on hard struggles. Thus, Lê sums up the history of French colonisation in what is now Vietnam as a history of continuous resistance. He describes France's reaction as a back and forth between concessions and crackdowns (cf. Lê, 1955). From the Vietnamese side, Nguyễn describes the same situation as two opposing reactions to the colonial aggressions, that of compromise and that of resistance, with the king and senior officials pursuing a policy of negotiation but educated elites for the most part joining the resistance (cf. K. V. Nguyễn, 1999).

Initially, the resistance movements were unsuccessful, especially as they were only military and lacked a major political programme. Thus, Vietnamese nationalism began to lay foundations for such a programme. At first, Siam and Japan served as models, the two states which had managed to remain independent and to modernise themselves without giving up traditional values. The first resistance movements with a comprehensive political programme emerged around the educated Phan Bội Châu and Phan Châu Chinh. These movements, however, were destroyed by the French: the end of Phan Bội Châu's career and the death of Phan Châu Chinh in 1926 also brought an end to two important movements. But in the same year, Nguyễn Ái Quốc (later known as Hồ Chí Minh) founded what would later become the Communist Party of Indochina. The division of the country after the colonial period finds its roots in colonial policy, which sought to pit South against North, but also instrumentalized ethnic minorities.

During the Second World War, Japan declared itself the liberator of Vietnam and largely pushed back the French from 1940-45. This was welcomed by parts of the Vietnamese population, but others (especially the communists) saw Japan as a new aggressor to be fought. On 14 August 1945, Japan capitulated. Mass demonstrations took place throughout Vietnam, and on 2nd September, Hồ Chí Minh declared the independence of Vietnam. This declaration was supported by most of the population in both northern and southern Vietnam, and the Emperor Bảo Đại, who was supported by the French, abdicated.

After the end of *Second World War* France tried to regain its supremacy in the Asian colonial area. This led to *Indochina War//Chiến tranh Đông Dương* (1945-54), which lasted almost ten years and entered history as the so-called *sale guerre* ‘dirty war’ because of its cruelty. This war became increasingly internationalised. The foundations were laid for the second and more famous war on the Vietnamese territory known as *Vietnam War/ Chiến tranh Mỹ*. The period from 1954-1965 should be seen as a temporary cease-fire of international intervention rather than peace: civil war started only one year after the war with France was finished, escalated, and led to the beginning of the bombing by the USA in 1965 until the end of war in 1975. Thus, it can be concluded that Vietnam was at war for about 30 years.

The main Vietnamese actors who played a role in *Indochina War//Chiến tranh Đông Dương* were the communists, the Việt Minh led by Hồ Chí Minh. Catholicism and various sects such as Cao Đài and Hòa Hảo, formed a counterpart to communism, carried elements of mass political movements and played a military role in the fight against the French. The terrorist organisation Bình Xuyên, which was born out of river piracy and first fought the French, later changed camps, and collaborated with the French against the Việt Minh. Many mountain minorities were also used by the French to fight against the Việt Minh. This policy of the French was adopted by the Americans during *Vietnam War/Chiến tranh Mỹ* and contributed significantly to a difficult situation of these minorities.

Besides France, the most important international actors were the USSR, the USA, Japan, China, and Great Britain. It was not only French soldiers who used the first napalm bombs in 1951, but French policy during the war continued to contribute to the division of Vietnam and the ensuing civil war. Thus, an independence movement under the influence of external forces became a civil war, which developed into the proxy war of the Cold War. Việt Minh was no longer a nationalist collective movement, but clearly communist. At the same time, the war in separate camps retained the character of a war of liberation. The relationship between the allies France and the USA was ambivalent. At first, the USA did not support French colonialism, but then gave in to fight the communists as a common enemy, accepting the cruel circumstances of the war. In France itself, communists showed solidarity with Việt Minh and other parts of the French population also increasingly criticized the government in waging this ethically unjustified war, among them the engaged anticolonialist André-Gorges Haudricourt. The latter has written important linguistic works on Vietnamese of which some are cited in this thesis.

In 1954, Vietnam finally gained independence from France, but in a divided form: after the decisive battle in Điện Biên Phủ the Geneva treaties stipulated that only the north should go to

the communists, while in the south power was given to the anti-communist dictator Ngô Đình Diệm, who also brutally fought Buddhist revolts (especially known is the massacre of Huế) and other oppositional groups. Free elections were prohibited by the allies, as they would have led to the victory of the communists in the south at that time. In contrast to the north, there was still a certain French influence in this area until the communists came to power in 1975.

As the aspect of education in colonial Vietnam is of special interest for our work on language contact, which can partly be situated in this context, we want to continue deepening the aspect of education. In 1907, the French found a university in Hà Nội, which was rather a pseudo-institution than a real university compatible with universities in hexagonal France. Lê (1955) and K.V. Nguyễn (1999) agree that progressive learning was not possible there:

Elèves et étudiants récitaient par cœur que ‘nos ancêtres s’appelaient les Gaulois’, dissertaient à longueur de journée sur Racine ou Chateaubriand, sans jamais approfondir la culture vietnamienne. Même les auteurs français du XVIIIe siècle, tels Montesquieu et Rousseau, étaient prohibés ; il n’y avait ni faculté de sciences, ni école ingénieurs à l’Université Indochinoise.

[Pupils and students recited by heart that "our ancestors were called the Gaulois", disserted all day long on Racine or Chateaubriand, without ever learning about Vietnamese culture. Even French authors of the 18th century, such as Montesquieu and Rousseau, were forbidden; there was neither a science faculty nor an engineering school at the Indochinese University] (K. V. Nguyễn, p.195).

The reading of the French Enlightenment writers did not take place officially, but the corresponding works nevertheless reached Vietnam via China and were secretly read by Vietnamese intellectuals. The successive replacement of the traditional Vietnamese education system by the French resulted in a decimation of schools and an increase in illiteracy. A countermovement took place through Vietnamese educated people: in the same year the university was opened by the French, Phan Châu Chinh founded the school *Đông Kinh Nghĩa Thục* with lessons mainly in Vietnamese, but French and Chinese were taught.

As the mandarinat was predominantly oppositional to the colonial regime, their traditional competitions were abolished in Tonkin in 1915 and in Annam in 1918. In the same year, the university, which had ceased to exist in between, was reopened, but again with only a very reduced programme. The highest school diploma awarded to Vietnamese graduates was not equivalent to the metropolitan French school diploma, which prevented graduates from entering universities both in Vietnam and France. This has resulted in students pursuing the metropolitan diploma. Likewise, many Vietnamese aspired to study in France, and university migration began to worry the Indochinese and hexagonal governments of France. In 1927, the first national congress of Vietnamese students was held in Aix-en-Provence (cf. Trinh, 1995).

Private schools played an important role during the colonial period: although officially abolished in 1918 with the last Mandarin competitions, the traditional education system lived on as part of a resistance of scholars in private schools and was taught by Confucianist teachers. Vietnamese scholars split into two camps: conservatism and reformation. The *Duy Tân hội*, a movement of Phan Bội Châu with a modernist approach, set out to reform the programme. Even after the official abolition of the Mandarin competitions, Vietnamese scholars did not allow their tradition to be taken away by the colonial power but decided for themselves which modernisation measures were necessary. French colonial policy had significantly underestimated the role of Vietnamese scholars, who had a long tradition and could not be easily suppressed. But the implementation of French as a lingua franca failed not only due to the resistance of the Vietnamese population, but also due to the qualitative and quantitative deficiencies of French teachers and their ignorance of Vietnamese language and culture:

Peu de temps après l'introduction du français dans l'enseignement élémentaire, les effets induits par cette francisation volontariste sont tellement graves qu'il faut l'abandonner.

[Shortly after the introduction of French in elementary education, the effects of this voluntary francization are so dramatic that it must be abandoned] (Trinh, 1995, p. 56)

Six years after the introduction of the colonial schooling system, there were only 180 000 pupils, with a population 100 times higher. In areas with the highest school density, one of 12 boys and two of 100 girls went to a French primary school, of whom at most one third went beyond very elementary basic courses. The number of private Confucian model schools is estimated in 1913 to 15000 in the north and centre and 487 in the south (cf. Trinh, 1995).

Under the pressure of the threatening situation for French colonial politicians, the latter had tried to take literacy into their own hands from 1942 onwards, which previously had been driven mainly by Vietnamese patriots and communists. In 1942, the number of schools increased from 450,000 to 700,000 to strengthen loyalty to France among the population (cf. Trinh, 1995). In 1944, 80% of the population was still illiterate. Only 900,000 children attended primary school, which make up 3.6% of the total population. 4000 children attended secondary school and 1500 students attended university. Only 77% of these students were locals (cf. Lê, 1955). In 1945, after the declaration of independence by Ho Chi Minh, literacy campaigns by the communists took place on a much larger scale: education in *chữ quốc ngữ* became compulsory and free of charge in the whole country: 2,5 million people learned to read and to write (cf. Trinh, 1995).

A successful campaign by the French had been the substitution of *chữ nôm*, the ancient ideographic writing system based on Chinese characters, by *chữ quốc ngữ*, based on the latin alphabet, which was later spread by the communists, as just mentioned. *Chữ quốc ngữ* was

developed primarily by Portuguese and French Jesuits who were missionaries in Vietnam in the early 17th century². During the colonial period, the French taught this alphabet first to promote French as a lingua franca more efficiently, to demonstrate power to the mandarins and to deprive the population of its roots. When this policy had failed, the French colonial regime used it as a propaganda tool, but instead it became a means for the Vietnamese national independence movement, and numerous newspapers and books in Vietnamese written by Vietnamese authors have been printed after its establishment (cf. K. V. Nguyễn, 1999). Thus, the ancient script dating back to Chinese dominance in Vietnam was replaced by the script of a later colonial power, it came to pass that communists took advantage of this script developed by Jesuits, and the population decolonized a heritage of the French colonial regime.

Having addressed Vietnamese French colonial history, in the context of which language contact took place in colonial times, we were unable to find concrete numbers on bilingualism during French colonial rule, which is why we can only gain a very vague picture: very few French people in Vietnam spoke Vietnamese, and although the relative number of Vietnamese who spoke French was much higher, it was still probably rather small in relation to the total Vietnamese population. The only estimation we found is taken from Huynh (2010) and according to this estimation, only 5% of the Vietnamese population spoke French fluently.

Today, the role of French in Vietnam is not very important either and the fact that Vietnam officially belongs to the Francophonie may be a politically motivated decision of the countries Vietnam and France rather than that it reflects a linguistic reality: at the turn of the millennium, only about 400 000 people spoke French, most of them belonging to generations that lived during colonial times. In the late 90's, 4.5% of pupils studied the basics of French at school (cf. Huynh 2010), and the mentioned numbers and proportions may have fallen further in the meantime. Despite the fact that culturally, the Francophony in Vietnam has been in decline since the 1950s (T. P. Nguyễn, 2014) and the minor role of French language in today's Vietnam, language contact between the two language takes place in other settings. First, there is a large Vietnamese community in France. According to the mid-2020 estimates from the migration policy institute, about 144 000 migrants from Vietnam live in France (United Nations, 2020, see also a visualization of the data on the related webpage of the Migration Policy Institute, 2020). This number does not include people with French citizenship, and people calling themselves members of the Vietnamese community in France could be estimated to be about

² Alexandre de Rhodes is considered to be the author of the *Dictionarium Annamiticum Lusitanum et Latinum*, printed in Rome in 1651.

twice as high. In a migration context, French is a second language of first language speakers of Vietnamese. The other way round, first language speakers of French in Vietnam who speak fluently Vietnamese are rather an exception and their community is quite small³. This imbalance can be observed to different degrees in any postcolonial setting. Besides contexts of migration, both languages are taught in Vietnam and France. On the one hand, French is the foreign language for students of French in some high schools and universities in Vietnam. On the other hand, French students learn Vietnamese at certain universities in France.

Building a bridge from Vietnamese French colonial history via the educational situation to the colonial and postcolonial language contact situation, we will now turn our attention to borrowing processes in loanwords as well as concepts of second language acquisition. In the view of the historical circumstances just described, it is not astonishing that loanwords in today's Vietnamese are the main trace left by colonial language contact. The number of these loanwords in Vietnamese is very small relative to the native vocabulary, but, as we will see later in 2.2.3., also relative to loanwords from other Asian languages. Corpora of 500-1500 words compiled by various researchers may sound like a large number, but this number is relativised to much less than 1% in view of the entire Vietnamese lexicon (cf. Poplack, 2018, for a comprehensive general discussion on the overestimated role of loanwords in language's lexica). However, before we turn to the research on French loanwords in Vietnamese, which is the starting point for our own research on these loanwords but also the experimental research connected to foreign and second language acquisition, we introduce some general concepts on borrowing processes loanword adaptation as well as foreign and second language acquisition.

2.1.2. General theoretical considerations about borrowing processes

The literature about borrowing processes in general and specifically about loanword integration have been studied for many language contact situations with diverse language pairs, especially for English and French as source languages, and diverse African, European and Asian languages as target languages, especially Korean and Cantonese.

A generally accepted definition of borrowing can be found in Thomason & Kaufman (1988), to which many researchers refer until today. According to this definition, borrowing is a process in which a lexeme of language is incorporated into another language's discourse (cf. Thomason and Kaufman 1988). The definition has been taken up, among many others, in Poplack (2018),

³ No concrete numbers are available on the websites for migrants from France in Vietnam. The only European country for which numbers exist is Great Britain: There are 1000 migrants from Great Britain in Vietnam, of which many may have a Vietnamese background.

a monography dedicated to the process of borrowing. Poplack gives three main assumptions made previously by other scholars a name and subsequently gives evidence for refuting them one after another: first, she argues against the *diffusion assumption*, according to which lexemes that are incorporated into another language's discourse once, "typically gain in frequency and extend across the community" (Poplack 2018, p.122-123). Secondly, she positions herself against the *graduality assumption*, according to which these lexemes have the possibility to be adapted to the structures of a language into which they are incorporated "as they increase in frequency and diffusion" (Poplack 2018, p.123). And finally, she presents her evidence against the *identity assumption*, according to which "(single word) code-switches cannot be distinguished from (nonce) borrowings" (Poplack 2018, p.142).

In the course of this work, we will come back to these assumptions, but at this point outline our endeavour to position ourselves for or against them considering prosodic language contact between Vietnamese and French. As to the diffusion assumption, we believe that Poplack is right as the number of loans from Vietnamese into French is overall very low but will not further dive into this topic. In our experimental approach, we will come back to the diffusion assumption, adjust it to our experimental setting and test it. As to the last assumption, we believe that the situation might be more complex, and generally question if it is necessary to categorize processes which may be distinguished in some contexts but have a lot in common.

Language contact situations often lead to borrowing from one language into another, regardless of how intensive this language contact is. Borrowing can be seen as a phenomenon of language change due to language contact (cf. Thomason 2006), even if this contact is kept to a minimum. The language from which borrowing takes place is the so-called *source language*, while the language into which borrowing takes place is the *target language*. It is almost always the speakers of the target language who are actively involved in the borrowing process; hence they are called *borrowers*.

The process of borrowing and loanwords are linked. While not all borrowings are loanwords, all loanwords are the product of a borrowing process. If one speaker borrows a lexeme one time into the target language, then this lexeme does not necessarily become a loanword, but, in the sense of Poplack (2018), remains a *nonce borrowing*. It only becomes a loanword if several speakers use it, if it stabilizes and enters the target language speaker's collective mental lexicon. While Poplack (2018) distinguishes the processes of borrowing, code-switching and loanword adaptation from a general point of view and rather focusses on syntactic, morphological and sociolinguistic aspects, other scholars concentrate on the phonology and phonetics of

borrowings and loans. The starting point of our endeavour is situated within this framework.

Therefore, we consider a lexeme to be a loanword from one language not only if it is incorporated in the target language's discourse, and additionally has a mental representation in this language, but, and this is most important for us, is adapted according to its phonological constraints (cf. Paradis & LaCharité, 1997; Poplack, Sankoff & Miller 1988). To meet the phonological constraints of the target language, structures which are illicit in the target language must be changed. These changes can be called *repairs*. For instance, take the French lexeme *scandal* [skãdal] 'scandal' which was borrowed as *xì cǎng đān* [si^{B1}kǎŋ^{A1}đan^{A1}] into Vietnamese. In the context of our work, illicit structures can be single speech sounds in certain syllabic positions (in our example the coda consonant [l]), the combinations of speech sounds organized within syllables (the onset cluster [sk]), other illicit syllabic structures in the target language but also toneless syllables, when the target language is a tone language which requires all syllables to be specified for tone. When we talk, e.g., of consonant repair, this implies that the repaired consonant in a certain syllabic position is a consonant which violates the target language's constraints: therefore, it is repaired. In our example, the coda [l] is repaired by [n].

Through a better understanding of specific language contact scenarios such as loanword adaptation we can learn more about general processes in language contact: looking at repair strategies in loans helps us to understand how speakers solve the dilemma between being faithful to the source lexeme and to their native grammar (cf. Kenstowicz, 2010). The French lexeme *scandale* [skãdal] for English 'scandal' is an example that the dilemma could only be solved with the help of various repairs as it became *xì cǎng đān* [si^{B1}kǎŋ^{A1}đan^{A1}] in Vietnamese. We also may have access to native processes which surface in a more visible manner in borrowings as compared to native lexemes (cf. Kang, 2011 among many others). An ongoing debate about borrowing and loanword adaptation is whether loan adaptation is driven by phonetic or phonological processes, linked to the issue of monolingualism vs. bilingualism of the speakers. In this section we discuss two models of loanword adaptation.

In most language contact situation for which borrowing processes and, more specifically, loanword adaptation has been studied, the target language is also the borrower's first language (L1). The same speakers may speak the source language as a second language (L2); depending on the contact situation, they may be fluent in L2 or only have picked up a few words without having any further knowledge of the source language. In the case of multilingual first language acquisition, the speakers involved in the borrowing process have learned the source language together with the target language and speak both languages at a native level. This means that

the source language cannot be equated with the second language L2 in all language contact situations, just as the target language cannot be equated with the first language L1.

The prototypical definition of L1 and L2 is based on age of acquisition is as follows: everything learned before the age of six is considered L1 and everything learned later is considered L2 (cf. Saville-Troike, 2006; Lenneberg 1967). However, strictly speaking, it is not accurate to call the source language L2 if borrowers are monolingual speakers of the target language, since a language never learned cannot be an L2 either. Therefore, in the context of borrowing, we do not speak of L1 and L2, but only of source and target language. The concepts of L1 and L2 will receive more attention in the framework of second language acquisition: second language acquisition, in the context of this work, constitutes a second focus.

Depending on the language contact situation, borrowing processes can be bi- or monodirectional. Bidirectional borrowing processes are also referred to as symmetrical when both languages function as both source and target languages for borrowing in a balanced frequency distribution. This depends on the socio-political background, i.e., on power relations and prestige factors, and on the resulting characteristics of language contact. Most situations are thus asymmetrical (cf. Haspelmath, 2009). Additionally, the borrowing of a source language's lexeme can happen one time, and it can happen several times. The borrower of this lexeme can be only one person, but the lexeme can also be borrowed by several persons.

Studying borrowing processes and, more specifically, loanword integration, helps us to get insights about the productive phonetic and phonological constraints of a target language but also to learn in which ways source and target language are different from each other. When considering the native lexicon, languages' constraints can oftentimes be less visible, as native lexemes, especially in an isolating language like Vietnamese, often remain static and we cannot observe productive alternations. This is different for loanwords: having knowledge about the corresponding lexeme in the source language and by comparing both lexemes, we can gain insights into creative processes which were active during the borrowing process, and which have been frozen in the stabilized loan.

By studying borrowing processes which were active in loanword adaptation, we cannot only gain more insights about the target language's productive patterns and their differences to patterns of the source language. We can also get a better understanding on the mechanisms of borrowing processes in language contact situations. By studying these processes for one language pair and comparing the results with previous research for other language pairs, we might also get more insights about universal principles in language contact which emerge in

borrowing processes and are still accessible via the study of loanwords at a point in time when the language contact situation is over. In the last 30 years, many researchers have devoted their works on loanword adaptation and knowledge has been gained about universal principles in loanword adaptation, among them Uffmann (2015); Kang (2011); Haspelmath & Tadmor (2009) and Paradis & Lacharité (2011). The interaction of both universal and language specific grammar in loanword adaptation can be described by the following quotation:

Correlation between the phonological patterns and auditory perception further supports the universal aspect [...] knowledge of the phonetic perception is encoded as part of grammar and interacts with other aspects of individual grammars yielding distinct loanword patterns across languages (Shinohara, 2006, p. 1075).

In what follows, we will summarize the most important findings and discussions on that issue. The central question when dealing with loanword phonology is: what are speakers doing when they borrow, or, more specifically, what might they have been doing? Possible answers to this question are provided in this section. First, we will consider the role of perception and that of the phonological system of the target language as has been discussed in previous works. We continue by mentioning the possible role of orthography and sociolinguistic factors and raise the question why certain lexemes are adapted as loanwords and others not.

When speakers adapt foreign words from the source language into the target language, they try, on the one hand, to adapt the loan word to the segmental, phonotactic and prosodic structure of the target language. On the other hand, they try to retain as much information of the source language as possible. Researchers have developed *Optimality Theory* (Prince & Smolensky 2004, first circulated 1993) and applied it to phonology (McCarthy, 2004), phonological acquisition (Barlow & Gierut, 1999) and prosody (Hammond, 1997). Optimality theory has also extensively been applied to model borrowing processes and especially loanword adaptation (among them Yip, 1993; Shinohara, 2000; Adler, 2006; Uffmann, 2006; Kenstowicz, 2007; Rungruang, 2008; Adomako 2008; Kenstowicz & Louriz, 2009; Kenstowicz, 2010; Shinohara et al., 2011; Pons-Moll, 2012; Kenstowicz, 2012; and Shoji & Shoji, 2014, to mention just some), and recently even applied to artificial intelligence and natural language processing (Tsvetkov & Dyer 2016). Thanks to this approach, it is possible to use markedness and faithfulness constraints to model the sometimes-conflicting goals of the speakers. By ranking these constraints, one can understand how the conflict was resolved by the borrowers. Although our work is influenced by an optimality-theoretical thinking, we use a descriptive approach, discuss repairs, and present a general model for the prosodic language contact situations addressed in this work at the end of the discussion, but do not undertake any detailed modelling of the conflicting constraints within the framework of Optimality Theory.

But who are the speakers who adapt loanwords from the source language into the target language and how exactly do they do this? Two related questions which have been the subject of much research discussion are whether the borrowers use phonological information of the source language in the borrowing process (Paradis & LaCharité, 1997) or if they just take the phonetic form of the source language (Peperkamp & Dupoux, 2003, Yip; 2006, Boersma & Hamman, 2009; Kenstowicz, 2010) and whether speakers are bilingual or monolingual. Kenstowicz (2010) summarises three models of loanword adaptation: while Paradis and LaCharité (Paradis & LaCharité, 1997; LaCharité & Paradis, 2005) explain the emergence of loanwords by the fact that bilinguals use their knowledge of the structures of both languages to abstract from the phonetic details of both grammars, Peperkamp & Dupoux (2003) postulate that the emergence of loanwords is extragrammatical. Native speakers of the target language attempted to produce a phonetic output as acoustically similar to the phonetic input of the source language as could be generated by their grammar. The model of Boersma & Hamman (2009), as well as Yip (2006), is partly consistent with the second model: it is assumed that the input is the surface representation of the L2. In addition, the adaptation includes phonological categories and constraints of the native language system as well as orthographic effects (cf. Kenstowicz, 2010, p. 104). We merge this model with the second model because of similarities between both. The extent of the role of perception, as well as whether, and if so, when the loanword grammar does not correspond to the native one, will be discussed at the appropriate point. The more bilingual speakers are involved in loanword integration and the higher their level in the source language, "the more likely the adaptation will refer to phonological representations over phonetic representations of the input language" (Kang, 2011, p. 2264).

Daland et al. (2015) as well as Vendelin & Peperkamp (2006) address the role of orthography in loanword adaptation. The latter claim that a written representation of a loanword can have a greater influence on its realisation than previously assumed. There are two ways in which orthography can influence loanword adaptation: so-called reading adaptations are pronounced "as if they were native words of the borrowing language" (Vendelin & Peperkamp, 2006, p. 997). This can be discussed for some examples in my work, for instance for the onset consonant [z] in the Vietnamese lexeme ray [zaj], a loanword from French rail [ʁaj] 'railway'. Because the letter <r> is pronounced as [z] in the northern standard variety of Vietnamese, speakers of this variety pronounce it as [z] also in the loan. We will dive deeper into this topic at the appropriate point. In the case of adaptations based on "between-language grapheme-to-phoneme correspondences" (Vendelin & Peperkamp, 2006, p. 1004), on the other hand, the authors assume a certain degree of standardisation in the extent to which graphemes of the

source language would be pronounced in the target language. Thus, language learners learn in class that a certain grapheme or combination of graphemes in the foreign language corresponds to a certain sound in their first language. Demonstrating this kind of adaptation is a major research challenge. It cannot be assumed within this thesis, because "adaptations based on this strategy [...] are often indistinguishable from adaptations based on phonological and/or phonetic minimality" (Vendelin & Peperkamp, 2006, p. 1004).

Another possible factor of influence on how loans are integrated is the fact that "older loans might have entered the language during a stage in which certain sounds in either the source or the borrowing language had different phonetic characteristics" (Peperkamp & Dupoux, 2003, p. 369). Vuong (1992) provides information about when individual loans entered Vietnamese lexica – but they may have already existed before in speaker's mental lexica. According to Vuong (2011), there were two waves of borrowing during the period of colonial language contact, historical information which could be studied deeper in this light in future work. Local varieties of both the source and the target language may also have influenced repair patterns in loan word integration (cf. Yip, 2006), an issue, which is addressed for the French-Vietnamese contact situation in Vuong (1992) and Huynh (2008, 2010), among others. This and other sociolinguistic influences can only be discussed in passing in the context of this work.

Finally, the question of why certain lexemes are integrated and others are not should be touched upon. The most common explanations refer to so-called *cultural borrowings* (cf. Haspelmath, 2009, p. 46). If new concepts or objects are introduced through contact between two cultures, the language contact often reflects this cultural contact and the lexeme for a new concept or object is adopted from the source language into the target language. Haspelmath (2009, pp. 46-48) goes into detail on the fact that it would be short-sighted to assume this as the sole explanation, but a brief introduction of the term will suffice at this point. In contrast to cultural borrowings, in the case of so-called *core borrowings* (Haspelmath, 2009, p. 48) the concepts or objects are known in the culture of the target language and there are also already lexemes denoting them. One explanation is that this type of borrowing occurs when the source language is a prestige language. Which role these two types of borrowing from French play in Vietnamese will be discussed in the following section, among others. The focus of the following section, however, will be on the results of previous research on repair strategies undertaken by speakers of Vietnamese when they borrowed French lexemes that have stabilised over time as loanwords and are still used in Vietnamese today.

2.1.3. General theoretical considerations in foreign and second language acquisition

Debates on borrowing processes and loanword adaptation are closely linked to second and foreign language acquisition and research in both fields overlap as they share a common intersection: language contact situations often imply to some extent second or foreign language acquisition as loanword borrowing can do. In this way, the previously presented debate to which extent borrowers have knowledge of the source language is linked to foreign and second language acquisition, and “similar phenomena found in L1 and language acquisition data prove that the mechanism of integrating perceptibility scales into the grammar is not restricted to loanword adaptation but is a general one.” (Shinohara 2006, p.1067). We start by considering the intersection between the study of borrowing processes in loanword adaptation and second or foreign language acquisition. Subsequently, we present the field of foreign and second language acquisition in a general fashion and finally sum up what is special about segmental and suprasegmental (prosodic) phonetics and phonology in second language acquisition.

At the intersection between the study of borrowing processes in loanword adaptation, we find some experimental works which aim at shedding more light into questions which arose in the debates on loanword adaptation but which cannot satisfactorily be answered considering loanwords alone. Therefore, scholars have extended their focus to foreign and second language acquisition contexts. This experimental approach can be adapted considering perception or production. While the focus of our experimental studies in the central part of this work is in production, a recent article presents and discusses the results of perception experiments and their implications on loanword adaptation (Kang & Schertz 2021). The two authors consider the perception of sound categories by monolingual native speakers of Korean vs. those with L2-knowledge of English. With their model, they present “one way to resolve the paradox that loanword adaptation shows sensitivity to perceptual similarity between the source form and the native output but, at the same time, that established loans are more consistent and systematic than naïve filtering by L1-based perception would predict.” (Kang & Schertz 2021, p. 575). Other scholars have considered a similar perception experimental approach: Nomura & Ishikawa (2018) study in which ways Japanese speakers perceive illusory vowels between English consonant clusters, Kwon (2017) suggests that near-monolingual speakers of Korean map a release after a coda consonant in English non-words to a vowel, while bilingual speakers do so much less. Kim (2017) conducts experiments with speakers of Korean reproducing Japanese lexemes with geminates in order to get more insights about patterns in borrowing such lexemes into Korean, and Peperkamp and Nakamura (2008) consider the perception of a final release after nasal codas in English and French by native speakers of Japanese. In some of these

works, there are several groups of native speakers of the target language: monolingual speakers are contrasted with those who have L2 knowledge of the source language, and sometimes the degree of this knowledge is even differentiated. Having provided some insights about the research at the intersection between borrowing and loanword adaptation on the one hand and foreign or second language acquisition on the other, we will now present the approaches which concentrate on foreign and second language acquisition.

When referring to *second vs. foreign language acquisition*, we differentiate between the two notions: foreign language acquisition refers to the acquisition of a language which is learned, but not spoken by learners in their daily life. With second language acquisition, we refer to the situation in which speakers use and acquire a language which is not their native language in their everyday life. For reasons of simplicity, what we call second language can also refer to the third, fourth or fifth etc. acquired language of speakers. Of course, a foreign language can also become a second language if speakers start using it in their daily life after having only used it in class. While some scholars also differentiate between learning and acquiring a language in that the first setting is a controlled and the second an uncontrolled setting (e.g., no systematic learning of language rules in class or with the help of grammars), we use both terms as synonyms (cf. Ortega 2013).

The field of second language acquisition has been studied intensively by some scholars from the 1960s on and is in the focus of many scholars since the 1980s and 90s. It is a multidisciplinary area which builds, among others, a bridge between scientific research on linguistics and language teaching didactics. Research can help language teachers to develop a language learning curriculum which best fits the language learner's needs and the language teacher's experience can help researchers to carry out research with outcome which can be applied in the instruction of languages.

Especially in the field of pronunciation, research results from phonetics, phonology, and prosody, such as those to which we devote ourselves in this thesis, are not applied to the extent that would be optimal for teachers and learners: linguistics and language practice, namely researching and teaching languages, are in this area not as closely linked as would be most efficient for language learners and teachers. Thus, the acquisition of pronunciation often takes place to a large extent in an uncontrolled manner. For some speakers this is more problematic than for others: some bring with them the sensitivity to phonetic details and are intrinsically motivated to invest a lot of time and eventually find ways intuitively. Others, on the other hand, toil for years and eventually give up out of frustration.

This goes in hand with the finding that while some adult second language learners communicate syntactically error-free, we can almost always observe *fossilisation* in phonology at a relatively low stage compared to other domains such as lexicon and syntax. *Fossilisation* means that at a certain level of second language acquisition, a stagnation can be observed, and no progress is made. In contrast to adults, children up to a certain age which is referred to as the *critical period* (cf. Lenneberg, 1967) are able to acquire a second language quickly without any foreign accent if they are frequently exposed to this language. Long (1990) postulates that this critical period for native-like pronunciation is at age six. Adults instead can be very frequently exposed to a second language but still preserve an accent of their L1 (cf. Ioup, 2008 for a deeper discussion of the variable age). But why do some speakers retain a strong accent even though they speak a second language on a high level and are surrounded by this language in their everyday life for years? Their perception may be worse than the perception of children, whose phonological system has already been learned, but is not yet so statically solidified. As to adults, difficulties in perception oftentimes lead to difficulties in production, but perceptive cues are not the only source of problems in production. Possibly, a better systematic and scientific approach in teaching segmental and prosodic phonetic and phonology could help language learners to train both perception and production effectively.

To sum up, the age of a language learner is particularly crucial for phonology, and maybe problems in communicating scientific results to language teachers contribute to the fact that adults struggle more than in other linguistic domains which are systematically taught in class. Let us now present some general concepts as well as considerations on segmental and prosodic phonetic and phonology in the context of foreign and second language acquisition, which can be deepened in Hansen Edwards and Zampini (2008).

In the 1960s, it was assumed that patterns in foreign and second language acquisition can be explained by a contrastive analysis of L1 and L2 alone. In the 1970s, however, researchers concluded that this approach alone is not a sufficient explanation for the observed patterns. Today, it is assumed that the linguistic system of learner languages is autonomous, and it is also called *interlanguage*. The interlanguage can be understood as a linguistic system which each L2 learner constructs during the acquisition. Even though L1 and L2 influence this system, it is not just a mixture of L1 and L2. Therefore, contrastive analyses of L1 and L2 do not always help us to understand the system of learner languages or so-called *interlanguages* (cf. Selinker 1972, see also Ortega 2013 for a deeper discussion). There seem to be processes independent of L1 and L2 in second language acquisition. Questions which linguistic research addresses are:

which interlanguage structures are *transfer* from L1 to L2? Which structures cannot be explained by a transfer? And finally: where do the structures come from?

The emergence of these structures can be explained in terms of *markedness/unmarkedness*. Unmarked structures are structures that are common to most languages in the world, and structures that are common to only a few languages are marked. In first and second language acquisition, unmarked structures are acquired first, and marked structures only later. We can speak of universal tendencies which often appear in interlanguage systems. In phonetics, typologically marked structures are often accompanied by greater articulatory effort than marked structures. The phenomenon *emergence of the unmarked*, coined by McCarthy & Prince (1994), and later applied to loanword phonology by Kenstowicz under the term *retreat to the unmarked* (2005), can also be applied to second and foreign language acquisition.

After having introduced the concept of markedness and briefly mentioned language transfer, we will now deepen both terms concerning segmental and prosodic phonetics and phonology. Language transfer is a cross-linguistic influence. When the application of a structure from L1 to L2 results in the correct L2 form, it is called positive transfer, and when it results in a form which is not correct, it is called negative transfer. A reason for negative transfer usually is perception: something which is not perceived can hardly be produced. An example from our thesis is that native French speakers sometimes do not perceive unreleased Vietnamese coda stops. L2 sounds are filtered through the L1 phonology in perception, an idea which has largely also influenced models for borrowing and loanword adaptation context. Important phonetic details of the L2 are lost, which play a role in the phonological categories of the L2, but not for the L1. An example here are Vietnamese implosives, which might be perceived and are produced as their explosive counterpart by native speakers of French. The basic idea was developed by Trubetzkoy (1939/58), treated later in Weinreich (1953) under the term interference and taken up and developed by many researchers under the term transfer (cf. Major, 2008, where a deeper discussion is provided). Assumptions which have been postulated concerning transfer for sounds and syllable structures can be resumed in what follows:

1. Phenomena which are the same in L1 and L2 do not pose a problem in language acquisition: positive transfer applies.
2. Phenomena which are very different between L1 and L2 are rather difficult but not too hard to acquire. No transfer applies.
3. Finally, phenomena which are not the same in L1 and L2 but rather similar are the most difficult to acquire. Negative transfer applies.

The paradox that different structures are easier to acquire than similar structures can be explained by the assumption that if sounds are very different, they are easily perceived as such whereas similar sounds can easily lead to negative transfer: they are mistaken in perception by structures known by the speakers of L1. This is not the case when structures are very different: they may cause problems in production but are at least perceived as something which does not exist in L1. The reasons why researchers postulate these assumptions are therefore that

1. L2 sounds (and structures) which belong to the L1 phonological system can be categorically perceived and produced.
2. L2 sounds speakers do not know from the L1 can be perceived by speakers as something which is different from their L1 system. Speakers can perceive them, but perhaps not produce them well.
3. L2 sounds which remind speakers of L1 sounds can be confused with L1 categories. Speakers already fail in perception and consequently also in production.

Two models have been developed from the basis of these hypotheses: the *Speech Learning Model* (cf. Flege, 1995), according to which new sounds are more easily learned than similar sounds and the *Perceptual Assimilation Model* (cf. Best, 1995), according to which the perceptual similarity of sounds stands in focus. The latter has later been applied to describe patterns found in the context of loanword phonology (cf. Adler, 2006), but also been extended to non-native perception in second language acquisition (cf. Best & Tyler, 2007). Their view that speakers of an L1 without L2 knowledge of another language process the perceived sounds on a phonetic level only but speakers with L2 knowledge process them both on a phonetic and phonological level has been adapted since then not only in the literature on second language acquisition (cf. Chang 2015; Strange, 2011; Strange & Shafer, 2008) but also on borrowing in loanword adaptation (cf. Kang & Schertz, 2021). This shows us how similar processes of transfer can be in borrowing and in second language acquisition contexts and that models about perception vs. production and the role of phonetics vs. phonology can be applied to both domains within the larger domain of segmental and prosodic language contact.

The conclusion for transfer is that the more similar L2 sounds are to L1 sounds, the more likely transfer is to take place. Transfer can be positive, but also negative. The more different L2 sounds are from L1 sounds, the more likely it is that markedness principles apply. Let us at this point deepen the notion of markedness in combination with segmental and suprasegmental phonetics and phonology. The concept of typological markedness goes back to representatives of the Prague School Trubetzkoy (1939/58) and Jakobson (1941), was essentially shaped by

Greenberg (1976), and applied to second language acquisition in Eckman (1977, cf. also Eckman, 2008, for a resume also of later research in this field). In typology, languages are compared and classified on the basis of their structural features. We will explain typological markedness with the help of two examples, one of which is segmental and the other syllabic. The first example is about plosives. Voiceless plosives are unmarked whereas voiced plosives are rather marked. This means that if a language knows voiced plosives, then it also knows the unvoiced counterpart, but the reverse is not necessarily true. The second example is about the position of consonants in a syllable. While onsets are unmarked, codas are rather marked. These two principles can also be combined: if a language has a contrast in voiced plosives, then it also has a contrast in voicing in the onset (cf. Greenberg, 1976).

Let us now come to typological markedness in foreign and second language acquisition by applying the just mentioned markedness principles.

1. Language A knows the phonemes /t/ and /d/ in onset and coda position.
2. Language B does not know either of the two phonemes

L1 Speakers of language B who acquire language A as an L2 may be able to realise the phoneme /d/ as [d] in the initial syllable sound. But in the coda, they realise the phoneme /d/ as [t] and not as [d]. We can be sure that a principle of markedness applies and not transfer, as both phonemes are not known to language B. But when language B structures fall together with unmarked structures and language A is instead rather marked, it is difficult to distinguish transfer from the emergence of unmarked structures. We illustrate this with one example, in which French is language A and German language B. In German, final obstruents are always devoiced, and the phonemic distinction which exists in German onsets is eliminated in codas. An example is *Räder* [rɛ:dɐ] 'wheel.PL' vs. *Rad* [rat] 'wheel.SG'. In contrast, French final obstruents can be unvoiced, but also voiced, as in *fade* [fad] 'tasteless'. In this respect, French is more marked than German. Consequently, when speakers of German acquire French, a usual pattern is that they pronounce [fat] instead of [fad]. In this case, we cannot be sure if we deal with transfer from German or if unmarked structures emerge in the interlanguage of German speakers. Instead, if speakers of English used the same structure as German speakers, we could assume a retreat to unmarked structures in the interlanguage system, as English is similar to French in that coda obstruents can be voiced, for instance in *bad* [bæd].

In Vietnamese, final obstruent devoicing is not a native phonological process, but Vietnamese is similar to German in that in both languages, only unvoiced plosives are possible in coda

position. This way, Vietnamese is less marked than French or English just as German is, and speakers of Vietnamese, when acquiring French, might meet the same problems that speakers of German meet. The fact that German and Vietnamese are similar in this aspect although they are very different in most other aspects can be explained with universal principles of markedness. Now that we have already briefly returned to the two languages French and Vietnamese, let us consider in what follows studies which have dealt with prosodic language contact between the two languages.

2.2. Relevant structures of Vietnamese and French

In this section we deliver insights into the structural linguistic properties of both languages Vietnamese and French that are relevant for this work and discuss similarities and differences of the two languages. We start with segmental and syllabic aspects of both languages, continue with intonation and tone, and briefly touch upon some morphological aspects which are relevant to the present work.

2.2.1. Segmental and syllabic aspects of Vietnamese and French sounds

For a study of prosodic processes involved in loanword adaptation it is essential to understand the segmental and syllabic differences of the studied languages. In this section we therefore describe relevant segmental and suprasegmental properties of French and Vietnamese. Table 1 and 2 list French and Vietnamese onset consonants as they are used in the respective standard variety (cf. Tranel, 1987, Fougeron and Smith 1999 and Walker, 2001 for French; Kirby, 2011 and Brunelle, 2014 for Vietnamese). In this context, the Île-de-France variety, which is considered the standard, as well as the variety spoken in Hà Nội are dealt with. As far as the consideration of loanwords is concerned, it would make sense from a diachronic point of view to additionally refer to southern varieties for French, since in colonial times not only speakers of the Île-de-France-variety but also, for example, Southern French speakers have been in Vietnam. It would also make sense to refer to the sound inventory of the variety spoken in TP Hồ Chí Minh (Sai Gòn) and other varieties in addition to the Hà Nội variety, as it can be assumed that there was a lot of contact between this variety and French. For the sake of simplicity, we will limit ourselves in this thesis to the inventory of the varieties considered to be the standard in both languages. This is especially since our experimental study, which constitutes the central part of this thesis, refers to varieties spoken in the north of Vietnam, which are either the Hà Nội variety or close to it. We acknowledge that this makes one of the differences between our experimental approach and the historical language contact situation, and we will mention and discuss also other differences at the appropriate point. It is important

to inform readers that Vietnam is rich of local varieties and minority languages. While current research looks at specific local features of Vietnamese and provide an insight into the diversity which is broad in additionally by minority languages (cf. the works of M.C. Nguyễn on the tonal system of Mường, among them Nguyễn, M.C. et al., 2019; Nguyễn, M.C. 2016), some of which potentially influence the local varieties of Vietnamese and vice versa (cf. Ferlus 2001), much work on diatopic varieties remains for the future (cf. Michaud, Ferlus, and Nguyễn 2015 in a paper on historical language change and standardization patterns of the Phong Nha dialect). Should the use of diatopic varieties of both languages make certain patterns in prosodic language contact explainable, differences to the standard variety of both languages will be discussed. In this chapter, we will first explain the consonant inventory (initial and final consonants) and then the vowel inventory (monophthongs and diphthongs).

Segmental aspects

The Vietnamese onset consonant inventory is richer than the very limited coda consonant inventory, whereas French onset- and coda inventories are nearly identical. As a side note, we want to mention that the Vietnamese consonant system itself is a result of language contact, namely between Proto-Việt-Mường and Middle Chinese (cf. Ferlus, 2014), and some of the striking assymetries can be explained by taking into account these historical developments which are not in the scope of this work. 14 French onset consonants have a direct equivalent in Vietnamese, whereas seven differ. Vietnamese sounds in brackets can appear in loanwords (cf. Kirby, 2011), as can be seen in table 1. Consonants in bold green refer to the consonants which do not have a direct counterpart in the other language.

Table 1: *French Onsets (Ile-de-France-Variety)*

	Bilabial	Labio-dental	Dental	Post-alveolar	Palatal	Labio-palatal	Velar	Uvular	Glottal
Plosive	p b		t d				k g		(?)
Nasal	m		n		ɲ				
Frikative		f v	s z	ʃ ʒ				ʁ	
Lateral			l						
Approximant	w				j	ɥ			

Table 2: *Vietnamese Onsets (Hanoi-Variety)*

	Bilabial	Labio-dental	Dental	Alveolar	Palatal	Velar	Uvular	Glottal
Plosive	(p) ɓ		t t ^h	d	tɕ	k		ʔ
Nasal	m		n		ɲ	ŋ		
Flap				(r)				
Frikative		f v		s z		x ɣ		h
Lateral			l					
Approximant	w							

A correspondence to the bilabial plosive [b] in French is the bilabial non-pulmonic sound [ɓ] in Vietnamese. It is often said that modern Vietnamese knows not only this sound, but also the unvoiced [p], just as in French (cf. Nguyễn, 1997, p. 20). In our table, the sound is in brackets because it is not realised by all speakers. The voiceless plosive also only occurs as an onset in some loanwords and appears in native Vietnamese only in coda position. If one decides to retain this sound in the onset inventory, however, the alveolar trill [r] should also be added for similar reasons. In the Vietnamese standard (Hà Nội variety), it is also only used for some loanwords and only by some speakers. In many other varieties of Vietnamese, including those in rural areas in the north, [r] is an allophone of [z]. Thus, speakers of the Hà Nội variety are also mostly familiar with this sound and are also able to produce it. Generally, there are many other interesting dialectal features, but within this framework, we do not focus on them.

We continue with the remaining plosives in both languages. As for [ɓ] in Vietnamese and [b] in French, there is a correspondence between Vietnamese [d] and French [d]. Besides, we find the voiceless plosives [t, k] in both languages. Vietnamese distinguishes between non-aspirated [t] and aspirated [t^h], this phonemic distinction does not exist in French. The French phoneme /t/ is phonetically more aspirated than Vietnamese /t/, and probably less aspirated than Vietnamese /t^h/ This difference can be measured by considering the *voiced onset time* (VOT) of this consonant comparatively in French /t/ and Vietnamese /t/ vs. /t^h/. Sadly, we could not find literature on VOT measurements comparing Vietnamese /t/ vs. /t^h/, but are able to present a comparison between French and Vietnamese /t/ as has been undertaken in Trần (2011) who has measured VOTs for the Vietnamese plosives and compared her values to French values as measured by Serniclaes (1987) The result is that “le VOT moyen des consonnes sourdes /p t k/ du vietnamien [...] est 1,5 fois plus petit qu’en français [the average VOT of voiceless consonants /p t k/ in Vietnamese [...] is 1.5 times smaller than in French]” (Trần, 2011, p. 112). Therefore, there are phonetic differences between Vietnamese and French /t/ in that Vietnamese

/t/ is less aspirated. Finally, for French, there is additionally to the unvoiced velar stop [k] the voiced plosive [g] which does not exist in Vietnamese.

Whether the glottal stop is only a phonetic or even a phonemic sound of Vietnamese, is an issue of discussion in the literature. While many authors are in favor of its phonetic status (Đ. L. Nguyễn, 1967; Vương & Hoàng Dũng, 1994; Đ. H Nguyễn, 1997; Đoàn et al., 2009), others treat it as a phoneme but do not give arguments for this decision, apart from Đoàn (1977), who discusses the issue only shortly, and Pham (2009). While most of the arguments presented in Pham (2009) account for southern varieties which do not stand in focus of our work, we only refer to the first, which accounts also for northern varieties: if the glottal stop is part of the phoneme inventory, we do not need a rule to insert this sound in empty onsets. Looking at loanwords where the glottal stop is mostly pronounced by speakers of Vietnamese, we will see later that these give us rather evidence for the existence of this rule. In fast speech, however, we observe that this sound can sometimes be deleted, probably because of coarticulation. While Thompson (1956) observes that the glottal stop stands in free variation with zero onsets, it could also be possible that prosodic rules predict if a glottal stop surfaces or not. The study of those must be a topic of future research. In French, the glottal stop has certainly no phonemic status but can surface phonetically in certain contexts, which is why we put it in brackets in the French sound inventory. The affricate [tʃ] exists in Vietnamese but not in French. The nasals [m, n, ŋ] exist both in French and Vietnamese, but the latter exists in the native standard French lexicon as a single consonant onset only word-medially, i.e. in *agneau* [a.ɲo] ‘lamb’. Word-initially, it may be a pattern of sound change induced by language contact, as it is found in loans from English, Italian, and even Vietnamese. In native French, it appears word-initially only in expressive slang words, for instance *gn(i)ouf* [ɲuf] ‘prison’ (cf. Michaud, 2017).

Voiced and unvoiced fricatives which exist in Vietnamese and French are [f, v, s, z]. In French, there are additionally the postalveolar fricatives [ʃ, ʒ] and the uvular [ʁ], which do not exist in Vietnamese. On the other hand, the velar unvoiced fricative [x] and its voiced variant [ɣ] only exist in Vietnamese but not in French. As to the phoneme /x/, we have noticed that it can alternatively to [x] also be pronounced as [k̟x] or even [k^h]. Historically, there has been a sound change from [k^h] to [x] in Vietnamese, and the writing system (documented by de Rhodes, 1651) reflects that the current sound [x] has evolved from aspirated [k^h] (cf. Haudricourt, 2010). This sound change may have gradually applied and left a trace in emerging phonetic realizations [k̟x] or [k^h]. We have noticed that speakers from Hà Nội and surroundings make use of all three phonetic realizations of /x/. Therefore, an alternative view to the view adapted in table 1, where

we show the sound [x], would be to show the sound [k^h] instead and say that speakers of Vietnamese not only make the distinction between aspiration and non-aspiration between [t] and [t^h], but also between [k] and [k^h]. We have mentioned this issue because some patterns in our data are easier explicable with this knowledge (see p.276). The lateral [l], and the approximant [w] exist in both in the studied variety of Vietnamese and French. While the French glide [j] does not exist in the variety of Vietnamese under investigation, it is the allophone of [z] in other Vietnamese varieties in the south. Finally, the glide [ɥ] only exists in French.

More striking differences in the segmental inventories of the two languages are found in the coda. In French onset and coda consonant inventories are similar, whereas in Vietnamese, the coda consonant inventory is very restrictive. This tendency found in Vietnamese goes in line with the universal tendency that coda inventories are smaller than onset inventories (Ridouane et al., 2011; Rousset, 2004) In French, the only difference between onset and coda inventory is that the velar nasal [ŋ] only exists in codas. However, this coda only occurs in loanwords, and (almost) only in the *-ing* morpheme borrowed from English, e.g., in the coda of *camping* [kãpiŋ] 'camping'. Apart from this, the inventory of onset and coda consonants is identical in French. To the contrary in Vietnamese, only eight consonants are possible in the coda, namely [p t k m n ɲ j w]. Not just in this respect, as we will see later, Vietnamese is similar to Cantonese (cf. Silverman, 1992; Yip, 1993). Kirby (2011) classifies the two glides [j w] as approximants and thus assigns them to the coda consonant inventory. However, he points out in a footnote that, depending on the point of view, they could also be considered as semi-vowels. Phonological evidence for their status as semi-consonants could be provided by the fact that they are never followed by consonants. This view is adopted in the context of our work. The coda plosives /p t k/ in Vietnamese are described as non-released (cf. Đoàn et al. 2009; Cao XXX) although later phonetic measurements have revealed that this does account for the majority, but not for all:

En effet, 27 % des consonnes sont réalisées avec burst dans cette position, avec une durée plus brève et une intensité plus faible du bruit d'explosion que dans les réalisations en initiale.

[Indeed, 27% of consonants are realised with burst in this position, with a shorter duration and lower intensity of burst noise than in onset realisations.] (Trần, 2011, p.113)

According to Kirby (2011), Vietnamese /k ɲ/ in codas are double articulated as [k̠p̠ ɲ̠m̠] following back round vowels [ɔ o u]. Still, we do not find this double articulation for /k ɲ/ following [u] in the loan *xúc xúc* from French *saucisse* 'sausage' and therefore transcribe it in our work as [suk.sik], not as [suk̠p̠.sik]. To the contrary, following the vowels [ɔ o] like in *hoóc-môn* [hɔk̠p̠.mon] from French *hormone* 'hormone' or *xi phông* [si.foŋ̠m̠] from *siphon* 'siphon', the double articulated [k̠p̠ ɲ̠m̠] surface both in the native lexicon and in loans. Comparative measurements on native and loan data need to be undertaken in future research.

After having presented comparatively the consonant inventory of Vietnamese and French and how they can be organized within a syllable, we move on with vowels. In table 3 and 4, we present the French and Vietnamese vowel inventories. However, since vowel adaptation is not the subject of this work, vowel quality is not discussed in detail.

Table 3: French vowel inventory

	Front	Mid	Back
Oral vowels	i y e ø ε œ	ə a	u o ɔ (ɑ)
Nasal vowels	ẽ (œ̃)		õ ã

French has twelve oral vowels and four nasals for which minimal pairs can be found. However, studies have shown that the vowels [a] and [ɑ] as well as [ẽ] and [œ̃] are not distinguished by most speakers (cf. Röder 1996), which is why we put [ɑ] and [œ̃] in brackets in our table. The back vowels are rounded. In general, it is assumed that length is not a distinctive feature, but allophonic lengthening may occur in the speech of some speakers and depending on the local variety of French⁴. Finally, unlike Vietnamese, French has a contrast between front rounded and front unrounded vowels (Fougeron & Smith, 1998).

Table 4: Vietnamese vowel inventory, monophthongs (Hà Nội variety)

Front	Mid	Back
i	u	u
e	ɤ	o
ε	ỹ	ɔ
	ă	
	a	

⁴ For reasons of space, we want to leave out the discussion on long vowels in French, but some interesting considerations can be taken from Meinschaefer (2020), a paper which concentrates on Limousin, but also takes French into account.

Vietnamese (Hà Nội variety) also has eleven full oral vowels, but no nasals. For the understanding of this work, which does not focus on vowels, it is important to keep in mind that two Vietnamese long vowels /a ɤ/ have their short counterpart, as can be seen in (1).

(1) Contrast in length between [a] and [ã] as well as between [ɤ] and [ɤ̃]

cam [kam]	'orange'	vs. cã[m] [kãm]	'very cold', 'to hate'
cơm [kɔm]	'rice'	vs. câ[m] [kɤ̃m]	'to keep quiet', 'stop' (consonant)

Short vowels only occur when followed by a consonant, inclusive glides, which serves as an argument for accounting glides as belonging to the class of consonants. In contrast, long vowels can occur in open and closed syllables. In other Vietnamese vowels, the length difference is not phonemic, but long and short allophones are in complementary distribution depending on surrounding material. For instance, an /i/ is long in ly [li] 'cup' and lim [lim] 'ironwood', but phonetically shorter and centralized in linh [liŋ] 'spirit, zero' and lịch [lik] 'calendar' (cf. Kirby, 2011 and Cao, 2017/1978). Here again, vowels are always long in open syllables. This is a motivation why it is assumed that in Vietnamese, there is a dimoraic minimum in syllables (cf. Brunelle, 2017). This aspect will be deepened a bit later in this section when we consider the syllable and syllabification in detail.

As a last relevant point to later understand repair processes, we would like to briefly discuss diphthongs and the differences between Vietnamese and French in this respect, based on the assumption that diphthongs are sequences of two vowels. Glides, when they are counted as consonants in a language, cannot be part of a diphthong. This way, Tranel (1987) and Meisenburg and Selig (1998) present the mostly assumed view that there are no diphthongs but only monophthongs in modern French. In French, if two full vowels succeed each other, there is always a syllable boundary between them, in contrast to Vietnamese. If two succeeding vowels are separated by a syllable boundary, we do not deal with a diphthong but with a hiatus. Hiats occur rarely in French and are avoided, if possible, with the help of prosodic processes. Vietnamese syllable structure with an obligatory onset makes the emergence of hiatus impossible, but diphthongs exist. According to Kirby (2011) and Đoàn et al. (2009), the three diphthongs [iə], [uə] and [uə] exist in Vietnamese. An alternative view is proposed in Emerich (2012). In (2), we provide illustrating examples of what has just been said.

(2) Comparison of French and Vietnamese on monophthongs, diphthongs and hiatus

French	veille	'previous day'	[vɛj]	CVC	Monophthong
	loi	'law'	[lwa]	CCV	Monophthong

	lier	‘to combine’	[lje]	CCV	Monophthong
			or [li.e]	CV.V	Hiat
Vietnamese	loa	‘bell’ (instrument)	[lwa]	CCV	Monophthong
	liên	‘connection’, ‘lotus’	[liən]	CVV	Diphthong
	lâu	‘long’ (time)	[lɔ̃w]	CVC	Monophthong

Syllabic aspects

After having already described which consonants and vowels can occur in which syllabic position, we now want to deepen the issue of how segments are organized into syllables. The syllable is generally an important linguistic domain in the context of prosody, as it plays role in the application of prosodic rules and the assignment of stress and tone (cf. Ridouane et al., 2011). It is also important to include the unit of a syllable when considering phonotactic constraints of languages. Although there are languages which can be analysed without the notion of a syllable, this is not the case for most languages (cf. Goldsmith, 2011). Therefore, the unit of a syllable specifically plays an important role in our study of prosodic language contact. Although it plays a different role in French than in Vietnamese, the unit of a syllable is necessary for analysing both languages. While in French, evidence can be found that the syllable plays an important role in perception (cf. Cutler et al. 1986; Mehler et al. 1981; and a partially contradicting view in Gaskell et al. 2002), the importance of the unit syllable in Vietnamese is unquestioned (cf. Lê & Besacier, 2009). Furthermore, it can be assumed that in French the unit of a syllable relative to single sounds is less important compared to Vietnamese. The view discussed in Goldsmith (2011), that “the syllable, rather than the segment, is the right level of analysis for production and perhaps for perception” (cf. also Sevald et al. 1995; Cutler et al. 1986), which is also put forward for French in the last cited article, could be assumed to apply to Vietnamese even to a larger extend. The possibility that single segments can be parsed differently in perception depending on which language is the native and which one the second language is discussed in Ryst and Pepiot (2016, chapter in a book by Russo, 2016, where the syllable in language contact is discussed).

The processes in which a string of segments is organized into syllables are called syllabification. According to generative views summarized in Kenstowicz (1994), each concrete utterance is syllabified, whereas in the underlying representation in the speaker’s mind, the string of phonemes is not organized. The organization takes place via language-specific syllabification

rules, which are stored in the speaker's mind as well. Some of these rules and principles which are important for French and Vietnamese will be explained in a moment. We will see that French and Vietnamese are very different in terms of syllabification and both very complex. We also discuss resyllabification processes, which take place in French but not in Vietnamese. Some universal tendencies in syllabification can be observed for Vietnamese, others for French. Still, both languages contradict to several universal tendencies as well and can be typologically described as rather atypic.

A first syllabic difference between the two languages is that in French, complex onsets and codas (CCV, CCVC, CVC, CVCC, etc) are possible. To the contrary, in Vietnamese, the only possible cluster is a consonant and the glide [w] in the onset (Cw). In this way, Vietnamese shares more similarities to universal tendencies as consonant clusters are marked structures. Evidence for counting the glide as a consonant is given in Pham (2009), and we adapt her view in this work. In French, the only obligatory element of a syllable is the nucleus (V), and zero-onsets are possible. In Vietnamese, an onset consonant is obligatory, resulting in a minimally CV syllable structure. This can only be true if we assume the glottal stop as part of the Vietnamese onset inventory, which is a topic of debate but which we assume in this framework for reasons of simplicity. Summarizing Vietnamese syllable structure, the obligatory elements of a Vietnamese syllable are an onset, a vowel, and a tone (cf. Kirby, 2011). A Vietnamese syllable has the following structure: C (w) V (C). Glide and final consonant are optional. Diphthongs fall under the category of vowels.

In Vietnamese, the principle of sonority hierarchy is never violated, according to which the sonority increases towards the nucleus and then decreases again. As the only consonant cluster is of the structure Cw and is only possible in onsets and therefore no problem for sonority hierarchy, we must not take the following considerations into account for Vietnamese, which are important to understand the French structure of complex onsets and codas.

In French, if there are consonant clusters in the onset, the sonority must increase toward the nucleus. If the first segment is a plosive, the second is a fricative, a liquid, or an approximant, examples are *bras* [bʁa] 'arm', *glace* [glas] 'ice-cream' and *poids* [pwa] 'weight'. If the first consonant is a fricative, then only approximants can be considered for the second segment, as for instance in *fleur* [flœʁ] 'flower'. Finally, if the first is a sonorant, the second must be a sonorant of higher sonority, as it is the case in *loi* [lwa] 'law' (cf. Féry, 2003). Unlike in the onset, sonority in complex codas can both rise and fall, and plateaus of sonority are also possible (cf. Féry, 2003). Examples of descending sonority and plateaus are *harpe* [aʁp] 'harp' and *kiosk*

[kiɔsk] 'kiosk'. An example of rising sonority is *chambre* [ʃɑ̃brɛ] 'room'. Rising sonority as in this example is a universally quite marked syllable structure.

We have mentioned previously that a dimoraic minimum can be assumed for all Vietnamese syllables (cf. Brunelle 2017). In this respect, Vietnamese is again similar to Cantonese: „Open syllables in Cantonese must have long vowels, since syllables are minimally bimoraic [sic!]”⁵ (Yip, 2006, S. 967, see also Yip, 1993 and Cheung, 1986), and the same accounts also for Thai (cf. Rungruang 2008). For French in turn, syllables do not require a dimoraic minimum.

The fact that 74% of all Vietnamese syllables are closed (cf. Thị Thúy Hiền Trần, 2011) also goes in line with the assumption that there is a minimality constraint that requires all syllables to have at least two morae. The ratio of closed vs. open syllables is reversed in French: According to Rousset (2004) and Vallée et al. (2001), 73% of all French syllables are open. In this respect, French goes in line with the universal tendency that syllables of the structure CV are the most frequent pattern (cf. Rousset, 2004; Maddieson, 1984; Jakobson & Halle, 1956) and Vietnamese is rather atypic. Another characteristic of Vietnamese syllables is their restricted number: “There are about 6500 distinct tonal syllables and 2400 distinct base syllables [...] in Vietnamese” (Lê & Besacier, 2009, p. 1478)⁶. In French, the number of syllables is larger for the reason alone that the vowel inventory is larger, consonant clusters are possible in onset and coda and because there is not a coda consonant restriction as in Vietnamese. Also, prosodic processes as *enchainement consonantique* and *liaison* override the syllable internal structure in a prosodic word.

The tendency of French syllables to be characterized by the unmarked structure CV is reinforced when resyllabification is considered. We present some principles of syllabification and resyllabification processes which mainly apply to French. As to syllabification in French, naked syllables are avoided as far as possible. What is obligatory in Vietnamese is thus a tendency in French and coincides with universal tendencies. Hence, an intervocalic consonant is syllabified as the onset of the following syllable in French. Thus, the phonetic sequence VCV is not syllabified VC.V, but V.CV. For two intervocalic consonants, the syllable boundary can either be drawn between them (VC.CV), or both consonants form the initial sound of the second syllable (V.CCV). This depends mostly on the sonority of the consonant cluster (cf. Meisenburg

⁵ Instead of *bimoraic*, we use the term *dimoraic* if we do not cite directly other scholar’s work. This way, both the stem and the prefix derive from latin. Following the same logic, we use the term *bisyllabic* instead of *disyllabic* (as it is oftentimes used in the literature) to combine an ancient greek stem with a ancient greek prefix.

⁶ With the term *base syllable*, the authors refer to segmental material of a syllable without taking into account tone assignment.

& Selig 1998). Examples are *malsain* [mal.sɛ̃] and *citron* [si.tʁɔ̃].

The rigidity of Vietnamese syllable structures makes it unnecessary to ask whether something similar applies to Vietnamese. First, unlike French, bare syllables are not possible at all. All syllables that do not have another consonant in the initial sound are covered by the glottal plosive [ʔ], even though its status as a phoneme is disputed. A sequence VCV could be syllabified as V.CV, as in French. However, VC.ʔV would also be possible: here, the consonant is added to the coda and the missing onset of the following syllable is filled by a glottal stop. However, since consonant clusters are not possible within onsets, the sequence VCCV is always syllabified VC.CV and never V. CCV. Because the unit of syllable is so static in Vietnamese, we cannot obtain information from native Vietnamese about how an underlying sequence of segments can be syllabified and which alternatives are possible. This is why we expect an investigation of language contact to be instructive.

Onset maximization (cf. Vennemann, 1988) is a phenomenon which applies to French, but not to Vietnamese. According to this principle, intervocalic consonants are rather grouped in the onset of the preceding syllable than in the coda of the preceding syllable, even if this structure results in a cluster. This principle does not apply to Vietnamese, again, as the skeleton of each syllable remains static in words and phrases. To the contrary in French, the application of this principle can lead to the resyllabification syllable structures within a prosodic word, which does not occur in Vietnamese.

Resyllabification plays an essential role in French. Within a *groupe rythmique* or *chaîne parlée*, phonetic sequences are syllabified according to the principles described above. In this process, lexical and morphological boundaries are mostly ignored. In *enchaînement consonantique*, for example, a coda consonant of one lexeme become the onset of the following lexeme. Thus, in *une idée* ‘an idea’, [yn] and [i.de] become [y.ni.de] (example taken from Meisenburg & Selig, 1998, p. 129). According to current research, such resyllabification does not occur in native Vietnamese (cf. Trần 2011). Syllable boundaries, as well as lexical and morphological boundaries, are not transgressed by resyllabification.

In the following we deal with the notion of gemination and discuss how it is linked to the two languages Vietnamese and French. In gemination, a consonant is underlyingly long or doubled, which means that a minimal pair can be found for its short or single counterpart (cf. Davis, 2011). Gemination exists in many languages, among them Italian: a minimal pair is *fato* [fato] ‘fate’ vs. *fatto* [fatto] ‘fact’. In *fatto*, gemination is expressed phonetically by a longer duration

of closure relative to *fato*. While Chomsky and Halle (1968) represent geminates vs. non-geminates by a distinction of the feature [long], later works such as Leben (1980) adapt the view that in gemination, a consonant is linked to two consonant slots in the syllable skeleton. Gemination is a phenomenon, but very marginal, in French (cf. Delattre, 1971; Tranel, 1987) whereas it has not been reported for Vietnamese in previous literature. Still, there is a phonemic difference between some words or word groups in Vietnamese, as shown in (3). Here, the distinction of one vs. two consonants is perceptible in consonantal length, expressed in closure. Nevertheless, this only occurs between syllable boundaries in some lexical minimal pairs in compounds and word groups.

(3) Examples for minimal pairs with differences between one vs. two consonants

[ka.kɔ̃n]	vs.	[kək.kɔ̃n]	or	[ka.mɛw]	vs.	[kam.mɛw]
cá con		các con		cá mèò		cám mèò
fish child		each child		fish cat		bran cat
‘little fish’		‘each child’		‘catfish’		‘cat food’ (special dry one)

In French as well, phonetic differences can surface for instance between *il a dit* [i.la.di] ‘he said’ vs. *il l’a dit* [il.la.di] ‘he said it’⁷. Additionally, speakers may use gemination to make a distinction between the conditional and the imperfect (cf. Delattre, 1971), for the verb *courir* ‘to run’, for example in *courrait* [kuʁ.ʁɛ] vs. *courait* [ku.ʁɛ].

Finally, we want to mention one phenomenon in French which is closely related to syllable prosodic structures: the *e caduc*. An *e caduc* is characterized by a reduced vowel. The syllable containing an *e caduc* is called a schwa syllable and cannot be stressed. It always has an onset and never a coda. The schwa vowel as the syllable nucleus is not always phonetically realized. There is disagreement about whether the remaining onset consonant can then be attributed to the previous coda, which leads to the universally unusual sonority increase in codas already mentioned. Some rules of deletion of schwa syllables are listed below. It should be noted, however, that they do not apply to southern French varieties that may have been in contact with Vietnamese. The schwa is deleted when the schwa syllable is at the end of a *groupe rythmique*. Even within a *groupe rythmique*, a schwa sound is avoided in most contexts.

The exception is the context where a schwa syllable has two consonants in the initial sound

⁷ According to Delattre 1971, this phenomenon is classified among the term gemination, even though it goes beyond lexeme boundaries. According to this view, one could argue that gemination exists marginally in Vietnamese as well.

followed by another consonant. An example is *chambre* ‘room’, which in standard French is transcribed without *e caduc* [ʃɑ̃brɛ] in most contexts. However, in the context *chambre d’hôtel* ‘hotel room’, the *e caduc* is not erased: [ʃɑ̃.brɛ.do.tɛl]⁸ (example taken from Meisenburg and Selig, 1998). Furthermore, Bürki et al. (2011) point out that processes affecting schwa sounds could be understood as phonetic reduction rather than phonological extinction. Thus, they argue for more variation and the existence of ambiguous forms. Regarding the *e caduc*, it can be concluded: on the one hand, its extinction depends on the variety, on the other hand, on the context. Finally, it can also be questioned whether one should speak of preservation or deletion or rather of a gradual problem that allows for much more variation. It is unclear how to deal with segmental material preceding a reduced or deleted schwa-syllable: whether it should be regrouped as the coda of the previous syllable, i.e., *chambre* [ʃɑ̃brɛ] or as an onset of a syllable which lacks a vowel, i.e. [ʃɑ̃.brɛ] ‘room’. If we assume the first, this contradicts the principle of sonority, which is assumed to play a major role in most language’s syllable structure. On the other hand, if we assume the second, French would be a language in which syllables must not contain a vowel, which also goes against universal tendencies. Anyway, assuming the first or the latter, French syllables with a reduced or deleted Schwa show a typologically untypical and therefore a universally marked structure.

After having presented the segmental inventory of consonants and vowels and in this context their organizations into the larger unit of the syllable, syllabification, resyllabification, gemination and language specific phenomena which are related to syllabification, we now move on to stress accent, tone and intonation and discuss these concepts for Vietnamese and French.

2.2.2. Intonation and tone

Tone is a characteristic of a typologically high proportion of languages in the world. Maddieson (2005), who takes into account 526 languages, points out that 42% of them have lexical tone, and eventually the proportion of tonal languages was even higher if all languages in the world were considered. Still, in linguistic research, tonal languages are proportionally still underreported, a fact that many researchers continuously aim to outbalance with their focus of research. In this section we will deliver a short summary about discussions in the literature about intonation in tonal and non-tonal languages and then deal with certain peculiarities of the languages French and Vietnamese regarding intonation and tone. Let us start with the attempt to define intonation and its differentiation from related prosodic phenomena. Rossi (2001)

⁸ At least, if the whole schwa-syllable is not truncated as it can occur in colloquial speech, i.e., [ʃɑ̃.do.tɛl], Alexis Michaud, personal communication.

defines intonation as one part of prosody, which forms a unit with stress accent and rhythm. As neither stress accent nor rhythm is in the focus of our investigations, we only deepen the notion of intonation in what follows. One and maybe the most studied correlate of intonation is f_0 , but also duration, intensity and other correlates are considered. Intonation can change the meaning of a whole utterance in some languages (statement vs. question), have pragmatic implications and transport the expression of emotions.

When we speak of tonal languages in this work, we refer to languages with lexical tone that is independent of intonation and stress accent. Lexical tone can change the meaning of a morpheme (cf. Lee & Mok, 2021; Yip 2002), and we can find minimal pairs with different tones as we can find minimal pairs for different phonemes.

The idea that in tonal languages, intonation or accent are automatically absent falls too short, as well as the claim to distinguish tone languages⁹ from intonational languages (cf. Michaud et al., 2021, for a deeper discussion which is summarized in what follows). While the existence of accent, be it on the lexical or the phrasal level, must be discussed separately for each tone language, intonation seems to be a quite universal phenomenon which exists in any language (cf. Hockett, 1963), no matter, if this is a tonal language or a non-tonal language. Still, some scholars (cf. Cruttenden, 1986) present the view that that intonation plays a less important role in tonal languages than in intonational languages, which is a quite general claim, and which has to be rediscussed for individual languages. To the contrary, Steien & Yakpo (2020) point out that “tone languages can have all features that characterize intonation-only languages, but not vice versa” (Steien & Yakpo 2020, p. 5). This issue is discussed, among others, in Downing & Rialland (2016) for several African tone languages and in Michaud & Vaissière (2015) for several tone languages in Asia. The most examined lexical tone language in terms of intonation is Mandarin Chinese. A traditional, but still plausible view is that of Chao (1933): in a sentence, lexical tone is superimposed on intonational movements. Or, summarized within the framework of the autosegmental-metrical theory, described in detail by Ladd (1996) and taken up by many others: “post-lexical boundary tones [...] tend to affect the pitch contour at the edges of prosodic constituents” (Brunelle et al 2012, p. 4). Among numerous works on intonation in Mandarin, a recent study on bisyllabic call melodies shows that there is a low boundary tone at the end of an intonational phrase, regardless of the lexical tone it has, and the boundary tone manifests itself phonetically and even goes beyond the contours of the lexical tone (Zhang, 2018).

⁹ When talking about tone languages in this work, we refer to languages with lexical tone.

Noteworthy are also phenomena discussed exemplarily for Thai in Pittayaporn (2007) and Luksaneeyanawin (1983), where tones are superimposed to intonational patterns.

After a general discussion of what is typologically possible, we want to summarize that there are languages with lexical tone and languages without, and that all phenomena which play a role in intonation are principally possible in both types, and that finally much research on tonal languages must still be undertaken. We now turn to the two languages which are subject of our study and differ from each other in this respect: while Vietnamese is a language with lexical tone, French is not. We first describe French and then continue with Vietnamese.

According to Delattre (1966), French has 10 intonation curves: minor and major continuation, question, implication, finality, interrogation, command, exclamation, parenthesis, and echo. While some later scholars have reproached this view for being too simplistic to categorize the whole variety of intonation patterns into ten categories (cf. Delais-Roussarie et al., 2015 for a more recent approach), others tend to still find this view useful (cf. Vaissière, 2002). Delattre describes the movements of f_0 for each of the ten classes using a 5-line scale, which, in a sense is more but in another is less simplistic than the later ToBI-system of the autosegmental-metric model, developed for French by Jun & Fougeron (2000). According to this model, “an intonational tune is composed of a sequence of underlying H [high] and L [low] tones, and [...] each tone is linked to a syllable which is either metrically strong or marks the boundary of a prosodic unit.” (Jun and Fougeron 2000, p. 210, cf. also Pierrehumbert, 1980 among others and Welby, 2006; Delais-Roussarie et al., 2015 for a further application to the French language). On the one hand, the assignment of high and low tones gives room for much differentiation on a time line, but on the other hand, the binary distinction gives room for less differentiation in terms of pitch than the 5-line scale proposed by Delattre. As far as phrasing is concerned, French is described as a boundary language, and the prosodic unit of importance is the so called ‘rhythmic group’ (Delattre, 1939), ‘prosodic word’ (Vaissière, 1974) or ‘accentual phrase’ (Jun and Fougeron 2000), and word boundaries are prosodically overridden by this unit.

As to phrasing in Vietnamese, and according to Schiering et al. (2010), a prosodic domain does not distinguish between words and phrases: “Metrically, polysyllabic words are thus indistinguishable from other combinations of syllables” and propose the phonological phrase as the domain of prominence. It is possible that in this respect, there is some similarity between the generally very different languages Vietnamese and French in that this domain can be compared to the rhythmic group in French. With regard to intonation, there are studies on focus, which is expressed by intonational structures in Vietnamese, among others f_0 (Đỗ et al., 1998;

Michaud, 2005; Vũ et al., 2006; Jannedy, 2007; 2008; Brunelle, 2017) and studies that show that differences between questions and statements are not entirely absent (see for example studies by Đỗ et al. 1998; Nguyễn & Boulakia, 1999; Vũ et al. 2006; Hà & Grice 2010; Brunelle et al. 2012 and Đào & Nguyễn 2018). Yet, intonation effects are not closely related to communicative functions or sentence types: “intonation is unlikely to be used for contrasting sentence types in southern Vietnamese, even if it is optionally present” (T.T. H. Phạm & Brunelle 2019, p. 27). This is also true for northern Vietnamese: “the role of intonation seems far more limited than in the average non-tonal language” (Brunelle et al. 2012, p. 25). To conclude, intonation plays a certain role in Vietnamese, but this role is more subordinated in Vietnamese than in French. Some of the possible functions of intonation are substituted in Vietnamese by morphosyntactic functions, such as e.g., final particles for questions and exclamations. This leads to the fact that the functions of intonation are more limited in Vietnamese than in the non-tonal language French. However, for this comparative assumption, there is still not enough evidence, and it could be discussed in detail in future works.

Vietnamese is an unrestricted lexical tone language in which each syllable is specified for tone, unlike Mandarin Chinese and Thai, in which some syllables are also unspecified for tone (cf. Brunelle et al. 2020). The domain of tone in Vietnamese is the rhyme of a syllable. Thus, as mentioned earlier, the syllable is an important unit in Vietnamese, especially since each syllable is assigned a tone. Furthermore, Vietnamese tones are culminative. They are realized by a different contour of fundamental frequency, duration and, in some varieties, by intensity; in addition, voice quality aspects such as laryngalisation, creakiness, breathiness and glottalisation, among others, play an essential role. It is unclear which of these culminative factors are distinctive. Traditionally, it is assumed that the fundamental frequency is phonemic (Vũ, 1981), but it is also discussed whether phonation types such as the features [glottal] or [laryngeal] are not distinctive instead (A. H. Pham, 2001, 2003). In this case, the fundamental frequency would only be a coarticulatory consequence. For example, a low tone correlates with breathy voice, and according to the latter interpretation, the fundamental frequency would be a purely phonetic consequence of voice quality. If it were really the phonation types that are distinctive, it could be debated to what extent Vietnamese is a tonal language. The reverse interpretation is equally possible, or both features are cumulatively distinctive at the level of phonology. Only perception experiments could bring more light on this issue. In the context of this work, no further contribution will be made to this debate, but the fundamental frequency as a correlate of tone will be considered in the foreground in our phonetic small-case-study on tone assignment in language contact.

In Vietnamese, there is a six-tone paradigm for syllables which do not end in a plosive, while two tones are found in occlusive-final syllables. In what follows, we refer to the alphanumeric denotation of tones as proposed in Michaud (2004). This description reflects the etymology of Vietnamese tones (cf. Haudricourt, 1954). In the southern variety around Ho Chi Minh City, the distinction of two tones is abandoned, and there is diatopic variation in the phonetic realisation of tone in other regions of Vietnam as well. In the following, the tones are presented based on the Hà Nội variety which is in focus of our work. The distinction abandoned in the south is present in the variety we focus on. In figure 1, we present the average fundamental frequency of tone contours taken from Michaud (2004). Table 5 lists the Vietnamese names of the tones, their phonetic features of contour, fundamental frequency, and voice quality (cf. Brunelle, 2009), as well as diacritical markers used to identify the tones in the orthography and the alphanumeric representation in the IPA transcription in the context of this work.

Figure 1: Northern Vietnamese tones, schematic diagram of tones produced by one speaker of the Hà-Nội-Variety, taken from Michaud (2004)

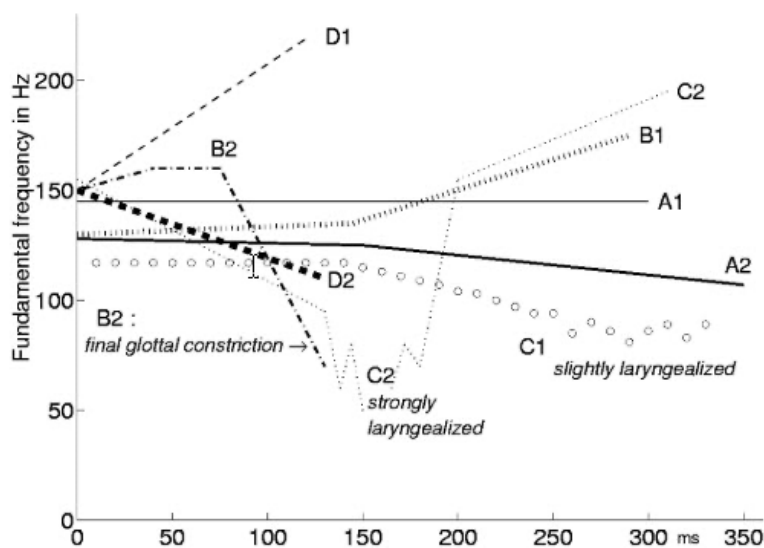


Table 5: Vietnamese tones: its features and its representations in orthography and the IPA

Name	Phonetic characteristics				Ortho- graphy	IPA
	Contour	Register	Voice quality	Length		
Ngang	level	high	modal	long	a	A1
Huyền	falling	low	modal/breathy	long	à	A2
Hỏi	falling (+ optionally slightly rising)	low	creaky (slightly laryngealized)	long	á	C1
Ngã	falling-rising	high	creaky/glottal	long	ã	C2
Sắc	rising	high	modal	long	á	B1

Sắc (plosive-ending)	rising	high	modal	short		D1
Nặng	falling	low	glottal	short	a	B2
Nặng (plosive-ending)	falling	low	modal (not glottal ¹⁰)	short		D2

After a presentation of tone in Vietnamese and the role of Intonation in both French and Vietnamese, we conclude this chapter with some morphological considerations.

2.2.3. Morphological considerations

This section presents some aspects of Vietnamese morphology in comparison to French, which are necessary for understanding this work. First, we will discuss the problem of grammatical words in Vietnamese, then consider the role of polysyllabic and monosyllabic lexemes in both languages, and finally describe the role of classifiers in Vietnamese. In the framework of our work, we mainly avoid the term *word*. Rather, we use the term *lexeme*, and explain in this subchapter why we do so. Along this decision, we also categorise the loanwords under investigation as lexemes. We only use the term loanword for reasons of convention in the literature, more appropriate would be the term loan lexeme. For all other contexts within our work, we use the term lexeme consistently, unless we are quoting directly. The reason is that in the case of Vietnamese it is not clear whether polysyllabic lexemes can be categorized as grammatical words. To open this discussion, we first provide a definition of grammatical word:

- A grammatical word consists of a number of grammatical elements which:
- (a) always occur together, rather than scattered through the clause (the criterion of cohesiveness);
 - (b) occur in a fixed order;
 - (c) have a conventionalised coherence and meaning. (Dixon & Aikhenvald 2003)

Schiering et al. (2010) discuss whether this definition is well suited for the application to the Vietnamese language. While they observe that (c) can be applied to Vietnamese without reservations, the application of (a) is more problematic:

the forms fail on other conventional criteria of grammatical wordhood as terminal nodes in the syntax, such as non-interruptability and ordering constraints. In Vietnamese, polysyllabic strings with a conventional meaning can be interrupted by phrasal elements, regardless of whether the strings consist of one or more morphemes (Schiering et al., 2010, p. 665).

We can illustrate this with the example of the loanword *cà phê* ‘coffee’. Its basis is the monomorphemic French lexeme *café*. In Vietnamese, the conjunction *với* ‘with’ can be inserted between both syllables of the lexical unit. *Cà với phê* translates into English as ‘coffee and the

¹⁰ The glottal feature which is present in tone B2 is absent in tone D2, where syllables end in a plosive consonant, cf. Michaud (2004) for further discussion.

like'. This is only one of several processes which can take place in Vietnamese lexemes, and which are discussed in detail in Schiering et al. (2010). For this reason, the authors cited above argue in the case of Vietnamese that "there is no evidence that there are terminal nodes in the syntax longer than one syllable" (Schiering et al., 2010, p. 667) and speak in the case of polysyllabic forms only of lexical units. From a phonological point of view, neither monosyllabic nor polysyllabic lexical units or lexemes can be distinguished from other syllables or polysyllabic sequences (cf. Schiering et al, 2010). Adapting this view, we justify the use of *lexeme* instead of *word* in the framework of this thesis, even though the category of a grammatical word could be applied to the French language. Still, to be consistent, we also use the more general term *lexeme* when discussing French since it is studied under the view of language contact with Vietnamese.

For the understanding of this work, it is important to know which role polysyllabic and monosyllabic lexemes play in both languages to compare such lexemes of Vietnamese and French. French lexemes have a minimum of one syllable, maximally there is no restriction. Examples are the monosyllabic lexeme *moi* 'I', the two-syllabic lexeme *moineau* 'sparrow' the three-syllabic lexeme *moinillon* 'young monk', etc. The number of monosyllabic lexemes accounts for only about 10%, while most lexemes are trisyllabic (37%), followed by bisyllabic (37%), 15% four-syllabic, 2.5% five-syllabic and 1% six- to nine-syllabic (cf. Trần, 2011; Rousset, 2004). In contrast to the inflectional language French, many lexemes in the isolating language Vietnamese consist of only one syllable. However, the group of multisyllabic lexemes is not small either. Thus, in modern Vietnamese, there is a clear tendency towards bisyllabic lexemes (cf. Nguyễn, 1997): like monosyllabic lexemes, bisyllabic lexemes make up about half of the Vietnamese lexicon.

Đoàn et al. classify Vietnamese lexemes into four categories based on their form: monosyllabic lexemes are grouped in the first group, reduplicative lexemes make up the second group, composita make up the third group, and the fourth group is titled *occasional compound words* (cf. Đoàn, et al., 2009). This means that they consist of two elements, each of which has no meaning on its own. Traditionally, these lexemes are loanwords of Chinese origin, but since language contact with European languages, they have also increasingly been of French and English origin (cf. Đoàn et al., 2009). According to Huynh (2010), composition is the most common and a highly productive word formation process, which can even combine native elements with sino-vietnamese elements or elements borrowed from other languages.

As stated above, most Vietnamese lexemes which consist of more than one syllable are bisyllabic. While reduplicative lexemes are always bisyllabic, compound lexemes just as French lexemes can contain any number of syllables. The same applies to the so-called occasional compound words, whereby a tendency towards one or two syllables can also be observed. While loanwords of Chinese origin are like native Vietnamese lexemes monosyllabic or bisyllabic, loan words of English or French origin, can in principle contain any number of syllables, like their base. An example of a monosyllabic Vietnamese lexeme is the adjective *buồn* ‘sad’, a reduplicative lexeme is *buồn buồn* ‘melancholic’ and a compound lexeme is *buồn ngủ* ‘sleepy, tired’, which is composed of the meanings of *buồn* ‘sad’ and *ngủ* ‘sleep, to sleep’. An example of an occasional compound word would be the loanword *ba lô* from French *balot*: it is not semantically composed of *ba* ‘father’ and *lô* ‘price’ and simply means ‘backpack’.

In this background chapter we have contextualized our work historically and theoretically and presented relevant features of the two languages under investigation. We presented research from both the perspective of loanword borrowing and second language acquisition as both will be the topic of our thesis. A related question which is discussed in this work is in which ways both topics should be contrasted. Or, in which ways they can be situated within a unified theoretical framework which combines both perspectives. Our assumption is that where much overlap between patterns in loanword borrowing and second language acquisition can be found, there is a strong connection. Evidence for this can be found if similar patterns condense in both. As to the segmental and suprasegmental patterns themselves, we will have a partly deeper and partly complementary look at single consonants and consonant clusters compared to what has previously been carried out. While repair and adaptation patterns for single consonants and consonant clusters have been the topic of many studies for many language pairs, the complex field of syllabification in language contact has not been paid much attention to in previous work and we want to rediscuss related theoretical assumptions. Finally, we devote smaller parts of our studies to the topic of tone assignment to material of a non-tonal language due to contact with speakers of Vietnamese and the loss of tonal features of a tonal language due to contact with speakers of French. If asymmetries between both directions arise, this may be an argument for assuming that features of a tonal language are more salient or less marked than features of a language without lexical tone. A contribution of this thesis is also to invite readers to see more graduality instead of categorization where this leads to a deeper understanding of how prosodic language contact works. We close our background chapter and move on with the presentation of our empirical studies.

3. Overview of empirical studies

After having initially provided background information and concepts for contextualization as well as to pave the way for our studies, we now move on to focussing on the studies themselves. The previously introduced information on prosody, language contact, borrowing processes as well as foreign and second language acquisition help us to better understand the linguistic processes in focus in this section and the concepts previously introduced can be applied to very concrete cases. One after the other, we present three concepts of studies which have evolved from each other over time, complementing each other and thus providing a multi-faceted picture of language contact phenomena related to borrowing processes and foreign or second language acquisition, which we address from a different angle in each of these studies.

The first study constitutes the starting point of our research: we focus on a corpus of French loanwords into Vietnamese and examine repairs which have been made by speakers of Vietnamese during the time of French colonialism. To leave aside the potential independent variable of different parts of speech and to have a more homogeneous corpus, we chose to include only nouns, especially since most loanwords are nouns (cf. Haspelmath, 2008). Those nouns refer mainly to things in the fields of nutrition (e.g. Vietnamese *cà phê* [ka^{A2} fe^{A1}] from French *café* [kafɛ] ‘coffee’), clothing (*bờ lu* [bɔ^{A2} lu^{A1}] from *blouse* [bluz] ‘blouse’), industry (*quy lát* [kwi^{A1}lat^{D1}] from *culasse* [kylas] ‘cylinder head’), and medicine (*vi rút* [vi^{A1}rut^{D1}] from *virus* [virys] ‘virus’). Some are only used in specific situations and domains by a small number of speakers (*quy lát*), while others are frequently used in Vietnamese everyday life (*cà phê*). From a larger corpus of more than 1000 nouns, we selected a smaller number of nouns for which we have checked that they are used in Vietnamese, but obviously, not every noun is known and used by everyone and in every social and local variety. A link to both the larger corpus and its selection can be found in the appendix on p.316. In our study, we focus on the segmental adaptations of consonants and the suprasegmental adaptations of consonant clusters. We also examine other suprasegmental issues such as syllabification and tone assignment. By doing so, we capture variety and systematic patterns. One example of systematic pattern is that consonant clusters are always repaired, as consonant clusters are illicit structures in Vietnamese. The variety is that this repair sometimes takes on the form of epenthesis (*bờ lu* [bɔ^{A2} lu^{A1}], from French *blouse* [bluz] ‘blouse’) and sometimes deletion (*pho mát* [fɔ^{A1} mat^{D1}] from French *fromage* [fʁɔmaʒ] ‘cheese’). Also, we pursue questions of monolingualism vs. bilingualism of Vietnamese speakers who borrowed lexemes at a given point in time and the role of perception vs. production. Loanword data admittedly cannot lead to a final answer, but they constitute a ‘real-world experiment’, and can provide insights into borrowing processes.

Although there is a lot of research literature on borrowing processes (cf. chapter 2.1.2.), many theoretical reflections and discussions still call for further investigation and questions like the ones mentioned above still appear well worth investigating: not least because the processes involved in borrowing are completed at the present time when loans are considered as an object of study: in this case, on average, probably even about a century ago. As a result, we are nowadays often groping in the dark, and in many cases, it only remains for us to make assumptions about what such a borrowing process might have been like, which speakers were the ones who borrowed and what exactly was going on during the process of borrowing. This is because borrowing processes, especially in colonial contexts, were often not or rather anecdotally documented at the moment they took place. One example is the loan *cà phê* [ka^{A2} fe^{A1}] from French *café* [kafe] ‘coffee’, and we have provided its anecdote on p. 58.

To achieve greater clarification and transparency on patterns which arise in French loans and to complement punctual anecdotal evidence for certain patterns with systematic patterns of prosodical language contact, we have developed experimental protocols to know more about speakers and what they do in the very moment they repeat a given stimulus lexeme. This approach aims to experimentally get closer to processes which share similarities to borrowing. The basic idea is that French lexemes are imitated by speakers of Vietnamese and subsequently embedded into a Vietnamese carrier sentence. Some speakers are also asked to write down each lexeme according to Vietnamese orthography, which is phonemic. Of course, such an experimental approach with only three steps per lexeme/participant cannot reflect the same situation which enabled borrowing processes about a century ago, but when comparing data gathered by an experimental approach, we can discuss structural parallels and differences between loan and experimental data. With this approach, we are also able to shed more light on the question of monolingualism vs. bilingualism, as we have one dataset with 34 monolingual speakers of Vietnamese, another dataset of 21 speakers of Vietnamese with French as a foreign language knowledge residing in Vietnam and finally a small dataset of four speakers of Vietnamese with French as a second language knowledge residing in France. Remember, that we differentiate between the notion of foreign and second language as outlined in 2.1.3. Additionally, with larger datasets compared to the loan data, we can capture intra- and interspeaker variability but better rely on systematic patterns which occur in parallel to the loan data. With our three-step-based experiment design, we can also get hints on differences between perception and production. Finally, with this a larger amount of data compared to loan data, we can finally come back to the question of phonetics vs. phonology-driven processes involved in spontaneous imitations as well as in borrowing processes in loans.

So far, we have introduced two broad concepts for studies with two different approaches but for only one and the same direction of language contact, namely French → Vietnamese. In our third study concept, we want to reverse the direction of language contact. Such a reversal of this kind of language contact study is simply not possible with loanwords, because due to historical reasons, there are even much less Vietnamese loans into French than the other way around. Therefore, this small-scale study is not only a project to compare both directions of language contact and to investigate questions of salience and universality in prosody. It is also the very modest first step of a big thought game: if the balance of power in the world had been or would be different or at best more balanced, how would systematic patterns, for example, during borrowing processes from Vietnamese into French look like (or, equally interesting but not the scope of this work, into English or German)? Maybe, in a very long time span of language contact with Vietnamese, European languages would even become tonal and lose their consonant clusters! To recall, this is what has happened to Vietnamese, and contact with Chinese and Tai-Kadai languages and varieties seems to have played an important role therein. Our long term thought game of course cannot be stimulated within the framework of this thesis, but it is important to us to confront not only Vietnamese experiment participants with French stimuli, but also to confront French speakers to Vietnamese stimuli. The inversion of the language contact direction is driven by our interest to consider both sides of a coin and to find out parallels and differences in processes occurring in two directions of language contact. It is also particularly enhanced by Vietnamese colleagues with whom we spoke during our field research trip to Vietnam as well as by teachers of Vietnamese in France. Due to the outbreak of the pandemic, the study on this language contact direction must remain a small-case study.

To guide readers through the following chapters 4. 5. and 6., we provide overview table 6 about our three study concepts, the corresponding studies themselves, datasets and experiments we describe in detail during the method section of each subchapter. Readers can get back to this overview picture at any time they wish to zoom out from detailed descriptions.

Table 6: Overview of the three datasets and the corresponding studies

Datasets	Study concept	Source lexemes/ Stimuli	Loanwords/ Responses	Location
loanword list (various sources)	French loans into Vietnamese	532 French lexemes	532 Vietnamese lexemes	-
Data from experiment block 1+2	Experimental studies FR -> VN	49 French lexemes, most of them in two variants (cf. experiment 1 vs. 2)	34 monolingual speakers of Vietnamese	Vietnam (Thái Nguyên)

			21 Speakers of Vietnamese with French as a Foreign Language	Vietnam (Hà Nội)
			4 Speakers of Vietnamese with French as a Second Language	France (Paris)
Data from experiment 3	Experimental studies VN -> FR	16 Vietnamese lexemes + 6 French lexemes (control group for study on tonal aspects FR -> VN)	10 Speakers of French without knowledge of East Asian and/or tone languages	France (Paris)

It what follows, we present detailed descriptions of the three study concepts. We start with chapter 4 which is dedicated to loanwords and serve as a starting point for the experimental studies in 5 on the direction French → Vietnamese and 6 on the opposite direction. A focus is on the study of consonant clusters and syllabification in chapter 5. For each of the three concepts we start by introducing the general hypotheses and research questions, then present the methods and finally the results.

4. French Loanwords into Vietnamese

According to the official site of the Francophonie (Organisation internationale de la Francophonie, 2019), Vietnam is officially a member since 1970, but the reality is a bit more complex, as Vietnam was divided and under war at that time. Also, the choice is essentially of politico-economical nature, with little linguistic basis and French does not play a major role in today's Vietnam. English, as in many other parts of the world, is much more important in international communication and is also considered much more important by large parts of the population. The traces that French has left in the Vietnamese lexicon are also rather marginal. Approximately 500-1500 loanwords are not a large reference number compared to the number of loanwords from Chinese (see p.57) and make up a very low proportion compared to the native Vietnamese lexicon. However, some of these loanwords are frequent in everyday life. The loanwords still in use today show how borrowing processes may have taken place at the time of language contact - although much remains unclear in this regard. Therefore, we understand the study on loanwords as a springboard for further experimental studies. In the following, we first summarize the state of the art for research on the language pair French Vietnamese, then introduce our methods and finally proceed to the presentation of the results.

4.1. State of the art for Loanword adaptation from French into Vietnamese

In this section, we start by presenting the literature on French loanwords in Vietnamese. In Vietnamese, it is said “Trung Hoa 1000 năm, Pháp 100 năm, Mỹ 10 năm”, which means that China was 1000, France 100 and America 10 years present in Vietnam. In line with this saying, 90% of all loan words in Vietnamese are of Chinese origin, while French loan words account for about 4% and English for even less (cf. Alves, 2009, p. 619). While the process of borrowing from English continues despite the war lost by the United States in 1975, the process of borrowing from French is likely to have been largely completed after the end of French colonial rule. This is so because the global importance of English has greatly increased since then, while that of French has declined since the end of the colonial period. Language contact between French and Vietnamese in Vietnam thus existed predominantly during the colonial period. Although it is possible that loan words from French were already integrated into Vietnamese through missionary activity from the 16th century onwards, Alves (2009, p. 621) only speaks of “noticeable effects on the Vietnamese lexicon” from the beginning of colonial rule. The vocabulary mostly concerns new terms in the semantic fields of food, clothing, and technology (cf. Alves, 2009). French terms were integrated for items of clothing and food brought into the country by the French, such as butter or ties. The loans are therefore to a large extent *cultural borrowings*. For example, before contact with French culture, there were no dairy products in Vietnam and thus no terms for *butter*, for example. Therefore, the loan *bơ* from French *beurre* has been introduced into Vietnamese.

During the colonial period and for some time afterwards, the number of *core borrowings* was also not small. Core borrowings are loanwords that semantically fall into a category with already existing native terms (cf. Haspelmath, 2008). Their emergence can often be explained by prestige. In this context, we mean by prestige that it represents a power imbalance rather than delivering information about the attractiveness of French among speakers of Vietnamese. In this context, it may also be related to the fact that French had a prestige status, even though ambivalent. The fact that such borrowings are generally less common today may have to do with the fact that French has largely lost this status since the independence and the native variant has mostly prevailed.

To sum up the two different models of loanword adaptation in general we have presented in the previous section, there is a discussion on the role of phonetics and phonology of source and target language, and linked to this, if borrowers are monolingual or bilingual. At this point, we present two controversial views concerning the borrowing processes which have led to French

loans in Vietnamese proposed in previous literature. According to Kang et al. (2016), speakers were imperfective bilinguals with at least some phonological knowledge of French. Kang et al.'s idea is “that Vietnamese adapters seem to extend the French phonotactic tendencies, i.e., *Loi de Position*, to loan adaptation productively” (Kang et al., 2016. p.12). While this analysis is plausible, their findings could also be interpreted as a *retreat to the unmarked* (cf. Kenstowicz, 2005, Kenstowicz & Suchato, 2006, Kang, 2011, Kang, 2010) or *emergence of universal grammar* (Shinohara 2004). To the contrary, Scholvin & Meinschaefer (2018) assume that the adapters were monolingual speakers of Vietnamese who had no phonological knowledge of French. Both views go in hand with plausible interpretations, but for both views, there is currently not enough evidence from data, which is why both views are possible to be assumed for the French Vietnamese borrowing situation. Also, it remains unclear how much phonological knowledge borrowers may have had of French, if they have had any. And as this is rather a question of at which scale of a continuum between monolingualism and bilingualism speakers can be situated, it is probably of a smaller importance to categorize binarily a complex borrowing situation, which lies about hundred years ago, with many actors with different degrees of knowledge of the two languages. These are the two articles about French loans into Vietnamese which include the current debates on loanword adaptation, but there are other works which deliver insights into these loan's phonology, and we present them in what follows.

Let us continue the presentation of works dealing with French loanwords into Vietnamese with an anecdotal note in Martini (1958) about the loan loan *cà phê* [ka^{A2} fe^{A1}] from French *café* [kafɛ] ‘coffee’. With this note, the author seeks finding an explanation for why the first syllable of this loan receives tone A2: an earlier or previously coexisting version of *cà phê*, according to childhood memories of Martini (1958), is *trà phê* [tɾa^{A2} fe^{A1}]. Vietnamese *trà* means ‘tea’ in English and speakers of Vietnamese may have semantically understood coffee as a certain type of tea (cf. also Michaud et al. (2015) who retell this story in more detail). Still, it is also possible that *cà phê* with the current tonal pattern existed already before *trà phê* and continued to exist after the disappearance of *trà phê*. While this anecdote still delivers a plausible possibility to explain a tonal pattern for a specific lexeme, it does not account for the same pattern in other lexemes where tone A2 is assigned to the first open syllable as well, as for instance in *gà ram* [ɣa^{A2} ram^{A1}] from French *gramme* [gʁam] ‘kilogramm’ or *bờ lu* [bɔ^{A2} lu^{A1}] from French *blouse* [bluz] ‘blouse’. Still, the same tonal pattern in Vietnamese *cà rốt* from French *carrotte* ‘carrot’ can again possibly be explained in parallel to *trà phê* with Martini (1958) and Michaud et al. (2015). They refer to the fact that *cà* in the Vietnamese lexicon means ‘eggplant’, and Vietnamese speakers could have understood the newly introduced vegetable carrot as a specific

type of eggplant. While the association of eggplant with carrot seems plausible to us, especially under the light that tomato in Vietnamese is also associated to the semantic class of eggplants and called *cà chua* ‘lit. sour eggplant’, we do not see an explanation for why *cà rem* from French *crème* ‘ice-cream’ should be associated to eggplants and Martini does not deliver explanations for this and other lexemes. Still, later works have also dealt with this pattern and other patterns and we present their explanations in what follows.

The generalisations established in the article of Barker (1969) give a first overview. Later, two theses appeared about French loans into Vietnamese and devote one chapter to their phonology each: Vương, (1992) delivers interesting generalizations which complement Barker’s first overview and a comprehensive thesis from a more general perspective on French loans into Vietnamese in 2007. The latter author has published two articles about these loans two years earlier, one of which treats tone assignment (Huynh, 2008). The results of her thesis and her articles are developed further in a book which appeared in 2010. The corpus in Huynh (2010) is carefully documented and thus very helpful for our work. V. K. Nguyễn (2013) has written a more general book about foreign loans in Vietnamese and gives some insights to phonology of French loans into Vietnamese as well, among them the substitution of single sounds, consonant clusters, and tone assignment, but these do not deliver much additional insights in comparison to the previous works. An optimality-theoretical approach is used in M. Pham (2012) on the adaptation of tones and in Nguyen and Dutta (2017) on consonant clusters. Kang et al.’s (2016) study focusses on the adaptation of vowels. In 2018, we have published an article on the issue of segmental, suprasegmental and tonal aspects of adaptations ourselves (Scholvin & Meinschaefter, 2018). In the following, we will briefly summarise the main research findings on this topic which are relevant for our study in the order of their publication date.

Barker (1969)

The first to deal with the phonology of French loanwords in Vietnamese is Barker (1969). His article focuses on the elaboration of systemicities of the adaptations and is based on a corpus of 136 loans. Barker (1969) focusses briefly on the adaptation of nasal and oral vowels, truncation, syllable-final consonants and consonant clusters. We have taken the following generalizations from Barker (1969), which are important for our work:¹¹

Single consonants: syllable-final consonants in the French source lexeme which are illicit in Vietnamese, are deleted, replaced by a licit consonant, or the previous vowel is replaced by a

¹¹ We do not quote verbatim, since we adapt the IPA to our notation including the alphanumeric representation of tone, gloss consistently, and speak of lexemes instead of words to establish consistency within this work.

glide. Examples are French *beurre* [bœʁ], corresponding to Vietnamese *bơ* [bɔ̃1] ‘butter’, *vernis* [vɛʁni] corresponding to *vét ni* [vɛt^{D2} ni^{A1}] ‘vernish’ and *tour* [tuʁ] corresponding to *tua* [tuə^{A1}] ‘tour’. The last of Barker’s generalizations of syllable -final consonants, according to our view, does not fit well to the example and we would rather describe it as a replacement of the illicit consonant by a glide, which would result in only two patterns instead of three, as we categorize glides as consonants.

Consonant clusters: consonant clusters of the French source lexeme are not realized in the loan in Vietnamese. They are either reduced to a single consonant, or an epenthetic vowel is inserted in between them. Examples are French *crème* [kʁɛm] ‘(ice) cream’, corresponding to *kem* [kɛm^{A1}] in one variant and *cà rem* [ka^{A2} zɛm^{A1}] in another variant of the loan in Vietnamese.

Tone: most tones are assigned the level tone ngang (A1) in Vietnamese, i.e., French *cabine* [kabin] corresponding to Vietnamese *ca bin* [ka^{A1} bin^{A1}] ‘cabin’. If the syllable of a loan ends in a plosive, it is assigned tone sắc (D1), i.e., French *cap* [kap], which corresponds to Vietnamese *cap* [kap^{D1}] ‘cap’. The falling tone huyền (A2) is often assigned to the first syllable in bisyllabic loans, i.e., French *café* [kafɛ] and its Vietnamese correspondence *cà phê* [ka^{A2} fe^{A1}] ‘coffee’.

Vương (1992)

Vương's observations provide more detail. He discusses the truncation of syllables, which is only marginally considered in our work, and distinguishes their position in syllable and lexeme. Furthermore, he deals with patterns of substitution and deletion of consonants as well as patterns of substitution of vowels. Vương also discusses the repair of consonant clusters and the assignment of tones. Generalisations which are important for our work are the following¹²:

Single consonants: some consonants can be easily mapped with corresponding Vietnamese consonants, among them are the onset consonants such as [m], [n], [t] and [v]. Only those with no Vietnamese correspondence are replaced, e.g., French [ʒ] by Vietnamese [z] e.g., Vietnamese *dăm bông* [zã^{A1} boŋ^{A1}] from French *jambon* [ʒãbɔ̃] ‘ham’. Vương differentiates between onset and coda consonants and goes into detail for both. He also considers patterns of substitution and deletion, which largely coincide with later works. Of particular interest are his observations on the variable substitution of the coda consonant [ʁ], which we will return to later when we present our own results.

Consonant clusters: Vương focuses on the pattern of deletion in onset consonant clusters, but

¹² Again, we adapt the presentation of examples to the conventions common in our work.

also discusses coda consonant clusters, and again separately. He observes that onset clusters with a [l] as the second consonant behave differently from those in which [ʁ] as the second consonant, and we will come back to this during the presentation of our results (see p.77).

Tone: Vưong's results correspond to Barker's in that tone D1 and D2 are only assigned to syllables ending in a plosive coda. e.g., the first syllable in *ắc quy* [ãk^{D1} kwi^{A1}] from French akku(mulateur): [aky] 'battery' or the second syllable in *cà vạt* [ka^{A1} vat^{D2}] from French cravatte [kʁavat] 'tie'. Syllables ending in a so-called open or half-open consonant (which refers to nasals) are assigned either tone A1 or A2 (đằm [dʒm^{A2}] from French *dame* '(western) lady', *bành tô* [bɛŋ^{A2} to^{A1}] from French *manteau* 'long coat', *bom* [bɔm^{A1}] from French *pompe* 'pump' and *bi đông* [bi^{A1} dɔŋ^{A1}] from French *bidon* 'water bottle' milit.). Epenthetic vowels inserted between two cluster consonants are usually assigned tone A2, e.g., *bờ lu* [bɔ^{A2} lu^{A1}] from French *blouse* [bluz] or *cà rem* [ka^{A2} zɛm^{A1}] from French *crème* [kʁɛm] '(ice) cream'. In rare cases, other tones are also assigned, or the tones described above appear in other structures. Like Barker's generalisations, Vưong's also agree to a large extent with our results. In this work, they will then be numerically verified, carried out in more detail, and refined.

Huynh (2008, 2010)

The observations made by Huynh (2008, 2010) do not contradict the results of Barker and Vưong. Huynh generally goes into much more detail in her book, but is less generalising in the chapter on phonology, and so it is more difficult to discern systemic patterns from her observations. We will refrain from addressing the detailed elaborations she gives on nasals and vowel quality, as they are not the focus of this paper, nor will we go into the details of consonant adaptation. As to tone, we can infer the following frequency distribution from Huynh: 69 % of all syllables from her corpus of about 600 loans are assigned tone A1. 20.5% of all syllables from her corpus are assigned tone D1, and 6% of all syllables are assigned tone A2. Tone D2 is assigned to 2.5% of all syllables. Tone B1 is assigned to 1.5% of all syllables Only 0.5% of all syllables are assigned tone C1 and no syllables are assigned tone C2 or D2. Her frequency distribution does not contradict the generalisations in Barker (1969) and Vưong (1992). Huynh's general merits are that she includes all items from her very carefully documented corpus, so that her explanations are complete and transparent.

M. Pham (2012)

The article by M. Pham (2012) is based on Barker's findings. Pham focusses on tone assignment and proposes an OT analysis which will not be discussed in detail here. He argues that the tonal system of loanwords is more restricted than that of native words, could be a *retreat to the*

unmarked (as defined in Kenstowicz 2005), also in that it excludes tones with complex contours (apart from a few exceptions). Pham postulates three tone assignment strategies, the first two of which coincide with points about tone in Barker, and the third of which attempts to specify Barkers second statement on tone, which we elaborate below:

- (a) All syllables are assigned neutral mid-high level *ngang* tone [A1] by default.
- (b) All syllables ending in obstruents receive high rising *sác* tone [D1]
- (c) If a loan is adapted as a bisyllabic word comprising an open initial syllable and a final closed syllable, the initial open syllable will receive low falling *huyền* tone [A2]. (M. Pham, 2012, p.6)

While (b) is a simplification in that it does not mention the possibility that also tone D2 can be assigned, we will see later that (c) is partly not true according to our data (see p.98).

Kang et al (2016)

The paper by Kang et al. (2016) is particularly devoted to the adaptation of vowels, which we do not discuss in depth here. The corpus underlying the findings is based, among others, on the corpus from Huynh (2010), which has been extended but is not accessible. The findings are that “Vietnamese adapters seem to extend the French phonotactic tendencies, i.e., Loi de Position, to loan adaptation productively.” (Kang et al., 2014, p. 11). Furthermore, phonological contrast of French (e.g. [ʁ] vs. [k]) is found to be neutralised in Vietnamese loan words because of phonological constraints (e.g., no [ʁ] in the coda): uvular and velar codas in the French base lexeme are neutralised to dorsal plosives in the Vietnamese loan word. (e.g., French source lexeme *corset* [kɔʁsɛ] and loanword *coóc xê* [kɔ:k^{D1} se^{A1}] in Vietnamese ‘corset’). In return, the Vietnamese adaptation often receives a contrast in vowel length and often quality in the preceding vowel (cf. Kang et al., 2016). The underlying results agree with Vương (1992), but with their explanation, they provide a different interpretation, to which we will also return later (see p.73). Finally, the just described pattern observed in the two works could, according to our view, be a universal tendency: a hint to this is the emergence of a similar pattern in a very different situation of historical language change found in Limousin, where a deleted [r] has led to vowel lengthening as well (cf. Meinschaefer 2020).

Nguyen & Dutta (2017)

In their article, the authors describe that when consonant clusters are repaired, epenthesis occurs less frequently and mostly deletion. They also note that epenthesis does not occur in coda consonants. These general findings go in line with our own research (Scholvin & Meinschaefer 2018). However, the data is not quantitatively analysed, but the results are modelled in within the framework of OT, which we do not want to address in detail here.

In general, it can be criticised that the works predominantly make little reference to each other, apart from Nguyen & Dutta (2017), who cite most authors once in their introduction. Perhaps not all works were always accessible to everyone, so that the wheel was partially reinvented several times. In the result section we will also come back on generalizations already made in previous research results, which is a decision we made to provide a complete overview. Still, we refer to the results of the above-mentioned works at the appropriate place and discuss if they go in line with our results. At this point, we will not summarise our own articles (Scholvin & Meinschaefer 2018, Scholvin 2022). The first one lays a first foundation for this work, a detailed further development including more aspects and new observations is discussed in what follows. The second one is a further development and deepening of syllabic aspects from this thesis.

4.2. Methods

For the studies on French loanwords in Vietnamese, a written corpus of 1008 loanwords is compiled, based on different sources. Corpora from the works of Barker (1969), Huynh (2010) and V. K. Nguyễn (2013) serve as a departure. While some of the loanwords are listed in each of these works, for instance the loan *cà phê* [ka^{A2} fe^{A1}] from French *café* [kafɛ] ‘coffee’, other loanwords are only listed in two or one of the four sources, for instance *công của* [koŋm̄ kuə] from French *concours* [kõkuʁ] ‘competition’. For each loanword, we have noted the source so that we remember from where we have taken it. While some of the authors have been very reliable in their documentation of loanwords, other works do not always show the methods used to collect the loanwords they listed. Especially in the case of loanwords which are only listed in one of the four sources and where not much is said about the method, there is no sincerity. Also, a simple copy-and-paste incorporation of loanwords from the four sources cannot guarantee whether the loanwords are still in use or have ever been frequently in use.

As a starting point, informal interviews with two Vietnamese informants help to check punctually this issue. The informants are native speakers of Vietnamese living in Germany but having acquired German only during their adulthood. In order not to cause hard-working people much additional amount of work and because we only wanted to get a first impression on actual use of these loans, we randomly compiled a selective list of only 134 loanwords. Parts of the loanwords are known to the informants, and for some of the loanwords already listed, informants mention variants or suggest loanwords which we had not yet listed. Although they have no knowledge of French, they are aware of the French roots of the loanwords they mentioned. We include these probable loanwords from French in our list with the remark that these are supplemented by the informants. Still, more than half of the loanwords in our selective

list are not known to the informants. In this case, there is the possibility that these words are outdated or, on the other hand, that they are simply very specific and therefore not part of the general vocabulary of most people who do not work in the specific professions where these words are used: many of the professions involve (car-) industry, mechanics, and medicine. Three examples for the just mentioned branches are *bugi* [bu^{A1} zi^{A1}] from French *bougie* [buʒi] ‘spark plug’, *(cờ lê) mỏ lét* [kɔ^{A2} le^{A1} mɔ^{C1} let^{D1}] from French *clé à molette* [kleamɔlet] and *vắc xin* [vắk^{D1} sin^{A1}] from French *vaccin* [vaksɛ̃] ‘vaccine’.

The possibility that some loans are outdated today is also discussed in Alves (2009) and Huynh (2010). Alves (2009) points out that some French loanwords which were in use in the early 20th century have disappeared since the end of the French colonial period. Thus, some loanwords are identified in Huynh (2010) as archaisms or rarely used variants of native lexical units today. For example, the common compound lexeme for *hotel* in Vietnamese is *nhà khách sạn*, which could literally be translated as ‘guest/customer house’. As a less common synonym today, Huynh (2010) lists the loanword *ô-ten*, borrowed from French *hôtel*. In such cases, it can either be a matter of so-called core borrowings. Core borrowings refer to those loans for which a native lexeme already exists (cf. Myers-Scotton, 2002; 2006; Haspelmath, 2009). In some cases, however, it is also possible that the native form arose later, for example due to purist currents in Vietnamese language policy, striving to replace loanwords by native lexemes. For more information, see the detailed commentary in Huynh (2010). For many of the loanwords we have taken from Huynh (2010) and the other above-mentioned sources, the speakers of Vietnamese we had asked to evaluate if these lexemes are known to them, did not know them. Therefore, it is possible that the number of archaisms is higher than expected.

Therefore, we used additional methods to check if the loanwords were existing and still in use. A Vietnamese dictionary (Bùi et al., 2003) is helpful in this respect, but even here archaisms might be listed or some of the loanwords still in use today might remain missing. The second method we tested was to make use of the internet corpus search Sketch Engine. The corpus available for Vietnamese in Sketch engine contains 106,464,835 lexemes, which looks like a large number, but in comparison to corpora of French or English is rather a small corpus. While it is possible to find many loanwords, especially those we supposed to be high-frequent, we could not find many supposedly infrequent or domain-specific lexemes. Some examples: for *cà phê* ‘coffee’, there are 6517 entries, for *cải xoong* ‘cress’ at least 12 but there is no entry for *bà đằm* ‘western lady’. The problems we met have also been pointed out in (Poplack 2018) in the context of the difficulty to define the status of established loanwords:

A long-attested loanword may appear only once in a given corpus, and some words in widespread use may not occur at all, simply because the corresponding topics were not the focus of conversation. The evidence for dictionary attestation is also limited: borrowed lexical items – just like their native counterparts – may be current in a community without ever appearing in a dictionary [...]. Frequency assessments are particularly thorny in the case of unattested borrowings, but they can be problematic with respect to attested but obsolescent or rarely occurring loanwords as well.” (Poplack 2018, p. 43)

Due to the above-mentioned disadvantages of canonical methods, we finally choose checking the use and frequency of loan words on the internet with a more helpful, though uncanonical method. This time, instead of proceeding selectively, we check all loanwords in our corpus. Our approach is the following: first, we enter each of the loanwords into our search engine startpage.com using image search. If at least three pictures of the corresponding object appear on the first page, this is a good indication that the loanword is still in use. To verify this, we visit websites belonging to the images and check whether and in which context the corresponding loanword is used in a journal article or a product description and if this is a current-day context. For instance, we search for the loan *bà đằm* ‘CFwoman (western) lady’ from French *madame, dame* ‘lady’. We find, among others, pictures of Angela Merkel, Margaret Thatcher, and Meryl Streep. Those pictures match semantically the expected content, and we continue by reading the corresponding articles. For instance, Margaret Thatcher is known as the ‘iron lady’, also due to the eponymous film from 2011, where she is played by Meryl Streep. And apparently, ‘iron lady’ has been translated into Vietnamese as *bà đằm thép* ‘CFwoman (western) lady iron’, for instance in the article *Có một “bà đằm thép” trong văn hóa đại chúng* of the Vietnamese newspaper *Báo Bình Dương* of the year 2013. This is an example of a loan which appears to be not frequently, but still in use. Other loans are currently frequently used, since matching images are displayed right on the first page, pointing out to numerous articles in which the corresponding loanword are used. An example would be *giăm bông* [zã^{A1} 6oŋ^{A1}] from French *jambon* [zãbõ] ‘ham’. For other loanwords we did not find anything initially, we try to enter the loanword in combination with a possibly matching classifier, and consequently, we are more likely to find it. An example is *pô* [po^{A1}] from French *pot (d’echappement)* [po] ‘pot (tailpipe)’, which we were able to find after adding *ống* ‘pipe’ before, so that it results in *ống pô*. Sometimes it also helps to enter a different noun from the same semantic field to refine the search, so that even for less frequent and well-known loanwords we could find some recent articles. Nevertheless, we do not find any match for many of the loanwords in our list this way either. Although it cannot be excluded that they also exist or at least have existed once, we do, as a precaution, not include them in the dataset for our studies, and when we found only one source, we exclude this item from our selective corpus.

Our procedure cannot provide definitive conclusions about whether, by whom, where, in which context and how often a loanword is used today, but our procedure still does provide initial clues about frequency and use and reveals that many of the supposedly current loanwords may be only rarely, if ever, used. It also reveals that the number of widely used loanwords is limited, while others are used only in very specialised domains or specific contexts. The linguistic footprint of French in current Vietnamese is thus even smaller than expected and will probably continue to decrease.

The dataset we finally select, includes slightly more than half of the originally listed loanwords: it is a selection dataset of 532 nominal loanwords. The phonetic transcriptions of Vietnamese loanwords are initially generated automatically using a Python script (Kirby, 2008) based on orthographic representations. Subsequently, we spot-checked the automatically generated IPA-transcriptions against the pronunciation of native speakers for some ambiguous cases for which we were not sure, for instance, to see how they pronounced the grapheme <r> in *ra-đi-ô* ‘radio’. Phonetic transcriptions of the French original words are based on the standard hexagonal pronunciation as noted in common dictionaries (Rey-Debove & Rey, 2013). A link to the dataset can be found in the appendix on p.316. The basis of the selective list has been the data we have based our 2018’s paper (Scholvin & Meinschaefer, 2018) on, and which is available under the following link: <http://dx.doi.org/10.17169/refubium-1023>. For the context of this work, we have made some changes, additionally provide annotations and references as well as the larger dataset we have taken the selective list of 532 loans from.

Finally, we justify our decision to not include Vietnamese classifiers in our corpus nor to put them in the examples in this work. Classifiers, or categorical nouns, are used to categorise nouns in terms of animacy, size and other properties in Vietnamese (cf. Nguyễn, 1997). Among the numerous classifiers, there are relative general ones such as *con*, which refers to animals, children and a few objects. There are also more specific classifiers for round objects, fruits, emotional states, seasons, etc. Classifiers occur in certain syntactic structures in combination with the noun they classify. An example from the loanword corpus is the noun *đậu*. Not only does it mean *bean*, but it also serves as a classifier for all kinds of beans. The loanword *cô ve* from the French *haricot vert* ‘green bean’ thus occurs in Vietnamese in combination with the classifier: *đậu cô ve*. However, the classifiers are not listed for loan words in the context of this work since they are not relevant for our investigations. In our corpus, for example, only *cô ve* is noted. In which context and in combination with which classifier some loanwords are used can be found in Huynh (2010), among others.

4.3. Results

Our study on loanwords is the point of departure for the experimental studies which follow after this study. It focusses segmental, syllabic and tonal aspects – the same aspects which we concentrate on in the whole thesis. The following investigations are a continuation of our research paper from 2018 which focusses on segmental, syllabic and tonal aspects (Scholvin & Meinschaefer 2018). Herein, we develop them further, especially elaborating on the aspect of syllabification. In the meanwhile, we have further deepened this aspect (Scholvin 2022). We start by presenting our main questions and providing the structure of the chapter. Our three main questions are:

- 1.) Which are the repair strategies speakers of Vietnamese have chosen when they borrowed French lexemes into Vietnamese?
- 2.) What can we learn from this about the two languages Vietnamese and French?
- 3.) And what can we learn about this specific language contact situation as well as universal mechanisms of language contact?

At first, we look at segmental repair, focussing on single consonants which are illicit in Vietnamese. We continue with consonant clusters and how they are repaired by epenthesis or deletion. Then we consider syllabification processes and finally tone assignment. At the beginning of each chapter we refresh the most important differences between Vietnamese and French for each issue and then continue with presenting the results of our study.

4.3.1. Segmental aspects: single consonants

To refresh some important issues on segmental differences between French and Vietnamese which are important for this issue, we want to point out that Vietnamese coda inventory is very restricted, compared to the Vietnamese onset inventory, but also to the French coda inventory. Details about the Vietnamese and French consonant inventories are provided in chapter 2.2.1. Because the Vietnamese coda inventory is so restricted, we expect more repair in codas than in onsets. Our hypothesis for consonants is the following:

We expect French consonant which are illicit in Vietnamese to get repaired by deletion or by replacement of the respective segment by another segment. This segment shares as many as possible features with the French segment, but to be licit in Vietnamese.

In what follows, we present repair patterns for onset and coda consonants of French loans into Vietnamese. In total, we count 300 consonants in the French source lexemes of our corpus

which are illicit in Vietnamese. 3% of them are not repaired, 20% of them are deleted, and the remaining 77% are replaced. For coda consonants, we count 164 items with illicit segments. In four of them, there are not just one, but two illicit coda consonants, so that 168 coda repairs are expected. 60 of them are deleted, which make 36%. A comparison to onset consonants: we have only 126 source lexemes with onsets that are illicit in Vietnamese. In six of them, there are not just one, but two illicit consonants, so that we expect 132 repairs in total. In none of them, deletion applies. The 3% of no repair, namely six cases, occur for the onset consonant [p]. We start by presenting segmental aspects for onset consonants and continue with codas.

The following twelve French onset consonants [b, t, d, k; m, n, ɲ; f, v, s, z; w] have direct counterparts in the variety of Vietnamese we base our research on. In loans, the French consonants are mapped to these direct correspondents, which results in slight phonetic adjustments, such as the fact that the French plosives [b] and [d] are mapped onto the Vietnamese implosives [b̥] and [d̥]. Instead, if there is no directly corresponding segment to the French source segment in Vietnamese, stable replacement patterns can be observed for most of the data. As expected, this results in consonants with similar features to the French source which exist in Vietnamese. In table 7 we present onset consonant replacement patterns for which robustly only one and the same feature gets lost with one example for each pattern.

Table 7: categorical replacement of the French onset consonants [ʃ], [ʒ] and [g]

Pattern	Feature change	Detail	FR	VN	Glosse	Abs.No
[ʃ] → [s]	Place	Delinking [high]	<i>choc</i> [ʃɔk]	<i>sóc</i> [sɔk ^{D1}]	'choc'	20
[ʒ] → [z]	Place	Delinking [high]	<i>gène</i> [ʒɛn]	<i>gien</i> [zɛn ^{A1}]	'gene'	14
[g] → [ɣ]	Manner (Constriction)	[plosive] → [continuant]	<i>golf</i> [gɔlf]	<i>gôn</i> [ɣon ^{A1}]	'golf'	34

For [ʃ] and [ʒ], the postalveolar fricative is replaced by an alveolar fricative and the plosive [g] is not replaced as a plosive but as a fricative. Other features of these consonants are preserved.

After having explained patterns of invariable replacement and provided examples for each of the invariable patterns, we have three onset consonants left which exist in French but are illicit in Vietnamese. For these consonants [j], [ʁ] and [p], we attest variable results, but in this variability, stable patterns can still be discerned. For the consonant [p], our results go in line with previous studies (cf. Nguyễn 1997, Đoàn, Nguyễn & Phạm 2009, Kirby 2011). Either it is replaced by [b] (9 instances), see (4)a-b, or it is not repaired, as can be seen in (4)c-d. The number between the two options is balanced: for a total of 20 French source lexemes containing

the onset [p], we count nine loans where it is replaced by [b], nine loans where it is not repaired and two instances with variability.

(4) Variable replacement of the French onset consonant [p]

	French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a)	<i>pompe</i>	[pɔ̃p]	<i>bom</i>	[bɔ̃m ^{A1}]	‘pump’	[p] → [b]
b)	<i>poupée</i>	[pupe]	<i>búp bê</i>	[bup ^{D1} bɛ ^{A1}]	‘doll’	
c)	<i>pince</i>	[pɛ̃s]	<i>panh</i>	[pɛ̃ŋ ^{A1}]	‘tweezers’	[p] → [p]
d)	<i>patin</i>	[patɛ̃]	<i>patanh</i>	[pa ^{A1} tɛ̃ŋ ^{A1}]	‘skaters’	

Before the existence of French loans in Vietnamese, the unvoiced bilabial plosive was illicit in Vietnamese onsets and only appeared in codas. But since French and now English source lexemes with [p] as an onset have been borrowed into Vietnamese, this consonant can today be pronounced by some speakers of Vietnamese. Still, not all the loans with a [p] as the source onset segment keep this segment and instead it is replaced by the voiced plosive [b]. Additionally, many speakers of Vietnamese with no second language knowledge are not able to produce the sound [p] and always make use of the [b] instead for all the loans.

As to the dorsal fricative [ʁ], it is, at least in the variety of Vietnamese we are focussing on, in most cases repaired by the coronal fricative [z], as in (5)a-b, but also as [r] as can be seen in (5)c-d. In the examples we refer to the pronunciation of two speakers, using [z] for some words and [r] or [ɹ] for others. We have showed them a slide with pictures of the lexeme’s significants and they subsequently pronounced the lexemes. Both speakers have learned English as a second language, but no French.

(5) Variable replacement of the French onset consonant [ʁ]

	French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a)	<i>rail</i>	[ʁaj]	<i>raj</i>	[zǎj ^{A1}]	‘rail’	[ʁ] → [z]
b)	<i>relais</i>	[ʁ(ə)lɛ]	<i>rɔ̃ le</i>	[zɔ̃ ^{A1} lɛ ^{A1}]	‘relay’	
c)	<i>radio</i>	[ʁadjo]	<i>ra đì ô</i>	[ra ^{A1} dī ^{A1} o ^{A1}], [ɹa ^{A1} dī ^{A1} o ^{A1}]	‘radio’	[ʁ] → [r] or → [ɹ]
d)	<i>rideau</i>	[ʁido]	<i>ri đò</i>	[ri ^{A1} dɔ̃ ^{A1}]	‘curtain’	

Although both consonants [ʁ] and [z] are voiced fricatives, the feature change in place of articulation is quite substantial: from uvular to alveolar, and there is not a strong perceptual similarity between the two either. A possible explanation can be found if we look at southern varieties: here, as well as in some non-standard northern varieties, the phone [z] is used instead

of [r] for the same phoneme. If the respective borrowings took place in these regions, we could argue with perceptual similarity between [ʁ] and [r]. There is an ongoing discussion in the literature about rhotics and why between these sounds, perceptual similarity arises typologically quite often as has been shown in the thesis of Howson (2018). This result can be explained under a phonological perspective referring to Walsh-Dickey (1997) according to which they form a natural class, but it cannot be grounded acoustically and articulatorily (cf. Ladefoged and Maddieson 1996). Due to the still observable perceptual similarity, also speakers of Vietnamese may have repaired French [ʁ] by [r]. Subsequently, the [r] may have been replaced by its allophonic counterpart [z] in the variety we are focussing on. The simplest explanation would be that the respective lexemes are reading adaptations, or at least some of them: the grapheme <r>, which corresponds to [ʁ] in French, corresponds to [z] in our studied variety of Vietnamese and to [r] in many other varieties of Vietnamese. Still, we must notice that also some speakers of this northern standard variety use the consonant [r] when they are aware of the lexeme's loanword status. For instance, speakers of the variety we focus on would rather not pronounce the lexeme *ray* as [rǎj^{A1}] but as [zǎj^{A1}], because many of them do not know that it is a loan, but they would rather do so for ra đī ô [ra^{A1} đī^{A1} o^{A1}], as they are aware of the lexeme's loan status. Probably, it is easier for them to produce [r], a consonant which exists in other Vietnamese varieties, than a [ʁ], which they may have never heard. If they have knowledge of English, they sometimes even use the approximant [ɹ], because they are able to pronounce this English sound, but not the French [ʁ], and make any European loan sound more English-like, the only European language they can refer to. The issue of the onset consonant [ʁ] gives us a first impression of how complex borrowings are and how complex the language contact situations behind them, with not only core linguistic but also sociolinguistic and historical variables to play a potential role. In retrospect, we cannot determine influencing factors, and much must remain speculation.

Let us continue with the palatal glide [j], which as a single onset consonant can be replaced by [z] or [i]. For the replacement of [j] by [z], again, a socio-historical reason may have a role to play: southern Vietnamese may have been the contact variety for some loans (cf. Huynh 2008). While in the north, the glide [j] does not exist, it is a possible onset consonant in the south. As its allophonic counterpart in northern Vietnamese is [z], we can assume that the French consonant [j] made its way through its direct counterpart in Southern Vietnamese to the north, where it was replaced by [z] in two loans. Examples can be seen in (6)a-c. In the remaining two other loanwords in our corpus, the onset glide [j] is replaced by the vowel [i] as displayed in

(6)d. In the realization of this last loanword by speakers of Vietnamese, we cannot perceive a glottal onset in the second consonant. This topic will be discussed in chapter 7 on p. 282.

(6) Variable replacement of the French onset consonant [j]

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>yaourt</i>	[ja.uʁt]	<i>da ua</i>	[za ^{A1} ʔuə ^{A1}]	‘yogurt’	[j] → [z]
b) <i>billiard</i>	[bijak]	<i>bi-da</i>	[bi ^{A1} za ^{A1}]	‘billiard’	
c) <i>ammoniac</i>	[amɔ̃njak]	<i>a-mô-ni-ác</i>	[ʔa ^{A1} mo ^{A1} ni ^{A1} ʔak ^{D1}]	‘ammoniac’	[j] → [i]
d) <i>iode</i>	[jød]	<i>i-ót</i>	[ʔi ^{A1} ot ^{D1}]	‘iodine’	

As to the data presented so far concerning onset consonant replacement, we can summarize that for three of the French consonants which are illicit in Vietnamese, the repair is stable. For the three other consonants, it is variable. Generally, replacement patterns are systematic. Phonetic and phonological factors have a role to play, but also socio-historical variables cannot be excluded. Furthermore, orthography may have had an impact on borrowing patterns as some lexemes may be reading adaptations (cf. Vendelin & Peperkamp 2006). After having presented results for onset consonants, let us now continue with codas.

The Vietnamese coda consonant inventory is quite restricted, and only the following consonants are possible in Vietnamese coda position: the voiceless obstruents [p, t, k], the nasals [m, n, ŋ], the glides [j, w] and finally the double-articulated sounds [ŋ̄m, k̄p] which are in complementary distribution with [ŋ] and [k] after back rounded vowels (cf. Kirby, 2011). All other consonants, even those which exist in Vietnamese onset position, are illicit in Vietnamese. In French, there is no such difference between onset- and coda inventory and all onset consonants are also licit codas. The only difference between onset- and coda inventory of French is that [ŋ] exists only in codas and only in loans from English, in parallel to the sound [p] in Vietnamese, with the difference that it exists in native codas and in loan onsets. As a consequence of a restricted coda inventory in Vietnamese compared to a larger one in French, many French coda consonants are adapted according to Vietnamese phonology in loans. In total, we count 59 loans in which they are deleted, as presented with examples in (7).

(7) Deletion of coda consonants

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>gare</i>	[gaʁ]	<i>(nhà) ga</i>	[ʔa ^{A1}]	‘station’	[ʁ] → ∅
b) <i>brancard</i>	[bʁɑ̃kaʁ]	<i>băng ca</i>	[bǎŋ ^{A1} ka ^{A1}]	‘relay’	

ʒ → t (or k,j ¹³)	Manner, voicing & place	[Continuant] → [Plosive] Delinking [Voiced] Delinking [high]		<i>pho mát</i> [fo ^{A1} .mat ^{D1}]	'cheese'	1
			<i>fromage</i> [frɔmaʒ]	(or <i>phở mách</i> [fɔ ^{C2} mɛk ^{D1}], <i>phô mai</i> [fo ^{A1} maj ^{A1}])		1
						1
ʁ → k → ə	Manner, Voicing	[Continuant] → [Plosive] Delinking [Voiced]	<i>carton</i> [kaʁtɔ̃]	<i>các tong</i> [kak ^{D1} toŋm ^{A1}]	'card- board'	13
	Vowel replacement		<i>sulfure</i> [sylyfʁ]	<i>sun-fua</i> [sun ^{A1} fuə ^{A1}]	'sulphide ,	9
v → w	Manner	[Continuant] → [Approximant]	<i>chou rave</i> [ʃu ʁav]	<i>xu hào</i> [su ^{A1} haw ^{A2}]	'kohl- rabi'	2
ɲ → ŋ	Place	[Palatal] → [Velar]	<i>bagne</i> [baɲ]	<i>banh</i> [bɛŋ ^{A1}]	'penal colony'	1

If we compare replacement patterns for onsets with codas, we can see that the position of the consonant within a syllable seems to matter: the same French segment in onset and coda position results in different replacement patterns. This can be illustrated with the example of the French fricative [ʁ], which is replaced by [z] in Vietnamese onset position, but by [k] or the vowel [ə] in coda position, just as the native German vocalization pattern, where the [ʁ] at the end of a syllable is likewise (and systematically) replaced by a vowel, i.e. in *Bier* [bi:ɐ] 'beer', which per chance sounds very similar to the Vietnamese loan *bia* [βiə] from French *bière* [bjɛʁ]. The fact that adaptation patterns can differ between onset and codas has been attested also for other language's loan phonologies, for instance for English loans into Thai (Kenstowicz & Suchato 2006), with the example that English [v] is adapted as [w] in the onset and as [p] in the coda. Another example can be given for loans of three different European languages into Mandarin Chinese (Miao, 2005), where the sound [r] is replaced by [l] in the onset but as the rhotic vowel [ə] in the coda.

To summarize results for coda consonants, most patterns in our study are categorical with only a few exceptions. The highest and a robust variability can be observed for the consonant [ʁ]: both the replacement pattern itself is variable between [ə] or [k] and the pattern between replacement and deletion. The uvular fricative [ʁ] is for 13 items replaced the consonant [k] and by the vowel [ə] for nine items as can be seen in table 8. While the emergence of the

¹³ In total, there are only five source lexemes with this coda consonant in our corpus. Deletion applies to four of the corresponding loans. What is shown in this table, are three of four different variants of the Vietnamese loan from French *fromage*. No other data with replacement patterns for this coda is available. In the fourth variant *phô ma* [fɔ ma] corresponding to the French source lexeme *fromage*, the coda is deleted.

consonantal replacement is observed in syllables which are not lexeme-final, vowel replacement takes place in lexeme-final syllables. Deletion also only arises lexeme final. Interestingly, with 44 items (example cf. table 8), deletion is the most frequent repair pattern for this consonant, although it is generally an infrequent strategy. The adaptation of this uvular French consonant [ʁ] in coda position has been studied by Vương (1992) and Kang et al. (2016). The latter claim that the neutralization of the French phonemes /ʁ/ and /k/ in coda position takes place since Vietnamese phonological restrictions intervene, but that the contrast between both phonemes is “systematically retained in the quality and length difference in the preceding vowel” (Kang et al. 2016, p. 11). This way, according to their study, the French coda phoneme /k/ is directly mapped onto Vietnamese [k], and the phoneme /ʁ/ is mapped to the sequence of [ək], so that the phonemic distinction is preserved. Still, the pattern they have described occurs in their examples in cluster sequences but not in single segments and allows for alternative interpretations. In the examples we just displayed, only half of their statement is correct: the phonemic contrast is retained in the vowel quality of an additional vowel, but the sound [k] does not surface. Therefore, we interpret the pattern as can be observed for *sulfure* in table 8 as an instance of vowel replacement and would also go for the same interpretation in cluster patterns. Still, we also find two instances where the pattern Kang et al. (2016) described surfaces in our data. These are given below in (8).

(8) Vowel replacement of the consonant [ʁ]

	French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a)	<i>tournevis</i>	[tuʁnəvis]	<i>tuốc nơ vít</i>	[tuək ^{D1} nɤ ^{A1} vit ^{D1}]	'carbon paper'	[ʁ] → [ək]
b)	<i>tournant</i>	[tuʁnɑ̃]	<i>tuốc-năng</i>	[tuək ^{D1} nãŋ ^{A1}]	'sulphide'	

As our data provides just two emergences of this pattern already described in Kang et al (2016), and the emergence of either [ə] or [k] occurs for in total 18 items more frequent than their combination [ək], Kang et al. (2016)’s interpretation cannot be applied to most of the data, and it is wrong that the pattern arises systematically. When considering the whole picture, the integration of coda consonants appears to be based on a complex interaction of constraints. But the loan data is overall quite small, compared to the experimental data we will analyse later. Therefore, the study of single consonants in loanwords has not been analysed in a very detailed fashion according to frequency values: if for some consonants, there are only a few items, this is a first indicator for certain patterns but not a very reliable one. And this is one of the reasons

why we would like to investigate the patterns explored here later experimentally in a different setting. But first, we want to continue with examining loanwords and look at consonant clusters.

4.3.2. Consonant clusters

Syllable-internal consonant clusters are the first syllabic aspect in loanword adaptation we will consider. By syllabic we mean that this aspect has to do with the unit of a syllable, as segments (here: consonants) are organized into certain structures (here: clusters) within the unit of a syllable. To refresh some important issues on syllabic differences between French and Vietnamese which are important for the issue of consonant clusters, we have to keep in mind that French is a language in which consonant clusters are possible in the syllable onset and coda (Klausenburger 1970; Tranel 1987). Although not only clusters of two consonants are possible in French, we focus in our study only on clusters with two consonants as French lexemes with more complex clusters do not exist in our data. To the contrary, in Vietnamese, only the cluster C+[w] is possible and only in onset position. No other cluster is licit according to the Vietnamese syllable structure. The onset is obligatory in Vietnamese. A parallel in both languages is that both obey the principle of sonority hierarchy, but only French is subject to the principle of onset maximization (Vennemann, 1988), not Vietnamese (cf. Nguyễn, 1997). Let us briefly present our hypothesis for the adaptation of consonant clusters:

We expect French consonant clusters to be adapted to Vietnamese licit syllable structures. This means that all clusters which are not composed by a consonant and the glide [w] must be repaired. We expect either epenthesis, i.e., the insertion of a vowel between the two cluster consonants, or the deletion of one cluster segment.

The results confirm our general hypothesis. From a total amount of 89 consonant clusters in French lexemes where the syllable with the cluster is not truncated, the cluster is preserved in the written form only in seven cases, which makes up only 8%. Examples are given in (9).

(9) Source lexemes with a cluster which is preserved in the written loan form

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>clorure</i>	[klɔʁyʁ]	<i>clorua</i>	[klɔ ^{A1} zuə ^{A1}] [kɣ ^{A1/A2} lɔ ^{A1} zuə ^{A1}]	‘chloride’	[kl] → [kl] [kl] → [kɣ ^{A1/A2} l]
b) <i>flan</i>	[bʁɑ̃kaʁ]	<i>flan</i>	[flan ^{A1}] [fɣ ^{A1/A2} lan ^{A1}]	‘flan’	[fl] → [fl] [fl] → [fɣ ^{A1/A2} l]
		<i>lăng</i>	[lǎŋ ^{A1}]		[fl] → [l]

Still, speakers without foreign or second language knowledge rather tend to not pronounce the cluster, and therefore even for these seven cases, cluster repair is chosen variably depending on the speaker. Therefore, we use the IPA transcription with two possibilities for each written loan: the preservation of the cluster and the insertion of an epenthetic vowel, to which either tone A1 or A2 could be variably assigned. In example (9)b, there is even a written variant, where the first cluster consonant is deleted. All other clusters in the source lexeme data do not surface even in the written loan and are repaired. In this chapter, we categorize the cluster repair strategies and look at the details to find result patterns for several French consonant clusters. Differently to our presentation of the results for segments, there is more data available. Therefore, we present a small quantitative analysis, which, due to the still restricted number, must be taken with caution.

French consonant clusters are adapted to Vietnamese with the help of the expected repair strategies epenthesis: $CCV(C) \rightarrow CV.CV(C)$, occurring only in onsets, and deletion: $CCV(C) \rightarrow CV(C)$ in onsets or $CVCC \rightarrow CVC$ in codas. In table 9, we display frequencies for the loanword data. An example for deletion is *pho mát* [fɔ^{A1} mat^{D1}] ‘cheese’ from French *fromage* [fʁɔmaʒ], to which the second onset cluster consonant [ʁ] is subject. An example for epenthesis is *bờ lu* [bɔ^{A2} lu^{A1}] ‘blouse’ from French *blouse* [bluz], where the vowel [ɔ] is inserted between the consonants [bl] of the onset cluster.

Table 9: consonant clusters an overview of frequencies for the repair strategies deletion and epenthesis with the dependent variable of cluster position in the adaptation of French clusters into Vietnamese loans

Number	Percent	Deletion		Epenthesis		Total
Onset clusters		34	69%	15	31%	49
Coda clusters		33	100%	0	0%	33
Total		67	82%	15	18%	82

As shown in table 9, deletion is generally more frequent than epenthesis (cf. also Nguyễn and Dutta 2017). In our data, overall, deletion makes up 82% relative to epenthesis with only 18%. Epenthesis is never attested in codas and makes up 31% of cluster repair strategies in onsets. There are some instances where we find a consonant cluster in the French source lexeme and we do not find it in the loan, but where none of the two mentioned strategies epenthesis and deletion are attested. We will come back to this issue when we deal with aspects of syllabification in 4.3.2. on p. 91, the next syllabic aspect we will concentrate on. At this point, we continue with a detailed look at deletion and epenthesis.

Deletion

The possibilities of deletion patterns are that either the first or the second consonant deletes. In our data, it is mostly the second cluster consonant which is deleted instead of the first, both in onsets and codas, as can be seen in contingency table 10. An example for the deletion of the second consonant is the previously mentioned loanword *pho mát* [fɔ^{A1} mat^{D1}] ‘cheese’ from French *fromage* [fʁɔmaʒ], and an example for the deletion of the first consonant is *lay-on* [lǎj^{A1} ʔɯn^{A1}] ‘gladiolous’ from French *glaiëul* [glajœl].

Table 10: consonant clusters: deletion of the first vs. the second consonant

Number	Percent	Deletion C1		Deletion C2		Total
Onset clusters		11	32%	23	68%	34
Coda clusters		4	12%	28	88%	32
Total		15	23%	51	77%	66

Still, we can observe different patterns for onsets and for codas: the tendency that it is rather the second consonant which gets deleted is at 68% for onset and even stronger for codas with 88%. So far, we have tested the independent variable position with the values onset and coda. But another independent variable could also be tested, which is licitness. The values for this variable are that a consonant is licit vs. illicit in Vietnamese. This way, the deletion of the consonant [ʁ] in *fromage* and of [g] in *glaiëul* could be explained by that fact that both consonants are not part of the Vietnamese inventory. It could be the case that illicit consonants are rather deleted than licit ones, and it could be that this variable is even a factor of greater influence than position. But, if we look at more data, this does not seem to be the case. Rather, illicit consonants in Vietnamese are replaced by licit ones according to the patterns we have observed also for single consonants, instead of being deleted. Therefore, an illicit consonant in the first position of a cluster rather gets replaced than deleted, while a consonant in the second position rather gets deleted, no matter if licit or illicit in Vietnamese in this position.

Let us still consider the features of cluster consonants, but not asking if consonants are licit or not but looking at the independent variable of specific consonant cluster material. For onset clusters, it makes sense to define the values of this variable as two groups: sequences of C+[ʁ] (20 loanwords) and C+[l] (6 loanwords), as can be seen in (10) and (11). These are the groups in this data for onset cluster material for which we can discern categorical stable patterns. Data with other onset clusters exist as well, but not enough to discern patterns.

(10) Examples for deletion patterns of C2 in onset clusters: material C+[ɣ]

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>brancard</i>	[bʁɑ̃kɑʁ]	<i>bǎng ca</i>	[bǎŋ ^{A1} ka ^{A1}]	‘stretcher’	Deletion C2
<i>cravatte</i>	[kʁavat]	<i>cà vạt</i>	[ka ^{A2} vat ^{D2}]	‘tie’	
<i>fromage</i>	[fʁɔmaʒ]	<i>pho mát</i>	[fɔ ^{A1} mat ^{D1}]	‘cheese’	

(11) Examples for deletion patterns of C1 in onset clusters: material C+[l]

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>complet</i>	[kɔ̃plɛ]	<i>com lê</i>	[kɔm ^{A1} le ^{A1}]	‘suit’	Deletion C1
<i>glaiëul</i>	[glajœl]	<i>lay-on</i>	[lǎj ^{A1} ʔɤn ^{A1}]	‘gladiolus’	
<i>chou-fleur</i>	[ʃufloʁ]	<i>su lơ</i>	[su ^{A1} lɤ ^{A1}]	‘cauliflower’	

We had stated before that in clusters it is the second rather than the first consonant of a cluster which gets deleted. This is the case for the clusters in which [ɣ] is the second consonant, as shown in (10), but not for the clusters in which [l] is the second consonant as in (11). These findings go in line with Vuong (1992).

Let us move on to coda clusters. Just as for onset clusters but even to a higher degree it is likely that the second consonant is deleted, and the first, if illicit, is replaced by a licit one. In table 11, we give a list with the attested patterns, the absolute numbers, and in total four exceptions from the usual pattern. After showing this list, we give examples for the two attested groups: in (12), we show examples for deletion patterns in which the second consonant is deleted and the first is not repaired, as it is licit in Vietnamese coda position. In (13), the second consonant is deleted as well, and the first one is replaced by a licit one. And finally, in (14), we display all the exceptions which are already listed in the rightmost column in table 11, for which it is not the second, but the first consonant which gets deleted.

Table 11: consonant clusters: replacement patterns for the first consonant when the second is deleted

Pattern	Details 1 st Consonant	Absolute number lexemes	Exceptions
[k]+C → [k] or [kʰ]	No repair (preserved)	2	-
[ɣ]+C → [k]	Replacement	14	2 (see 14 a,c)
[l]+C → [n]		6	1 (see 14 b)
[s]+C → [t]		6	-

(12) Deletion in coda clusters: first consonant preserved, second deleted

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>contact</i>	[kɔ̃takt]	<i>công-tắc</i>	[koŋm ^{A1} tak ^{5 D1}]	'switch'	kt → k
<i>inox</i>	[inɔks]	<i>i-nốc</i>	[ʔi ^{A1} noŋp ^{D1}]	'stainless steel'	ks → k

For the lexemes in (12), the first consonant [k] is not repaired and survives, while the second is deleted. The first consonant is not repaired, because it is licit in Vietnamese codas. Until now, we have considered the two lexemes for which the first consonant of a cluster is licit and therefore not repaired, but with 14 occurrences, the number is higher for lexemes in which the first consonant is illicit in Vietnamese and gets repaired, while the second consonant is still deleted. Examples are shown in (13).

(13) Deletion in coda clusters: first consonant replaced, second deleted

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>harpe</i>	[aʁp]	<i>hạc</i>	[hak ^{D2}]	'harp'	ʁp → k
b) <i>citerne</i>	[sitɛʁn]	<i>xitéc</i>	[si ^{A1} tɛk ^{D1}]	'tank'	ʁn → k
c) <i>yaourt</i>	[jauʁt]	<i>da ua</i>	[za ^{A1} ʔuə ^{A1}]	'jogurt'	ʁt → ə
d) <i>talc</i>	[talk]	<i>tan</i>	[tan ^{A1}]	'talc'	lk → n

In all the above shown cases, the first consonant is replaced. No matter which consonant is the second and even though it is a licit Vietnamese single coda in all these examples, it is always deleted. In (13)a-c, we display examples for the replacement of the first consonant [ʁ]. In (13)c the consonant [ʁ] is replaced by a vowel, possibly due to phonetic misperception. The variable pattern for the replacement of the single coda consonant [ʁ] as [k] or [ə] can also be observed herein. In the last example, the same pattern can be observed but for a different first consonant. [l] is replaced as [n], which is the common pattern for single consonants as well, and [k] is deleted, although it would be a licit Vietnamese coda.

At this point, we turn to the three exceptional cases for coda consonants in which it is not the second but the first consonant of a cluster which gets deleted. Two of these exceptions are found for [ʁ]+C-clusters and one for [l]+C-clusters.

(14) Exceptions for coda cluster deletion: first consonant gets deleted

	French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a)	<i>forme</i>	[fɔʁm]	<i>phom</i>	[fɔm ^{A1}]	'form'	ʁm → m
b)	<i>film</i>	[film]	<i>phim</i>	[fim ^{A1}]	'film'	lm → m
c)	<i>moutarde</i>	[mutaʁd]	<i>mù tạt</i>	[mu ^{A2} tat ^{D2}]	'mustard'	ʁd → t

For the [ʁ]+C-clusters, the borrowing does not result in the single consonant [k] or [ə] and for the [l]+C-cluster in the nasal consonant [n]. This would be the usual replacement pattern for single [ʁ] and [l] and expected herein for clusters as well. In the examples (14)a-b, the pattern is [ʁ/l+m] → [m]. The first consonant is deleted and the second one not repaired. As to the last exception (14)c, it is an irregular variant to the regular adaptation of French *moutarde* as *mù tạt* [mu^{A2} tak^{D2}]. In sketch engine, we find 41 entries for the regular form, but no entry for the irregular variant. Having analysed in detail deletion patterns of onset and coda clusters in our loanword data, we summarize the results in table 12.

Table 12: consonant clusters: deletion patterns, material and position within a cluster and a syllable

Material adaptation pattern	Position within a cluster		Position within a syllable
	1 st consonant	2 nd consonant	
C+[ʁ] → [C]	No repair	Deletion	Onset
C+[l] → [l]	Deletion	No repair	
[l]+C → [n]	Replacement	Deletion	Coda
[s]+C → [t]	Replacement	Deletion	
[k]+C → [k]/[k̠]	No repair	Deletion	
[m]+C → [m]	No repair	Deletion	
[ʁ]+C → [k]	Replacement	Deletion	
[ʁ]+C → V	Replacement (vowel)	Deletion	
[ʁ,l]+[m] → [m]	Deletion	No repair	

After our analysis of cluster deletion, it seems possible to assume that the position of a cluster within a syllable may have a role to play. Only for clusters in which the second consonant is the lateral [l] in onsets and the nasal [m] in codas, they do not get deleted but instead the first cluster consonant, which may have to do with saliency of the lateral and the nasal. We must keep in mind for these generalizations that the total number of occurrences in our corpus is quite limited, which is why especially the last assumption remains speculative. In the experimental data, although in a very different setting than this borrowing setting, we have more data to our disposition and can check if patterns are similar. We will have a higher number of

total occurrences for each pattern and therefore more reliable results. So far, we have seen that patterns are complex, sometimes variable, and quite systematic. We continue with the second repair strategy of consonant clusters, which is epenthesis.

Epenthesis

Epenthesis is not as frequent as deletion and only occurs in onsets for this loan data. However, with this data of only 15 cases of epenthesis in total, it is not possible to systematically explain when in onsets epenthesis occurs and when the repair is deletion. For a few French source lexemes, there are even two variants in one of which epenthesis is the chosen repair strategy and in the other deletion. They are shown in (15).

(15) Consonant clusters in the French source lexeme and two loan variants: epenthesis and deletion as two possibilities to adapt the same lexeme into Vietnamese

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>crêpe</i>	[kʁɛp]	<i>kép</i>	[kep ^{D1}]	‘crêpe’	Deletion
		<i>cà rép</i>	[ka ^{A2} rep ^{D1}]		Epenthesis
b) <i>crème</i>	[kʁɛm]	<i>kem</i>	[kɛm ^{A1}]	‘(ice-) cream’	Deletion
		<i>cà rem</i>	[ka ^{A2} rem ^{A1}]		Epenthesis
c) <i>gramme</i>	[gʁam]	<i>gam</i>	[ɣam ^{A1}]	‘gramme’	Deletion
		<i>gà ram</i>	[ɣa ^{A2} ram ^{A1}]		Epenthesis
d) <i>slip</i>	[slip]	<i>sip, xip</i>	[sip ^{D2}]	‘slip’	Deletion
		<i>xi líp, xì líp</i>	[si ^{A1} lip ^{D1}], [si ^{A2} lip ^{D1}]		Epenthesis

From our loan data, we cannot derive any systemic pattern for when deletion applies and when epenthesis, especially as the total amount of epenthetic cases is very low. The emergence of source lexemes with different variants indicates that consonants which are deleted in the above-mentioned deletion examples could still be perceptible by some speakers of Vietnamese; otherwise, they would not be preserved by epenthesis in their epenthetic variants. This discussion will be deepened in chapter 7.3.2. on p. 263. For now, we want to give some more examples for loans with the insertion of epenthetic vowels to adapt onset clusters. In (16), there is no variant with deletion as an alternative repair strategy.

(16) Epenthesis as the only repair strategy of French onset clusters into Vietnamese in loans

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>blouse</i>	[bluz]	<i>bờ lu</i>	[ɓʁ^{A2} lu^{A1}]	‘blouse’	bl → ɓʁ.l
b) <i>clef</i>	[kle]	<i>cờ lê</i>	[kʁ^{A2} le^{A1}]	‘spanner’	kl → kʁ.l
c) <i>scandal</i>	[skãdal]	<i>xì cãng đản</i>	[si^{A2} kãŋ^{A1} đản^{A1}]	‘scandal’	sk → si.k

In our corpus, three epenthetic vowels are attested, namely [a], [i] and [ɤ]. The vowel [ɤ] has the highest frequency. The explanations we provide in what follows make sense according to universal tendencies and matches well the data. Given the overall very small amount of data for epenthetic vowels (10x [ɤ], 3x [a] and 2x[i]), we still cannot provide sufficient evidence at this point and explanations remain speculative. Generally, three different processes and their complex interaction may have an influence on the vowel quality of epenthetic vowels in loanword adaptation: "vowel harmony, local assimilation to the preceding consonant and default insertion" (Uffmann, 2006. p. 1079). Furthermore, the tendencies are similar in the languages tested by Uffmann and may be universally valid. In our data, the epenthetic vowel [ɤ] occurs most frequently as can be seen in (17).

(17) Vowel [ɤ] as the highest frequent epenthetic vowel attested in our loan corpus

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>blouse</i>	[bluz]	<i>bờ lu</i>	[ɓʁ^{A2} lu^{A1}]	‘blouse’	bl → ɓʁ.l
<i>clef</i>	[kle]	<i>cờ lê</i>	[kʁ^{A2} le^{A1}]	‘spanner’	kl → kʁ.l

It is possible that the assignment of certain vowels may have to do with vowel harmony, although there is no such phonological process attested in Vietnamese. Vowel harmony can still be seen as a universal tendency which emerges in such a language contact situation: the vowel [ɤ] is always inserted when the nucleus of the following syllable contains a front or back closed vowel such as [e], [o], or [u]. If a front open vowel such as [a] and [ɛ] follows in the preceding syllable nucleus, [ɤ] is still inserted with the highest frequency, but also the epenthetic vowel [a] emerges, as can be seen in (18).

(18) Vowel [a] as an epenthetic vowel when the preceding syllable nucleus is [a] or [ɛ]

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>gramme</i>	[ɡ ʁam]	<i>gà ram</i>	[ɣa ^{A2} ram ^{A1}]	‘gramme’	ɡʁ → ɣa.r
<i>crème</i>	[kʁ ɛm]	<i>cà rem</i>	[ka ^{A2} rem ^{A1}]	‘(ice-) cream’	kʁ → ka.r

The insertion of [i] could be due to consonantal assimilation, i.e., the coronal consonant [s] preceding the epenthetic vowel may have an influence on the epenthetic vowel quality, see (19).

(19) Vowel [i] as epenthetic vowel when preceded by the consonant [s]

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
<i>slip</i> ¹⁴	[s lip]	<i>xì líp</i>	[si ^{A2} lip ^{D1}]	‘slip’	sl → si.l
<i>scandal</i>	[sk ãdal]	<i>xì cãng đân</i>	[si ^{A2} kãŋ ^{A1} đân ^{A1}]	‘scandal’	sk → si.k

With our observations about epenthetic vowel quality and the other so far discussed consonant cluster repair strategies, it is becoming increasingly clear that looking at our loanword dataset helps us to gain interesting insights into prosodic language contact situations, but it is becoming equally clear that it would be helpful to work experimentally with a larger dataset to learn more about repairs of segmental and syllabic structures in prosodic language contact situations on the French-Vietnamese language pair. Let us now stay for a moment with the loan data and conclude the topic of cluster adaptation under a typological perspective on the repair of consonant clusters. Finally, we provide an outlook on other potential cluster repair strategies than epenthesis and deletion. These will be looked at in detail under the aspect syllabification.

In a cross-linguistic perspective, consonant cluster adaptations of French loans into Vietnamese seem to be unusual under certain aspects. First, according to the results in Paradis & Lacharité (1997), it seems that epenthesis appears more frequently than deletion in the data, to the contrary to what has been found herein for Vietnamese. Additionally, the accumulation of results by different scholars shows that deletion is rather infrequent in word-initial position (cf. Kang, 2011 for an overview). In Vietnamese, the deletion of the first consonant in a lexeme is possible. The deletion of the second consonant of a word-initial cluster in a lexeme is more frequent, and the same accounts for syllables in other positions within a lexeme.

¹⁴ The origin of this loan is English, but it has been adapted from English to French and via French to Vietnamese, cf. Hùynh 2010

In most studied languages, among them Sesotho (Rose and Demuth 2006), Shona (Uffmann 2006) and Akan (Adomako 2008), there is no other strategy than epenthesis available in word-initial position. For Vietnamese, we have examined that stable differences cannot be observed between word-initial or word-final position but rather for syllable-initial (onset) vs. syllable-final position (coda). For Vietnamese, in onset position (no matter in which position of a word) deletion is the preferred strategy. And by definition, onsets can never be word final. But the domain of a word does not seem important for this aspect of adaptation patterns in loans into Vietnamese, the domain rather seems the syllable. Let us continue with segmental material, which in many languages seems to be influential in the choice between the two repair strategies of clusters, among them Hawaiian (Adler 2006), where deletion instead of epenthesis applies more frequently to non-native than to native sounds, Thai, and several other languages described in Fleischhacker (2005). The just mentioned author describes two patterns and distinguishes between the cluster categories obstruent+sonorant vs. sibilant+stop. The first pattern is that obstruent+sonorant clusters are deleted and sibilant stop clusters resolved by epenthesis; and the second pattern is that epenthesis occurs in both, but the vowel is inserted between the obstruent+sonorant whereas it is put before sibilant+stop. For French loans into Vietnamese, first the epenthetic vowel is always inserted between the two cluster consonants and never before. Second, we cannot observe any pattern for deletion vs. epenthesis. Still, the lack of a systematic pattern could also be due to the restricted number of epenthetic items.

A parallel can be found for Vietnamese and Thai (Kenstowicz & Suchato, 2006 : 932), languages which do not belong to the same family but which are close to each other geographically: in both languages, epenthesis is not attested in word-final position. For Vietnamese, it is also not attested in any other syllable coda within a lexeme. Another parallel between Thai and Vietnamese can be found when examining the patterns of deletion, namely, which consonant of a cluster gets deleted. While in Vietnamese, it is a tendency that deletion applies to the second consonant of a cluster, this tendency becomes categorical for Thai (Kenstowicz & Suchato, 2006). In this aspect, the two languages behave differently to other attested recipient languages in loanword adaptation. As has been pointed out in Shinohara (2006), in languages such as Cantonese, Marshallese, Yoruba and Fijian, it rather seems to be the segmental material which determines which of the two cluster consonants is deleted. This is possible to assume only for a very restricted number in our dataset.

Until now, we have treated the usual strategies of cluster repair, which are also attested in the literature by other scholars. But we have found some other instances where the French source

lexeme contains a cluster and the loan does not, but neither deletion nor epenthesis is applied. Just as epenthesis, these share an overlap with syllabification processes, which is why we treat them now at the transition part to syllabification.

There is one pattern, namely the cluster of a consonant + the glide [j] in onset position in the French source. The total amount of source lexeme containing this structure is 19. For nearly all these lexemes, the glide is mapped onto the most similar vowel, which is [i]: the segment is syllabified as a syllable nucleus of an additional syllable instead of a syllable margin. Examples are provided in (20)a-b. In only one case the [j] is replaced by the vowel [u], cf. (20)c.

(20) Vowel replacement in C+[j] sequences

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>radio</i>	[ʁa.dʒo]	<i>ra ði ô</i>	[ra ^{A1} ði ^{A1} o ^{A1}]	‘radio’	dʒo → di.o
b) <i>piano</i>	[pjano]	<i>piano</i>	[pi ^{A1} a ^{A1} no ^{A1}]	‘piano’	pja → pi.a
c) <i>légion</i>	[leʒjɔ̃]	<i>lê đuong</i>	[le ^{A1} zuəŋ ^{A1}]	‘French foreign legion’	ʒjɔ̃ → duəŋ

In (20)a-b, we can observe syllable augmentation: there is one more syllable in the loan than in the source lexeme. To the contrary, in (20)c, no syllable augmentation takes place, as [u] can form a diphthong together with the following vowel [ə] in Vietnamese. But it could also be a topic of discussion if there is syllable augmentation in the other cases: the fact that speakers of Vietnamese do rather not seem to put a glottal stop between [i] and [o] in *ra ði ô* and between [i] and [a] in *piano* is a hint that we could interpret the combination of both vowels as syllable-internal diphthongs just as is it the case for *lê đuong*. For instance, we could transcribe the loan *piano* alternatively this way: [piə^{A1} no^{A1}], as the diphthong [iə] is licit in Vietnamese.

Another phenomenon could seem, at first glance, like another cluster repair strategy. We exemplify it shortly with the French lexeme *chou-fleur* [ʃu.floʁ], which is adapted into Vietnamese as *súp-lơ* [sup^{D1} lɤ^{A1}] as a variant of the previously mentioned *su-lơ* [su^{A1} lɤ^{A1}]. A syllable-internal cluster is divided into a single coda consonant, which is added to the preceding syllable and a single onset consonant which remains in the following syllable. Although this syllable boundary shift could be analysed as a cluster repair strategy which has never been discussed the previous literature, it is also possible to assume another process to drive this resulting syllable boundary shift than consonant cluster repair. It makes sense to treat this pattern together with other instances of syllabification for which cluster repair can be totally

excluded. Therefore, we want to conclude definitively our study of consonant cluster repair of French loans into Vietnamese and dedicate us in the following to syllabification, deepening among others the just exemplified process.

4.3.3. Special syllabification patterns

Before we start presenting syllabification processes, we recapitulate the most important aspects of French and Vietnamese syllables and their differences which are important for this issue. While in French, there is no underlying distinction between long and short vowels in French, two long vowels /a ʁ/ have a short counterpart in Vietnamese. For other Vietnamese vowels, length difference is not phonemic, but long and short allophones are in complementary distribution depending on surrounding material. Short vowels only occur when followed by a consonant, but long vowels can occur in open and closed syllables. In Vietnamese, each syllable fulfils a dimoraic minimum (cf. Brunelle 2017, among others), whereas there is no such minimum in French. According to corpus studies on syllable structure, the majority of Vietnamese syllables are closed (cf. Thị Thúy Hiền Trần, 2011, Nguyễn, 1997), while the majority of French syllables are open (cf. Vallée et al. 2001, Rousset 2004). Vietnamese, unlike French, is not subject to the principle of onset maximization (Vennemann, 1988). Gemination is a very marginal phenomenon in French (cf. Delattre, 1971; Tranel, 1987). For Vietnamese, gemination has not been described in previous literature, but for some words or word groups, there is an underlying difference between one vs. two consonants, for instance *cá con* [ka.køn] ‘little fish’ vs. *các con* [ka.k.køn] ‘each fish’. This does not stand in contrast to French, where phonetic differences can also surface between *il a dit* [i.la.di] ‘he said’ vs. *il l’a dit* [il.la.di] ‘he said it’¹⁵. When we discuss syllabification, we leave out the transcriptions of Vietnamese tone to be able to concentrate better on segments at syllable boundaries.

Our main hypothesis for syllabification is that due to the substantial differences between Vietnamese and French syllable structure, there must be some differences between the syllabification of the French source lexeme and the Vietnamese loan. We avoid the term resyllabification as it has to be discussed if it makes sense to talk about resyllabification in this context, even if syllables or segments are added or other processes happen which results in a shift of syllable boundaries. This discussion will take place in chapter 7.

¹⁵ According to Delattre 1971, this phenomenon is classified among the term gemination, even though it goes beyond lexeme boundaries. According to this view, one could argue that gemination also exists in Vietnamese. Also, lexical minimal pairs can be found word-internally for composita, as shown on p. 39.

In total, in our data, we count 93 instances of these specific syllabification processes, where the syllable structure differs between the source lexeme and the loan. An example is Vietnamese *lắc-lê* [lǎk.le] ‘spanner’ vs. its French source *la clé* [la.kle] ‘the key’, where we can observe a difference in the position of the syllable boundary: in Vietnamese, it is between [k] and [l], while in French, its position is before [kl].

The two types of potential syllable augmentations in our data have already been discussed for the issue of consonant clusters: epenthesis and the adaptation of [j] as a syllabic [i]. Epenthesis is a repair strategy for the integration of consonant clusters in many languages in which loans have been studied (cf. Shinohara, 2006, Rose & Demuth, 2006, Kim & Kochetov, 2011 among others). When an epenthetic vowel is inserted between two cluster consonants, syllable augmentation is rather a consequence than the driving process. For these items, constraints that require all segments to be maintained seem to be more important than those which do not require segmental material to be added. Since the motivation of epenthesis is clear, namely repairing consonant clusters, and also well-know in previous literature, it is not discussed further here. Also the adaptation of [j] has already been dealt with before on p. 71 (single onsets) and 85 (onset clusters). Instead, we focus in the following on the remaining syllabification processes, which we can classify into six categories. They are listed with examples in (21), which give us a first overview impression. We will start with the pattern categories wich appear low-frequently in our corpus and continue with higher-frequent categories.

(21) Overview of six pattern categories for syllabification: processes at syllable boundaries when the first syllable is open in the French source and is closed in the loan in Vietnamese

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>camion</i>	[ka.mjɔ̃]	<i>cam-nhông</i>	[kam.joŋm̃]	‘lorry’	.mj → m.j̃
b) <i>glaiëul</i>	[glɑ.jœl]	<i>lay-on</i>	[lǎj.ʔɤn]	‘glaiolous’	.j → j.ʔ
c) <i>accu</i>	[a.ky]	<i>ắc quy</i>	[ǎk.kwi]	‘battery’	.k → k.k
d) <i>saucisse</i>	[so.sis]	<i>xúc xích</i>	[suk̃.sik]	‘sausage’	.s → k.s
e) <i>la clé</i>	[la.kle]	<i>lắc-lê</i>	[lǎk.le]	‘spanner’	.kl → k.l
f) <i>litre</i>	[li.tʁ(ə)]	<i>lít</i>	[lit]	‘liter’	.tʁ → t

At the end of the preceding section 4.2.2., we have presented clusters with the consonant [j] as the second consonant (see p.85). In (21)a, there is a cluster of [mj] in the French base, but the pattern in the loan is different from the examples presented on p. 85, as the glide [j] is not mapped to the vowel [i] but replaced by the nasal consonant [j̃]. Additionally, the first consonant of the cluster [m] is syllabified as the coda of the preceding syllable. In (21)b, we

also deal with the glide [j] as a French onset, but not in a cluster context. In the loan, it is syllabified as the coda of the preceding syllable, and the resulting empty onset of the second syllable is filled by the glottal stop [ʔ]. In the examples (21)c-d we deal again with consonant clusters. But the pattern is similar to the example before: the first segment of the second syllable in the French source lexeme gets syllabified as the coda of the first syllable. In (21)d, the rest of the material of the second syllable gets additionally truncated. Finally, in (21)e-f, there is again a single onset in the second syllable of the French source lexeme, but it gets geminated in (21)e and one of the two consonants is syllabified as the coda of the preceding syllable. In (21)f, the pattern is very similar, just that not all features of the doubled consonant can survive in coda position due to the Vietnamese restriction of coda consonants, therefore features get lost but the consonant slot is still doubled and syllabified in the same way as in 21e.

This was a short overview of very complex patterns which are quite different, but which share some properties: all the just described syllabification processes occur at the boundary between two syllables. In the French source, the first of these two syllables is open, and the process results in a closed first syllable in the corresponding Vietnamese form. If there is a consonant cluster in the second syllable, it is split by a syllable boundary in the loan (21)a,c,d. If there is no cluster in the second syllable, the consonant is geminated (21)e or, at least, the consonant slot is doubled (21)b, f. To allow readers a deeper understanding of each of the just presented patterns, we present the six pattern categories in more detail in what follows.

Let us start with the first pattern, exemplified in (22)a. We have learned before that the [j] is mapped to [i] sometimes in single onset position, mostly when it is the second consonant of a cluster, and this also holds for two of four clusters in which a nasal consonant [m] or [n] is the first cluster consonant, as can be seen in (22)a-b. But, and this is the first syllabification process which interests us here, it can also be repaired differently, as can be seen in (22)c-d.

(22) Repair of the French onset cluster nasal consonant +[j] when an open syllable precedes the target syllable: four instances in total, in half of which syllabification patterns can be observed

	French	IPA FR	Vietnamese	IPA VN	Glosse	Syllabification
a)	<i>amiante</i>	[amjɑ̃t]	<i>a-mi-ǎng</i>	[a.mi.ǎŋ]	‘asbestos’	No
b)	<i>ammoniac</i>	[amɔ̃njak]	<i>a-mô-ni-ác</i>	[a.mo.ni.ak]	‘ammonia’	No
c)	<i>camion</i>	[ka.mjɔ̃]	<i>cam-nhông</i>	[kam.ŋoŋm̃]	‘lorry’	mj → m.ŋ
d)	<i>aluminium</i>	[alyminjɔ̃m]	<i>nhôm</i>	[nom]	‘aluminium’	nj → n

In the examples (22)c-d, the glide [j] is replaced by the [high] nasal consonant [ɲ]. This process can phonologically be conceived as progressive spreading of the feature [nasal] to the following glide, as the consonant [j] is illicit in Vietnamese syllable onsets but the nasal [ɲ] is licit. The base, from which the nasal feature has spread, is still preserved, but syllabified as the preceding coda consonant. This is the nasal [m] in *camion* or [n] in *aluminium*. Additionally, in *aluminium*, the first syllables are truncated and only the last syllable survives. The fact that we cannot observe the whole pattern due to truncation in (22)d and that the total number of occurrences with the French syllable structure CV.C_{nasal}+ [j]V(C) is restricted to only four lexemes, we can only observe one syllabification case for this pattern with certainty and move on with the next pattern category. This category still has to do with the repair of [j] in onsets, but this time in single onsets, and again when these are preceded by an open syllable. In our corpus, we also only have a very restricted number of occurrences of the French structure CV.[j]V(C), namely three lexemes, For the adaptation of all these lexemes into Vietnamese, we can observe a syllabification process.

(22) Repair of the French single onset [j] when an open syllable precedes the target syllable: three instances in total, for all of which syllabification patterns can be observed

French	IPA FR	Vietnamese	IPA VN	Glose	Pattern
a) <i>glaiëul</i>	[gla.jœl]	<i>lay-on</i>	[lǎj.ʔɲn]	‘gladiolus’	.j → j.ʔ
b) <i>maillot</i>	[ma.jo]	<i>may-ô</i>	[mǎj.ʔo]	‘undershirt’	.j → j.ʔ
c) <i>moyeu</i>	[mwa.jø]	<i>moay-ơ</i>	[mwǎj.ʔɤ]	‘wheel hub’	.j → j.ʔ

For the four remaining categories, we have more data, from 11 to 19 lexemes per category. The two following categories are very similar to each other in the syllable structure of a French source lexeme. In both, the French source syllable skeleton is CV.CV(C), while the Vietnamese loan skeleton is CVC.CV(C). The difference between the two is that in Vietnamese, there is one additional segment more, and the first syllable is closed by a consonant. In the French source, this syllable is open. But how do we come to this difference? Either the consonant of the following syllable onset gets doubled or at least the consonant slot. This doubled consonant (slot) then becomes the coda of the previous syllable. When all features are doubled, this can be seen as an instance of gemination, and when only some of the features survive in the preceding coda, the pattern goes beyond the usual pattern of gemination. The process may be referred to as *featural gemination* or *partial gemination* for this issue (Rachid Ridouane, personal communication), which means that the consonant slot is doubled and some features as

well, but due to the restricted coda inventory of Vietnamese, not all are able to survive. We count in total 240 French lexemes with the syllable structure CV.CV(C), in which this process would principally be possible. In 29 of the respective Vietnamese loans, instances of gemination or featural gemination can be observed, which make up 12%. For the remaining 212 instances, which make 88%, the process cannot be observed. Therefore, this syllabification process is proportionally not the most frequent process, but still frequent enough to be worth a deeper examination. Among the 29 instances where the Vietnamese loan results in the syllable structure CVC.CV(C), we count 13 instances of gemination and 16 instances of featural gemination, with quite balanced proportions between the two groups of 45 vs. 55%. One French lexeme has two loan variants: (*disjoncteur*) *automatique* [o.to.ma.tik] is either adapted as *áp-to-mát* [ap.to.mat] or *at-to-mát* [at-to-mat] in Vietnamese, and we count it twice¹⁶. In (23) and (24), we provide examples for both categories gemination and featural gemination.

(23) Gemination, 13 instances in total

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>accu(mulateur)</i>	[a.ky]	<i>ắc quy</i>	[ăk.kwi]	‘battery’	.k → k.k
b) <i>containeur</i>	[kɔ̃.t(ə).nœv]	<i>công-ten-nơ</i>	[koŋm.tɛn.nɔ̃]	‘container’	.n → n.n
c) <i>potence</i>	[po.tãs]	<i>phốt-tăng</i>	[fot.tãŋ]	‘stem’	.t → t.t

(24) Consonant slot doubling or featural gemination, 16 items in total

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>saucisse</i>	[so.sis]	<i>xúc xích</i>	[suk.sik]	‘sausage’	.s → k.s
b) <i>essence</i>	[e.sãs]	<i>ét xăng</i>	[ɛt.sãŋ]	‘gasoline’	.s → t.s
c) <i>buffet</i>	[by.fe]	<i>búp phê</i>	[bup.fe]	‘buffet’	.f → p.f

In one instance of featural gemination, the base gets replaced and not the double. This item is shown in (25). Here, the second syllable onset [p] gets replaced by [b] in the loan, but the double, which surfaces in the coda of the first syllable, retains the features of the French base.

(25) Special case for featural gemination: the base is replaced, the double retains all features

<i>poupée</i>	[pu.pe]	<i>búp bê</i>	[bup. bɛ]	‘puppet’	.p → p.b
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¹⁶ Additionally, a truncated form át [at] from the second variant exists but which does not interest us here.

Having examined this case, we come back to the pattern category discussed before in (22). An example is French *glaiëul* [gla.jœl] ‘gladiolus’, adapted as *lay-on* [lǎj.ʔɯn] into Vietnamese, which can now be seen as a similar process. The difference to the adaptation of *poupée* ‘puppet’ is just that in the base, all features of the consonant [j] get lost in *lay-on*, and the consonant slot is filled by the glottal stop, whereas in *búp be*, only the feature [voiced] is delinked in the second syllable onset base. Therefore, the three instances which fit into the same category as *lay-on*, could be interpreted as another form of the process observed in *búp be*, and therefore also fit in the category of consonant slot doubling. Still, the term featural gemination does not work for these cases: all features in the base get lost and only the consonant slot itself remains.

Let us now consider the possibility that orthography instead of phonotactic or phonological factors and phonetic missperception may have influenced the process of gemination (Kang et al., 2016 talk in their paper of orthographic gemination). For instance, this could be assumed for French *accu(mulateur)*. If this was a reading adaptation, speakers of Vietnamese who borrowed this lexeme may just have geminated the consonant [k] because in the written form, there are two graphemes <c>. Still, for many other cases, among them *containeur*, *potence* and *poupée*, this possibility can be excluded as there is no double consonant in the graphemic form of the French source lexeme.

After having presented the syllabification categories of gemination and consonant slot doubling, we finally come back to the category we had briefly mentioned at the end of the preceding section 4.2.2. The process of syllable boundary shift we examine herein could be interpreted as a typologically so far undiscovered cluster repair pattern, but after having presented the previous patterns of syllabification, it is possible to assume another process as the driving factor for the emerging structures. This issue will be deepened in the discussion on p. 283. At this point, we provide some examples in (26).

(26) Syllable Boundary shift: first consonant of an onset cluster becomes the coda of the preceding open syllable, eleven instances in total

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>chou-fleur</i>	[ʃu. fl œʁ]	<i>súp-lơ</i>	[sup. lɤ]	‘cauliflower’	.fl → f.l
b) <i>cyclo(pousse)</i>	[si. kl o.pus]	<i>xích lô</i>	[sik. l o]	‘pedicab’	.fl → k.l
c) (<i>œuf</i>) <i>au plat</i>	[œ. fo .pla]	<i>ốp la</i>	[op. l a]	‘fried egg’	.pl → p.l

The structure of the French stimuli lexemes is CV. CCV(C), whereas the syllable boundary shifts one segment further between the two cluster consonants and results in the same loan

syllable structure as in the previous gemination and consonant slot doubling cases: CVC. CV(C). There is a parallel to what we have described in (22)c for the lexeme *camion*. In principle, the same also happens in lexemes with a Schwa-vowel as the nucleus of the syllable which contains a consonant cluster in the onset as well. The difference is that here, the schwa-syllable with a *muta com liquida* sequence gets truncated, but its first onset cluster consonant survives as a coda of the previous syllable, which is consequently closed whereas in its French source, the syllable is open. Examples can be seen in (27).

(27) Syllable boundary shift in schwa syllable onset clusters and truncation: the first onset consonant becomes the coda of the preceding open syllable, the remaining material gets truncated, 19 instances in total

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>litre</i>	[li.tʁ(ə)]	<i>lít</i>	[lit]	‘liter’	.tʁ → t.∅
b) <i>cable</i>	[ka.bl(ə)]	<i>cáp</i>	[kap]	‘cable’	.bl → p.∅
c) <i>fascisme</i>	[fa.fĩ.sm(ə)]	<i>phát-xít</i>	[fat.sit]	‘fascism’	.sm → t.∅

The structure of the French lexeme is CV.CCV_(schwa). The resulting structure in Vietnamese is CVC. The last consonant of this Vietnamese syllable is marked in bold and is the only segment from the schwa-syllable that survives because of a syllable boundary shift. To the contrary, such a syllabification process is blocked when the syllable preceding the schwa-syllable has not an oral vowel as a rhyme but a nasal vowel. In this case, the nasal vowel is repaired by a sequence of an oral vowel and a nasal consonant, as it is typologically often the case and discussed in the literature for many languages in borrowing situations (Paradis & Prunet, 2000). Consequently, this syllable is closed, which is why the syllabification process which happens in (27) is blocked and the whole schwa-syllable gets truncated, see (28).

(28) No syllabification process of schwa-syllable onset clusters if preceding syllable rhyme is a nasal vowel

French	IPA FR	Vietnamese	IPA VN	Glosse	Pattern
a) <i>cylindre</i>	[si.lɛ̃.dʁ(ə)]	<i>xi-lanh</i>	[si.lɛŋ]	‘cylinder’ tech.	ɛ̃.dʁ → ŋ.∅
b) <i>timbre</i>	[tɛ̃.bʁ(ə)]	<i>tem</i>	[tɛm]	‘stamp’	ɛ̃.bl → m.∅
c) <i>chambre</i>	[ʃɑ̃.bʁ(ə)]	<i>săm</i>	[săm]	‘air chamber’	ɑ̃.bʁ → m.∅

After having discussed several syllabification categories and the conditions under which syllabification is possible or blocked, we finally present an overview of all discussed categories,

regrouped under the types syllable augmentation, consonant slot doubling or gemination, and shift of syllable boundary, see table 13.

Table 13: overview of all syllabification types, including epenthesis and the adaptation of [j] as [i], as well as the just presented types where the target syllable follows an open syllable which as a consequence gets closed

Description source	Description loan	Skeleton source	Skeleton loan	Type
Onset cluster	Epenthesis	CCV	CV.CV	Syllable augmentation
Onset cluster with glide	Full vowel	CjV	Ci.(?)V	
Single onset glide	Coda of preceding syllable	CV.jV	CVj. ?V	Consonant slot doubling or gemination
Single onset consonant	Single onset consonant slot doubled as coda of preceding syllable	CV.CV	CVC.CVC	
1 st Onset cluster consonant	Coda of preceding syllable	CV.CCV	CVC.CV	Shift of syllable boundaries
Schwa-cluster after oral vowel	See above +truncation	CV. CCə	CVC. ∅	
Onset cluster with nasal cons.+glide	Coda or preceding vowel	CV.C _{nasal} jV	CVC _{nasal} . jV	

To sum up, it is worthwhile to look at instances of syllabification of French loans into Vietnamese. We have treated special cases of syllabification the processes where the French source syllable structure differs from the Vietnamese loan syllable structure and have identified different syllabification types. What we have already treated under consonant clusters from p. 81 to 85 are syllable augmentation types with epenthesis as the largest category. The remaining types we have just concentrated on are shift of syllable boundaries and consonant (-slot) doubling. Whereas epenthesis as an instance of syllable augmentation is a widely known consonant cluster repair strategy, the two less discussed remaining categories receive the attention they deserve in this work. In our experimental study we will be able to test if similar structures arise in the experimental language contact situation and finally seek for explanations for their emergence in the discussion. At this point, we summarize the main problem we will

turn to in the discussion: while some of the attested syllabification processes involve consonant clusters in the French source lexeme, they could be interpreted as a so far unattested strategy of cluster repair. But this interpretation falls too short as it cannot capture also the data where no cluster is in the input, especially the instances of consonant slot doubling or gemination. We will have to seek for explanations which capture the whole data. After having presented special cases of syllabification, we move on to tone.

4.3.4. Tonal aspects

We classify the study of tone in loanwords as a syllabic aspect, as in Vietnamese, the tonal domain is the syllable. To recapitulate the most important facts about tones we have described in 2.2.2., each syllable is obligatorily assigned a tone. In open and sonorant-final syllables, six tones can be distinguished in the variety of Vietnamese we focus on, and two tones are possible in syllables which end in a plosive (Kirby, 2011). We base our research on the categorization presented in Michaud (2004), where the six tones A1-C2 occur in the first and tone D1 and D2 in the latter syllable structure.

Our main hypothesis is that each syllable in French loans must be assigned a Vietnamese tone as tone is obligatory. Also, syllable structure may influence the assignment of certain tones. In what follows, we consider distributions of tones in mono- and bisyllabic loans in our corpus (table 14 and 15) and continue by summarizing what has been claimed in previous research and refine some aspects. Patterns for lexemes with more than two syllables are not taken into consideration in this overview, but later, when we go more into the details, we also include them in our study. As lexemes with more than two syllables are infrequent in our corpus, a distributional overview could not provide us a good picture of stable patterns, which is why we focus on mono- and bisyllabic lexemes in this first overview.

Table 14: distributional overview of tone assignment in monosyllabic loanwords

Tone	Absolute number of words	Per Cent
A1	94	55%
A2	10	6%
B1	0	0%
B2	0	0%
C1	0	0%
C2	0	0%
D1	62	36%
D2	6	3%
Total	172	

In monosyllabic words, 55% of all syllables get assigned tone A1. These are open or sonorant-ending syllables. The other tone which emerges in these syllables is tone A2 with a frequency of 10% of all monosyllabic lexemes. The tone with the second highest distribution is tone D1 with 36%, and is assigned to plosive-ending syllables, which perfectly matches Vietnamese tone restrictions. The other tone which is possible in plosive-ending syllables is assigned only to 6% of the data. Tones B1, B2, C1 and C2 never get assigned to any monosyllabic lexeme. We move on with tonal distributions in bisyllabic lexemes in table 15.

Table 15: distributional overview of tone assignment in bisyllabic loanwords

Tonal sequence	Absolute number of words	Per Cent
A1 A1	163	53,4%
A1 A2	3	1,0%
A1 D1	33	10,8%
A1 D2	7	2,3%
A2 A1	17	5,6%
A2 A2	4	1,3%
A2 D1	6	2,0%
A2 D2	5	1,6%
C1 A1	2	0,7%
C1 D1	2	0,7%
C1 D2	1	0,3%
D1 A1	41	13,4%
D1 D1	16	5,2%
D1 D2	1	0,3%
D2 A1	2	0,7%
D2 A2	1	0,3%
D2 D1	1	0,3%
Total	305	

Again, most syllables receive tone A1, and the frequency of the combination of both syllables with A1 is at about 53%. Among all possible combinations we only list those with at least one occurrence: as to monosyllabic lexemes, tones B1, B2 and C2 are not assigned to any syllable in bisyllabic loans, and as a consequence, combinations with these tones are missing completely. The only tone which is not assigned to any monosyllabic lexeme but marginally assigned to the first syllable of bisyllabic lexemes is tone C1, but this makes up only 5 items in total, which is 1,7% of the whole data.

According to the results overview, we can confirm in terms of distributions the result from previous research (Barker 1969; Huynh 2008; 2010; M. Pham 2012) that most syllables in loans, no matter if mono-, bi- or multisyllabic, get assigned tone A1, see (29).

(29) Mono-, bi- and multisyllabic lexemes with the assignment of tone A1 to all syllables

French	IPA FR	Vietnamese	IPA VN	Glosse
<i>gare</i>	[gaʁ]	<i>(nhà) ga</i>	[ga ^{A1}]	‘penicillin’
<i>relais</i>	[ʁ(ə)lɛ]	<i>rơ le</i>	[zɤ ^{A1} lɛ ^{A1}]	‘relay’
<i>ragoût</i>	[ʁagu]	<i>ra gu</i>	[ra ^{A1} ɣu ^{A1}]	‘ragout’
<i>pénicilline</i>	[penisilin]	<i>pê ni ci lin</i>	[pe ^{A1} ni ^{A1} si ^{A1} lin ^{A1}]	‘penicillin’

Syllables with a plosive in the coda only get assigned tone D1 or D2, which reflects the native Vietnamese requirement that only these two tones can be assigned to this syllable structure. Tone D1 is assigned to the majority of syllables with a plosive coda: 191 syllables = 92 % of all 208 syllables ending in a plosive. To the contrary, tone D2 is only assigned to 8% of plosive final syllables. These results go in line with results in Huynh (2010). In (30)a-b, we provide examples for a monosyllabic lexeme with tone D1 and tone D2. In (30)c-d, we provide bisyllabic lexemes: the lexeme in (30)c gets assigned tone D1 to both syllables, while in (30)d, tone D2 gets assigned to the first and D1 to the second syllable. Finally, in (30)e, we give an example for a loan with more than two syllables, where tone D1 is assigned to the last syllable.

(30) Mono-, bi- and multisyllabic lexemes with the assignment of tones D1 or D2

French	IPA FR	Vietnamese	IPA VN	Glosse	Tone
a) <i>vis</i>	[vis]	<i>vít</i>	[vít ^{D1}]	‘screw’	D1
b) <i>gaze</i>	[gaz]	<i>gạc</i>	[ɣak ^{D2}]	‘gauze’	D2
c) <i>atlas</i>	[atlas]	<i>át-lát</i>	[at ^{D1} lat ^{D1}]	‘atlas’	D1 D1
d) <i>cartable</i>	[kaʁtabl]	<i>cấp táp</i>	[kãp ^{D2} tap ^{D1}]	‘briefcase’	D2 D1
e) <i>(disjoncteur) automatique</i>	[o.to.ma.tik]	<i>áp-tô-mát</i>	[ap ^{D1} to ^{A1} mat ^{D1}]	‘circuit breaker’	D1 A1 D1

Let us now look at specific patterns which emerge in bisyllabic loans. We focus on the first syllable of these loans and consider certain pattern which seems to be specific to first syllables of bisyllabic loans. As just discussed for any syllable position, if the syllable ends in a plosive,

it is assigned tone D1 or D2, and syllable position does not seem to be of influence. This pattern in a first syllable of bisyllabic lexemes is attested in 59 items, which is 58% of in total 103 bisyllabic loanwords with a closed first syllable. Examples are shown in (31). In (31)a, the first syllable is assigned tone D1, and in (31)b, it is tone D2. The second syllable does not interest us here as we cannot observe a special pattern here.

(31) Bisyllabic lexemes with tone D1 or D2 on the 1st syllable when it is plosive-ending

French	IPA FR	Vietnamese	IPA VN	Glosse	Tone 1 st syll.
a) <i>taxi</i>	[taksi]	<i>tắc xi</i>	[tăk ^{D1} si ^{A1}]	‘taxi’	D1
b) <i>tabiler</i>	[tablije]	<i>tạp-dê</i>	[tap ^{D2} ze ^{A2}]	‘apron’	D2

Equally in line with what has been previously described goes the fact that if the syllable is closed by another consonant, then it is likely that tone A1 gets assigned: tone A1 is the most-assigned tone to any non-plosive-final syllable. This is the case for 41 lexemes which make 40% of 103 bisyllabic lexemes. Examples are shown in (32)a-b. Tone A2 gets assigned to only 3% of the first syllable is bisyllabic loans, examples can be seen in (32)c-d.

(32) Bisyllabic lexemes with tone A1 or A2 on the first syllable when this syllable is closed but does not end in a plosive: assignment of tone A2 occurs only very marginally.

French	IPA FR	Vietnamese	IPA VN	Glosse	Tone 1 st syll.
a) <i>antenne</i>	[ãten]	<i>ăng ten</i>	[ãŋ ^{A1} tɛn ^{A1}]	‘antenna’	A1
b) <i>balcon</i>	[balkɔ̃]	<i>ban-công</i>	[ban ^{A1} koŋm ^{A1}]	‘balcony’	A1
c) <i>mouchoir</i>	[muʃwaʁ]	<i>mùi soa</i>	[muj ^{A2} swa ^{A1}]	‘handkerchief’	A2
d) <i>bidon</i>	[bidɔ̃]	<i>bình toong</i>	[biŋ ^{A2} tɔŋm ^{A1}]	‘water bottle’	A2

To the contrary, if the first syllable is open, occurrences of tone A2 are much higher in this syllable: this can be observed in 26 words, which make 14% of in total 187 bisyllabic loans with an open first syllable. Compared to the frequency of tone A2 in mono- and bisyllabic lexemes in this corpus, this is also a relatively high number. In (32)a, we provide an example for tone A1 on the first syllable, examples (32)c-d show the assignment of tone A2.

(32) Bisyllabic lexemes with tone A1 or A2 on the first syllable when this syllable is open: assignment of tone A2 occurs with relatively high frequency

French	IPA FR	Vietnamese	IPA VN	Glosse	Tone 1 st syll.
a) <i>chemise</i>	[ʃ(ə)miz]	<i>sơ mi</i>	[sɤ ^{A1} mi ^{A1}]	‘shirt’	A1
b) <i>carotte</i>	[kaʁɔt]	<i>cà rôt</i>	[ka ^{A2} zɔt ^{A1}]	‘carrot’	A2
c) <i>blouse</i>	[bluz]	<i>bờ lu</i>	[bɤ ^{A2} lu ^{A1}]	‘blouse’	A2
d) <i>ressort</i>	[ʁəsɔʁ]	<i>lò xo</i>	[lɔ ^{A2} sɔ ^{A1}]	‘spring’ (tech.)	A2

For most of these lexeme-initial open syllables with tone A2, the vowel is a central [ɤ] or [a], namely in 21 lexemes which make 84%, cf. (32)a-c. Only in 5 items, there is other vowel material than [a] or [ɤ], as can be seen in (32)d.

Our investigation on tone assignment to the first syllable of bisyllabic loans supports what has been said in Barker (1968) distributionally with a larger corpus and extends. In Barker, it is only said that the first syllable in bisyllabic loans often gets assigned tone A2. Our results partly disconfirm what has been stated in M. Pham (2012). According to M. Pham (2012), the second syllable as well has an impact on whether the first syllable is assigned tone A2. The structure of the second syllable cannot be related to tone assignment of the first according to our data, and only the structure of the first syllable seems to play a role. Here, we go in line with M. Pham (2012) in that an open first syllable enhances the possibility that the first syllable gets assigned ton A2.

To conclude the aspect of tone assignment, general hypotheses are confirmed: tones are assigned to each syllable. Vietnamese phonotactic hard constraints on tone assignment remain hard constraints in loans: if a syllable ends in a plosive, it always gets assigned tone D1 or D2. Other generalizations are gradient. In terms of frequency, position of syllables as well as if they are open or closed seem to play a role. This has been shown for bisyllabic loans. Probably, also the vowel quality of open syllables may have a role to play, but the total number of occurrences is not high enough to deliver strong evidence.

Our study on French loanwords into Vietnamese contributes empirically to delivering a concise overview of segmental repair and with new generalizations about cluster repair and tone assignment. The most innovative part of our investigation is the study on syllabification processes, which have, apart from gemination, only marginally been in focus of prosodical research on loanwords so far. By studying syllabification in French loanwords, we have found

some evidence for our assumption that loanwords into Vietnamese have some phonotactic parallels to Cantonese. That these parallels may have to do with structural parallels in terms of the coda inventory but also in terms of a bimoraic minimum of syllables, will be deepened in the discussion section on p. 289 and will further help us to understand why the investigation of loanwords can be very fruitful to better understand native processes. To answer other theoretical questions about universal principles of language contact as well, a theoretical perspective will be delivered in the discussion chapter after the presentation of our experimental study which focusses on the same aspects but in a different setting.

5. Experimental studies with French stimuli and speakers of Vietnamese

With the experimental studies with French stimuli, we intend to check and to refine the results we obtained through the examination of adaptation patterns for French loanwords into Vietnamese. We do so by enlarging our perspective to other language contact settings than loanwords. The idea behind our experimental procedure is to verify the assumptions made previously with the help of loanwords by using spoken experimental data. For instance, in loanwords, consonant clusters must be repaired as they do not exist in Vietnamese. One example for such a loanword is *xì cǎng đān* [si^{A2} kǎŋ^{A1} đān^{A1}] deriving from French *scandale* [skãdal] ‘scandal’ (itself a loanword from Greek – *σκάνδαλον* – into Latin). The adaptation which is chosen by speakers of Vietnamese in our example consists in inserting the epenthetic vowel [i] between the consonants [s] and [k].

Our experimental data is elicited by playing recordings of French lexemes to speakers of Vietnamese who in turn repeat them. These lexemes have never been adapted into Vietnamese and are therefore not familiar to speakers of Vietnamese without knowledge of French. After having examined adaptation patterns in loanwords, we can take the results as a starting point for the following first research question for our experimental approach: how do illicit structures of Vietnamese get repaired in experimental settings? We consider again the aspects of single consonants, consonant clusters, syllabification, and tone assignment.

Possibly, similar patterns emerge as in loanwords, but as the language contact situation is very different, this must not always be the case. Differently from the loan data, we can focus in a controlled way on the role of monolingualism vs. knowledge of a foreign or second language and therefore widen our focus to foreign and second language acquisition. Other variables which cannot be excluded or controlled for in loanwords can also be excluded herein, as for instance the influence of orthography, or at least specifically controlled, as the local variety. We also want to shed light on the role of phonetics and phonology in perception and especially production: we have chosen production experiments and therefore focus on production. Still, perception is also involved, and with the help of our experiment design, we can partly provide hints on differences between the former and the latter. In this section, we first present an overview of relevant research within the framework of second language acquisition, move on with our experimental methods and then proceed with the presentation of our results.

5.1. State of the art: second language acquisition for the direction French Vietnamese

Let us summarize research on phonetics and phonology, including prosodical aspects, in second language acquisition for French and Vietnamese. We start by resuming research in Language Acquisition where French is the L2 and continue with research, where Vietnamese is the L1 or L2. Not much research has been carried out for the language pair Vietnamese French, and we will finish this chapter by shortly presenting it.

Second language acquisition studies which involve French

A general overview of numerous studies on French as a second language is provided in Myles (2004), and a project which is devoted to interphonology phenomenon with French as an L2 is called *Interphonologie du Français contemporain (IPFC)*, cf. Racine et al. 2012; Detey et al. 2016a). Situated within this context is also the book *La prononciation du Français dans le monde: du natif à l'apprenant* [The pronunciation of French in the world: from native speakers to learners] (cf. Detey et al, 2016b) with research on various languages. Authors involved in the project IPFC have, among others, worked on the production of French nasal vowels and consonant clusters by L1 speakers of Japanese (cf. Detey et al 2014a; Detey et al. 2014b) Nasal vowels have also been studied for other languages as L1 (cf. Chanethom & Mather, 2019). Other topics which have recently been focus on are, for instance, voice onset time (VOT) in French as an L2 (cf. Gabriel et al., 2018), liaison (cf. Howard & Ågren, 2019; Harnois-Delpiano, 2017), extra-rising patterns (cf. Santiago and Delais-Roussarie, 2015) and consonant-glide-vowel sequences (cf. Kehoe et al., 2008), to mention just some. Levy (2009) studies assimilation patterns of rounded vowels in consonantal contexts as perceived by speakers of American English as an L1 with French as an L2. She assumes that these patterns are influenced by native language allophonic variation. An interesting by-product of her study is that the degree of variability decreases with the degree of L2-knowledge, a finding which goes in line with other studies (cf. Bundgaard-Nielsen, Best, & Tyler, 2011, among others), and to which we come back later in our discussion in the context of our own work (see p.274).

Another interesting endeavour is to consider tone perception by L1 speakers of non tonal languages. We present two studies which deal with the identification and discrimination of Mandarin Chinese tones, perceived by Mandarin Chinese vs. English (Wang 1976) or French listeners (Hallé, Chang, & Best 2004). In the study of the first mentioned authors, the English listeners' categorical perception boundary is less clear compared to the one of native speakers,

but still categorical perception seems to be not fully absent. This result can be replicated in the second mentioned study: the French listeners have no L2 knowledge of Mandarin Chinese, and even though they perform worse than the Mandarin Chinese speakers, results indicate that “French listeners are not absolutely “deaf” to tonal variations as well. They simply fail to perceive tones along the lines of a well- defined and finite set of linguistic categories” (Hallé et al., 2004, p. 395). A bunch of other studies on this issue emerged, among them Qin and Mok (2015), who take up the future research desideratum in Hallé et al.(2004) to investigate if speakers of two prosodically distinct none-tonal languages such as French and English perform differently bad. Hallé et al. (2004)’s prediction that French listeners outperform English listeners because of the differences in terms of their native prominence system, is tested in Qin and Mok (2015), where Mandarin Chinese, French and English listeners are confronted with Cantonese speech material. Their results contradict the claim made in Hallé et al. (2004) in that French and English listeners perform similarly bad and only show substantial differences to the Mandarin Chinese speaker group. To sum up, studies cover phenomenon of single segments, syllabic structures, and other prosodic topics such as stress intonation and tone and consider them both from phonetic and phonological, and from perceptive and productive perspectives.

Second language acquisition studies which involve Vietnamese

For Vietnamese as an L1 or L2 in second language acquisitional language contact studies, there are less works than for French. Still, research covers various segmental and syllabic interlanguage phenomena, especially for the language pair Vietnamese-English. From the 1980s on, researchers began to be interested in this language pair for second language acquisition and have discussed general principles of markedness (Benson, 1986; 88; Sato 1984; 89; Piper 1987). In these works, syllabic aspects are discussed, and some patterns are explained with the general preference of open syllables as an unmarked structure. We will come back to this issue later during the discussion of our data (see p.288), especially as this general constraint seems to be not that powerful in the context of Vietnamese, where CVC syllables are more usual than CV syllables. In Osburne (1996), the topic taken up again under the aspect of final cluster reduction in the speech of one speaker with L1 Vietnamese and L2 English. According to the *cluster reduction rule*, all consonants except the first are dropped, no matter if the first or the second cluster consonant exist in Vietnamese or not. Word-medial sequences of consonants which may be onset or coda clusters in native English, are treated as sequences of a coda and an onset consonant. Post-vocalic /r/ is realised by the speaker as a vowel, therefore part of the nucleus and not reduced. Although the speaker has a higher proficiency than speakers in Sato’s

studies, the tendency to rather reduce a cluster than to delete both consonants can be observed for both studies' speakers. One final note is that the paper focusses on regular but not on variable patterns. In our studies, both regular and variable patterns are accounted for.

In the last twenty years, a bunch of studies focussing on other phenomena appeared. Nguyễn et al. (2008) as well as Ingram (2010) study the acquisition of English word stress by L1 speakers of Vietnamese. Đào & A. T. Nguyễn (2018a) study the production of Vietnamese vowels by L1-speakers of Korean and the same authors publish another study in the same year of L2-English intonation patterns produced by L1 speakers of Vietnamese (A. T. Nguyễn & Đào, 2018b). The first author of the latter study also contributes to research of this language pair with a phonetic study on F0-patterns of Vietnamese L1 speakers when they speak English and claims that especially for beginners, patterns are transferred from the tonal L1 (A. T. Nguyễn, 2020). Let us finally resume what has been said about the language pair Vietnamese French in the context of phonetic and phonological second language acquisition.

Second language acquisition French Vietnamese

Two articles compare the phonological system of French to the phonological system of Vietnamese and deliver on the basis of negative transfer problems didactical methods for teaching French to speakers of Vietnamese (L. T. Nguyễn, 2010; Xuan, 2002). Another article resumes the interlanguage system of Vietnamese French learners (T. X. Lê 2016).

Especially noteworthy for the context of our study are the thesis by Trần (Trần 2011) and two related articles by the same author and colleagues (Trần & Vallée, 2012, Trần et al., 2014). In this chapter, we only summarize the great lines of these studies, but will come later to them when we discuss our own results in chapter 7. The most important differences between Trần's thesis and ours is the difference of focus: while Trần focusses on contexts of second language acquisition for the direction French → Vietnamese, she examines her results statistically on the basis of detailed phonetic measurements, while we rather take a phonological stance with less phonetic measurements but also take into account other language contact settings. Trần focusses on single consonants, consonant clusters and sequences of consonants separated by a syllable boundary. We also focus on single consonants and consonant clusters but do not have a look at consonant sequences divided by a syllable boundary and instead study syllabification and tonal processes. Another difference between her studies and ours is that she chose two speaker groups with L1 knowledge of Vietnamese and different levels of L2 knowledge of French. In contrast, we contrast monolingual speakers of Vietnamese with L1 speakers of Vietnamese with L2

knowledge of French, and additionally consider a group of L1 speakers of French. When both our studies overlap, we discuss similarities and differences of design, results, and interpretations. Trần discusses processes of transfer as well as principles of markedness and considers important theoretical works in the framework of second language acquisition. The main results are that most patterns can be explained by transfer processes from the speaker's L1 Vietnamese. Also, in line with principles of markedness, speakers have greater difficulties with onset clusters than with coda clusters (cf. also Sato, 1984), as coda clusters are more frequent in onset than in coda position (cf. Rousset, 2004). Interestingly, she does not find a lot of differences between the results of early and advanced French learners. Trần focusses in a very comprehensive and carefully measured fashion on clusters of single consonants which are known in both languages, Vietnamese, and French. Although we cannot deliver an equally deep view in terms of phonetic measurements, we can continue with taking her research desideratum as a starting point to also cover in more detail the study of other consonant clusters, where one or two consonants are not existent in Vietnamese. After a brief overview on previous research within this field, let us now move on to the methods of our study.

5.2. Methods

The basic idea of our experimental design is that speakers of Vietnamese listen to French stimulus lexemes once, imitate and subsequently embed them in a Vietnamese carrier sentence. We decided for this design to come experimentally close to the first steps involved in borrowing processes. Further advantages of this experimental approach relative to the loan data are that we can focus specifically on certain structures but also examine intra- and inter-speaker variabilities and regularities much more precisely with more data. Although the loanword data provides sufficient data for some phenomena to identify regularities, the data available for other phenomena is not sufficient to draw conclusions. With this approach, we aim to shed light onto questions about processes active among others in loanword integration in a more detailed and experimental way than in previous research. This in turn can help us to contribute to general debates about universal principles in language contact more precisely. Since we have conducted experiments both with monolingual native speakers of Vietnamese and with those who have already acquired a certain degree of French, we can also learn more about prosody in foreign and second language acquisition. In this section, we describe Experiment 1 and 2, which provide data for the main points of our investigation (consonant, consonant cluster repair and syllabification) as well as a smaller study on tone assignment. Experiment 2 is a cloned version of experiment 1 with some differences we describe later, but it is important to keep in mind that experiments 1 and 2 belong closely together, therefore form an experimental block and provide

stimulus data for the same studies. Both experiments are conducted with the same speaker groups at the same places, but within each group, half of the participants took part in experiment 1 and the other half in experiment 2. Experiment 1 and 2 were mostly planned and performed in 2019. This section is organized as follows: at first, we describe and justify the selection of stimulus lexemes, then move to the experiment design, its performing and finally the data editing process. As experiment 1+2 are build up and structured nearly identically, they are also described in a block. The differences between experiment 1+2 are primarily just important for our study on tone assignment for the direction French → Vietnamese. Therefore, these differences are described in the corresponding section 5.1.1. in the paragraph about tonal aspects (see p.113) which are relevant in this study.

5.2.1. Stimuli

First, we select 49 French lexemes. The complete list of those lexemes is provided in the appendix (p.316). Those lexemes are mostly monosyllabic (24 items) or bisyllabic (22 items), but three items also contain three syllables. This distribution reflects the native Vietnamese distribution of monosyllabic, bisyllabic and polysyllabic lexemes in the lexicon (see p.51). We also choose mostly mono- and bisyllabic lexemes to compare them among one another within their group without the confounding variable of syllable number, but also a bunch of lexemes with three syllables to investigate the number of syllables as an independent variable (for example the comparison of *brique* [bʁik] ‘brick’, *briquet* [bʁikɛ] ‘lighter’ and *bric-à-brac* [bʁikabʁak] ‘bric-a-brac’). The following syllable structures can be found in the list of lexemes the speaker of French produced: CV, VC, CVC, CCV(C), (C)VCC.

In a second step, we ask a speaker of French to read the 49 lexemes aloud. The speaker is asked to separate each lexeme by a pause. This is to prevent several stimulus lexemes from combining into one intonational unit. The recording is made in a soundproof chamber at *Labor für Experimentelle Linguistik (LabEx)* of *Freie Universität Berlin*. The recorder we use is a Zoom H2 and the audio file in wav-format is cut with the help of Audacity.

The 49 lexemes realized by the French speaker are selected based on our results which we obtained by analysing our loanword corpus in chapter 4. We have at least one but sometimes also more lexemes per phenomenon under investigation. For instance, there is only one item for the onset consonant [ʒ], namely *gigot* [ʒigo] ‘leg (of mutton etc, gastr.)’; but three items for the coda consonant [s], namely *efface* [efas] ‘rubber’, *épice* [epis] ‘spice’ and *glace* [glas] ‘ice cream’. This sometimes slightly uneven distribution is because some lexemes are chosen to study certain phenomenon, but then happen to fall additionally into a further category. This

problem becomes clearer if we turn again to the examples: the lexemes to investigate the repair of French coda consonant [s] in Vietnamese are also chosen to investigate syllabification (*efface* and *épice*) and consonant cluster repair (*glace*). Therefore, it turns out that we have two lexemes more available for the investigation of the repair of coda [s] than for the repair of onset [ʒ], for instance. Nevertheless, even with only one lexeme per phenomenon, enough data is provided to recognize structures and stable patterns, as the number of experiment participants is quite high. A larger number of lexemes per phenomenon only improves the amount of data.

Four main topics determine the selection of the 49 lexemes: consonant repair, consonant cluster repair, syllabification, and tone assignment. We begin with the selection of lexemes for the investigation of single consonants and continue with consonant cluster repair and syllabification. Finally, we present the items we select for our study on tone assignment. We start by describing our methods for single consonants.

To see what happens to consonants which are not part of Vietnamese sound inventory, we need a list of lexemes which begin or end with all these single consonants. As the Vietnamese onset consonant inventory is much larger than the very restricted coda inventory, the list of lexemes for the latter must be longer as more sounds are likely to be repaired. The independent variables of this investigation are all consonants which are not part of the Vietnamese inventory in onset and coda position. The dependent variable is the way those consonants are adapted. The assumed values for this variable (i.e., the consonantal replacements allowed in the respective structures in Vietnamese) vary and can be taken from the table below (see column *expected repair*). We derive our expectations for the repair from the results of our loanword data analysis. One example is the loanword *sóc* [sok̚p^{D1}] from French *choc* [ʃɔk] ‘choc’, in which the initial [ʃ] is replaced by a [s], an example for coda repair is *caramen* [ka^{A1} ra^{A1} mən^{A1}] from French (*crème*) *caramel* [kavamɛl] ‘crème caramel’, in which the final [l] is replaced by [n]. Let us now turn to the stimulus lexemes for our experimental data on table 16 and 17. The column *expected repair* refers to our results for loans: if certain patterns emerge in loans, we expect them to emerge also in the experimental data.

Table 16: onset consonants

Lexeme	IPA	English glosses	Stimulus consonant	Expected repair
guignol	gijɔl	clown, joker	g	ʎ
chameau	ʃamo	camel	ʃ	s
gigot	ʒigo	leg (of mutton etc, gastr.)	ʒ	z
radeau	ɾado	raft	ɾ	z, r

yeuse	jœz	holm oak	j	z
perle	pɛʀl	pearl	p	b (or no repair)
port	pɔʀ	harbour		
poulet	pule	chicken		
crapaud	kʀa.pɔ	toad		
crépuscule	kʀe.pyskyl	dusk		
épice	e.pis	spice		

Table 17: coda consonants

Lexeme	IPA	English glosses	Stimulus consonant	Expected repair
saule	sol	willow	l	n
ciel	sjɛl	sky		
crépuscule	kʀepyskyl	dusk		
gignol	gijɔl	clown, joker		
coude	kud	elbow	d	t
griffe	gʀif	claw	f	p
piaf	pjaf	little bird		
épice	epis	spice	s	t
glace	glas	ice-cream		
efface	efas	rubber		
cloche	klɔʃ	bell	ʃ	t,k
port	pɔʀ	harbour	ʀ	k
crabe	kʀab	crab	b	p
yeuse	jœz	holm oak	z	t
cableuse	kabløz	wiring specialist		

The French coda consonants [g ɲ v ʒ] are not tested here. After having described the methods for consonants, we now move on to consonant clusters, which is quite more complex.

In our loanword data, consonant clusters, which are illicit in Vietnamese, are either repaired by deletion or by epenthesis. The aim of the analysis of spoken data is to go into detail and to verify if French lexemes with consonant clusters are repaired the same way or not. Therefore, we focus on 27 lexemes with different consonant clusters: 21 with onset clusters and 6 with coda clusters, but within both groups also different combinations of different consonants. Thereby we limit ourselves to a selection of possible French consonant clusters. The selection is determined according to the following criteria: on the one hand, we want to focus on high-frequency clusters in French (cf. Dell, 1995; Bursill-Hall, 1956; among others), on the other

hand, and more importantly, we want to select clusters and cluster classes we have already examined based on our loanword data and therefore have predictions on.

The main independent variable values are onset vs. coda position of a cluster and the different consonant material. We also want to check whether the number of stimulus syllables may be an influencing independent variable and whether a cluster is word medial or not. The expected dependent variable values are deletion or epenthesis as a repair strategy, and more precisely: if epenthesis, then which vowel is inserted; if deletion, then which consonant is deleted. One example for deletion from our loan data is *pho mát* [fɔ^{A1} mat^{D1}] from French *fromage* [fʁɔmaʒ] ‘cheese’ and for epenthesis *bò lu* [bɔ^{A2} lu^{A1}], from French *blouse* [bluz] ‘blouse’.

The main onset cluster groups we want to focus on in this chapter in parallel to the loan data are C+[ɸ] and C+[l]. If deletion is the chosen repair strategy in loanwords, it is always the second consonant which is deleted in the group C+[ɸ] whereas this happens to the first consonant in the C+[l] group. Our main question is whether the different behaviour of these two classes in the loan data is also stable in our experimental data. Also, we want to compare different cluster combinations among and beyond each group. For both groups with [ɸ] vs. [l] being the second consonant, we therefore choose as a first consonant the voiceless plosives [k] and [p] with their voiced variant [g] and [b] as well as the fricative [f]. As the voiced fricative [v] is not the first consonant of frequent clusters in French, it is excluded. In this manner, we can focus on the feature [+/- plosive], [+/- fricative] and [+/-voiced] in a first consonant position of a cluster. Finally, we add the clusters [st] and [sj], which do not appear in our loan data. The investigation of [st] is nevertheless relevant in parallel to the investigation of [sk] in our loanword corpus because, as will be explained later, we want to investigate the effect of [s] as the first consonant of a cluster on the vowel quality of epenthetic vowels. On the contrary, the study of [sj] is not relevant to this part of the investigation and will be taken up again when we address syllabification. The stimulus onset cluster lexemes are provided in table 18.

Table 18: onset clusters: deletion

Lexeme	IPA	English glosses	stimulus cluster	Expected repair
griffe	gɾif	claw	C+ɸ (gɸ)	Second consonant gets deleted
crabe	kɾab	crab	C+ɸ (kɸ),	
crapaud	kɾapo	toad	1-3syllables,	
crépuscule	kɾe.pyskyl	dusk	+ word medial	
écran	e.kɾã	screen	position	
brique	bɾik	brick	C+ɸ (bɸ)	
briquet	bɾike	lighter	1-3 syllables	

bric-à-brac	bʁikabʁak	bric-à-brac		First consonant gets deleted
prune	pʁyn	prune	C+ʁ (pʁ)	
frai	fʁɛ	spawn (frog)	C+ʁ (fʁ)	
cloche	klɔʃ	bell	C+l (kl)	
flaque	flak	puddle	C+l (fl)	
blé	ble	wheat	C+l (bl)	
blason	blazɔ̃	coat of arms	1-3 syllables, + wordmedial position	
bloc-cuisine	blɔkɥisin	kitchen unit		
cableuse	kabløz	wiring specialist (fem.)		
plume	plym	feather	C+l (pl)	
glace	glas	ice-cream	C+l (gl)	
stylo	stilo	pen	s+t	
stuc	styk	stucco		

The selection of stimulus coda consonant clusters is based on the results of our loan data investigation as well, see table 19. We select five consonants with varying consonantal material to proof whether our expectation that generally the second consonant in codas is deleted holds for our experimental approach. We also want to test whether the exception holds for the clusters [ʁ] + Nasal/Lateral just as in our loan data: in these cases, the nasal/lateral is never deleted.

Table 19: coda clusters: deletion

Lexeme	IPA	English glosse	Stimulus cluster	Expected repair
algue	alg	algua	l+C (lg)	First consonant is maintained/replaced, second consonant deleted
bisque	bisk	bisque	s+C (sk)	
insècte	ẽsɛkt	insect	k+C (kt)	
carpe ¹⁷	kaʁp	carp	ʁ+C	
feuille-morte	fœjmɔʁt	reddish brown, lit. dead leaf		
perle	pɛʁl	pearl	ʁ+l	Exception for ʁ + nasal/lateral ¹⁸
ferme	fɛʁm	farm	ʁ+m	

¹⁷ One problem arises with this stimulus we had overseen in the planning of our experiment design: The Vietnamese signifier *chép* [tɛp^{D1}] for the signified *carp* shares phonetic similarities to the French stimulus *carpe* [kaʁp] and could possibly be another loan from French, but we have not been able to find it in any corpus or source before. We leave this possible intervening factor aside but point out that the results for this one and only stimulus *carpe* should be considered with caution. Still, results are quite diverse for this stimulus.

¹⁸ First consonant deleted or replaced by a vowel; second consonant maintained/replaced by another consonant.

20 of the chosen onset cluster lexemes (see table 18) are interesting regarding epenthesis, because French stimulus lexemes of these structures have sometimes, but not in a so far predictable pattern, enabled epenthesis instead of deletion in the loan. The only stimulus lexeme cluster from table 18 which can probably be disregarded for epenthesis is *ciel* [sjɛl] ‘sky’ because in the case of a consonant plus the glide [j], the glide is expected rather to vocalize than to be separated from the preceding consonant by an epenthetic vowel (see p.85), but we come to a re-examination during the results section. In the loan data, only onset clusters are repaired by epenthesis. Therefore, we only chose onset clusters in this table. Still, during our analysis, we will also investigate whether in our experimental data, epenthesis is also possible in coda clusters (referring to table 19).

Let us now move to these constraints: in loans, it seems that the surrounding material influences the selection of a certain epenthetic vowel. Thus, the dataset is quite small. With the spoken data corpus, we can have a closer look at that issue, and therefore divide the 22 lexemes into three groups: the vowel [i] is expected after the consonant [s]; [a] or [ɤ] are expected before open vowels and only [ɤ] is expected before closed vowels with the largest occurrence. Already mentioned examples from our loanword data are *bờ lu* [bɤ^{A2} lu^{A1}], deriving from French *blouse* [bluz] ‘blouse’ and *xì cǎng đān* [si^{A2} kǎŋ^{A1} đān^{A1}] from French *scandale* [skǎdal] ‘scandal’, from those data we derive our expectations, see table 20.

Table 20: epenthesis (Onsets)

Lexeme	IPA	English glosses	Expected epenthetic vowel
stuc	styk	stucco	[i] is expected after [s]
stylo	stilo	pen	
crépuscule	kɤɤpyskyl	dusk	
bloc-cuisine	bɔkɤisɪn	kitchen unit	[a] or [ɤ] is expected before open vowels
cloche	klɔʃ	bell	
blason	blazɔ̃	coat of arms	
bric-à-brac	bɤɪkɔbɤɪk	bric-à-brac	
crabe	kɤɪɔb	kɤɪɔb	
crapaud	kɤɪɔpɔ	toad	
frai	fɤɛ	spawn (frog)	
flaque	flak	puddle	
glace	glas	ice-cream	
écran	ɛkɤɔ̃	screen	
cableuse	kɔblɔz	wiring specialist (fem.)	

plume	plym	feather	
griffe	gɾif	claw	
prune	pɾyn	prune	
ble	ble	wheat	
brique	bɾik	brick	
briquet	bɾike	lighter	
bric-à-brac	bɾikabɾak	bric-à-brac	
crépuscule	kɾepyskyl	dusk	

Deletion and Epenthesis are the widely attested repair strategies for consonant cluster repair in many languages (see p.85). Still, for our loanword data, we have also discussed instances with the glide [j] as the second consonant of an onset cluster, respective stimuli are provided in table 21. In loans, this results in vowel replacement, which can be interpreted as another cluster repair strategy. Like epenthesis, this strategy leads to one more syllable in the loan respective to the source lexeme, and it also concerns only syllable structures with onset clusters.

Table 21: French lexemes which may enable vowel replacement of the glide [j] as C2

French lexeme	IPA	English glosses	Expectable syllabification process
piaf	pjaf	sparrow, little bird	Glide could become a full vowel
ciel	sjel	sky	

We have now finished describing the methodology for consonant clusters and continue with certain syllabification processes which result in a different syllable structure of the stimulus and the response, but which may not be caused by a repair strategy of clusters, even if clusters are involved. One example for such a process from our loan data for a differing syllabification between French lexeme and Vietnamese loanword is *xích lô* [sik^{D1} lo^{A1}] from French *cyclopusse* /si.klo.pus/ ‘pedicab’, in which the first onset cluster consonant of the French lexeme is a coda consonant of the preceding glide in the Vietnamese lexeme. Another example for another syllabification process type is *phôt-tăng* [fo^{D1} tãŋ^{A1}] from *potence* /po.tãs/ ‘stem’ (bicycle). In this case, no cluster is involved: to the contrary, the onset consonant of the second syllable is doubled, and the double becomes the coda of the first syllable. Hence, it seems that we are dealing with gemination processes. These and similar processes have already been presented in the previous chapter on loanwords, will be addressed again during the result section of this and the following experimental chapters and finally become an interesting topic of debate during our summarizing discussion. For our stimulus list for the experiment, we choose 25 lexemes which are interesting regarding syllabification processes. Our method is simply to look

through a French dictionary (Rey-Debove & Rey 2013) for entries with the corresponding syllable structures with the possibility to enable a differing segment structure between stimulus and response. The source lexemes of loanwords are again used as a model for lexemes with such structures. Among those 25 lexemes, we can classify seven different groups, in parallel to our loan data groups. Our expectations are derived from our loan data as well, see table 22.

Table 22: French lexemes which may enable special syllabification processes

French lexeme	IPA	English glosses	Expectable syllabification process
boyau	bwa.jo	tubeless tyre	Onset glide could become coda glide
écran	e.kʁɑ̃	screen	First onset cluster consonant could become a coda consonant of the preceding syllable
câbleuse	ka.bløz	wiring specialist (fem.)	
étang	e.tɑ̃	pond	Onset consonant of second syllable could be doubled and become coda consonant of preceding syllable
crapaud	kʁa.po	toad	
épice	e.pis	spice	
briquet	bʁi.ke	lighter	
bric-à-brac	bʁi.ka.bʁak	bric-à-brac	
menotte	mə.nɔt	handcuffs	
hamac	a.mak	hammock	
chameau	ʃa.mo	camel	
efface	e.fas	rubber	
gigot	ʒi.go	leg (of an animal, gastr.)	
coussin	ku.sɛ̃	cushion	
radeau	ʁa.do	raft	
poulet	pu.le	chicken	
stylo	sti.lo	pen	
blason	bla.zɔ̃	coat of arms	
guignol	gijɔl	joker	

First, we choose two lexemes with a glide as the second consonant of a cluster which we expect to become vocalized. Second, we choose one lexeme with an onset glide which is preceded by an open syllable. We expect the glide to become the coda consonant of this preceding syllable. Therefore, syllable boundaries of the stimulus and the response are expected to differ. We also expect a difference of syllable boundary between stimulus and response for the two stimulus consonant clusters [kʁ] and [bl]: in the response, we expect the first consonant of each stimulus cluster to be the coda of the preceding syllable. Since some lexemes which show structures in focus in other investigations also fall into this category, the following group is quite large: for

two-syllable lexemes with an open first syllable, we expect that the onset consonant of the second syllable is doubled, and the double becomes the coda consonant of the previous syllable. We can investigate this issue with the consonants [p,t,k,m,n], which are all permissible coda consonants in Vietnamese. For the consonants [f,g,s,d,l,z] in second syllable onset position of the following group, this is not the case: they are no possible coda consonants in Vietnamese. Still, their consonant slot is expected to get doubled the same way as in the beforementioned group, with the difference that those doubled consonants lose some of the consonant features and become other, permissible coda consonants.

After having presented the scenarios for differing syllabification between stimulus and response with the according stimulus lexemes, let us now present the method for the last topic, namely tone assignment. For this aspect, the methodology is partly different and does not follow the same scheme as for consonants, consonant clusters, and syllabification. In this paragraph about tone assignment, it comes to the differences between Experiment 1 and 2, which, until now, have not yet been described. They are described now as they matter mostly for our study on tone assignment. Let us first present our main research questions which determine our methodological choices. These questions again derive from the results of our loan data. In the loan data, it seems that Vietnamese phonology is the main factor for the assignment of tones. Still, for the loanword data, we have no information about f₀ patterns of the stimulus lexeme realizations. Probably, differing lexeme realisations with differing f₀-movements have been heard until a speaker of Vietnamese, even if monolingual, chose to borrow and use the lexeme in Vietnamese. But what happens if a speaker hears a stimulus lexeme with a certain f₀ movement only once? Will the imitation be different from the imitation of another speaker who hears another realization of the same lexeme, this time with a differing f₀ movement? If yes, does that mean that these speakers treat French as a tonal language? And what does that mean for loanwords? Do the differing f₀ movements only matter for tone or also for other issues? During the discussion of the results, we will come back to these questions and discuss assumed differences between real borrowing situations and our experimental approach. We also hope to get clearer ideas on how real borrowing processes may be structured, to what extent they are phonological and to what extent they are phonetic, and what this implies for monolingualism vs. bilingualism of the speakers.

Generally, as we do not have strong expectations or clear-cut hypothesis on that issue, we want to get an overall impression by examining a wide range of possible F₀ curves on the French stimulus just as it would occur in free speech and decide only after experiments were done to

focus on special curves which are particularly interesting. This is one of the reasons why we choose a not very controlled setting to elicit stimulus data. This stimulus data is elicited by asking the speaker of French to read the lexemes in two runs. In a first run, she receives no further instructions. The absence of instructions in the first run lets the speaker to realize all lexemes with a falling fundamental frequency. However, for our experiment design, we want to prevent exactly this: the monotonous realization of all lexemes with the same falling f_0 -movement. Rather, we want to have stimulus lexemes which represent more variety of intonational movements. Therefore, we ask her to read the same lexemes again in a second run. This time, she is asked to imagine different conversational situations of her choice in which the lexemes were uttered. With this approach, we have no access to which situations she imagined, but she could act relatively freely, which is closer to a natural conversation setting. As a result of the instructions in the second run, she realizes the lexemes with diverse f_0 -movements: sometimes with rising fundamental frequency, sometimes with falling fundamental frequency, and sometimes with other f_0 progressions. Since we have no assumptions about how speakers of Vietnamese would react to these different f_0 movements of the stimulus lexemes, we elicit the stimulus data in a not very controlled way as we wanted to get an overall picture. With the insights we will gain from the study belonging to these methods, it will be possible in the future to pursue more specific questions in a more controlled setting.

To summarize the preceding paragraph: a not very controlled situation delivers relatively natural and variable data. This method has advantages and disadvantages. Since we have already named the reasons for our choice and the advantages of this procedure, we now want to look at the two disadvantages under discussion in detail: one disadvantage might be that we are not able to choose the whole dataset for our quantitative study on tone assignment as the two runs do not always only vary in the shape of the fundamental frequency. Sometimes, both repetitions of one lexeme have a falling f_0 -curve but are differing in vowel length and tempo. Sometimes, they are differing both in f_0 curve and other aspects such as the above mentioned. This can be interesting for other questions but is a disturbing factor for this issue. We do not choose those items which are differing also in other aspects than f_0 -movements, for our quantitative study of f_0 measures and tone assignment. Still, we will reflect some of those differences and the results they cause during in our result section. However, in our favour and to mitigate this disadvantage, we evaluate only a small data set with acoustic measurements, because this is already very revealing and a further overview glance at other data seems to confirm this picture. Thus, it is not a problem that not all lexemes from this dataset could be used for the investigations of tonal aspects since an evaluation of all these data would have

meant a disproportionate amount of work with relatively little additional knowledge gain. Of minor importance for this study is the fact that we have no information about which concrete situations the speaker imagines when she realizes the lexemes with different f0 curves. Still, since it is not the focus of this work which conversation situation the speaker of French has in mind and which f0 progressions are mapped onto which conversational situations in French, but on the contrary what speakers of Vietnamese do when they hear and reproduce French stimulus lexemes with different f0 progressions, this is of minor importance for our work.

An interesting side effect of this method is that we have many lexemes with two concrete and differing realizations. This fact can not only be interesting for considering tone assignment but the f0 contour of a syllable can also have effects on the realization of segments and suprasegmental structures. Therefore, with this procedure, we do not only have intra speaker variability for the response within the participant group but can additionally check whether French stimulus lexeme intra speaker variability can have effects on various issues. Therefore, we include this as a possible independent variable also in the above discussed topics.

To conclude, what we discussed so far is one of the differences between the loan data and the experimental data: in the experimental data, we have two realizations of some stimuli, but each participant only hears one of those two realizations. In the loan data, we do not have any knowledge of the concrete realizations of the stimulus data. After having described how we choose the lexical items for the stimuli of our experiment, we now come to a detailed description of its design and its performing.

5.2.2. Design

With the 49 stimulus lexemes, we design two nearly identical experiments: experiment 1 and 2. All lexemes are the stimulus data of both experiments, but if we choose, for example, the stimulus realization of the lexeme *boyau* ‘tubeless tyre’ with a rising f0 contour in experiment 1, the same stimulus lexeme is realized with a falling one for experiment two. For *bamboo* ‘bamboo’, a lexeme realized with comparable f0 contours in both runs (rising vs. falling), the order is reversed: the falling contour is chosen in experiment 1 and the rising contour in experiment 2. Therefore, the number of falling, rising and other f0 contours is equally balanced in both experiments. In this way, we have two different realizations for many stimulus lexemes: while half of each speaker group participates in experiment 1 and hears one realization of a lexeme, the other half participating in experiment 2 hears the other realization of the same lexeme. In this manner, we can investigate how much variability in the stimulus may influence the response. Our experiment is designed with the help of the software SpeechRecorder

(Draxler & Jansch, 2019), developed for lab phonology and especially phonetics at the Institute of Phonetics and Speech Processing of the LMU München. This software, among others, has the advantage of automatically cutting the recordings of each run so that we finally have one recording per lexical item and condition (the conditions will be explained in what follows) and the advantage of randomizing the order but then reordering the obtained recordings so that we can quickly find the corresponding recording for one lexeme from all speakers. Another advantage of this software is that it makes the experiments easy to use by the participants.

Per lexeme, two conditions take place: the first condition is to simply repeat the lexeme, and the second condition is to insert it into the Vietnamese carrier sentence *Cái/cây/món này tên ... bằng tiếng Pháp* ‘This means ... in French’. In the carrier sentence, we choose *tên* ‘name/is named’ instead of the more usual alternatives *gọi* ‘call/is called’ or *là* ‘is’ because the tones on the latter are falling which could have caused progressive tonal coarticulation processes (cf. Brunelle, Hà, & Grice, 2016) on the target lexemes. With *tên* [ten^{A1}] ‘name/is named’, such process is unlikely to happen because the tone A1 realized on *tên* is a mid-level tone. The idea behind the two conditions is that in the first one, speakers simply reproduce what they hear. In contrary, in the second condition, they may adapt in a larger degree the material they just realized to Vietnamese because it is embedded in a Vietnamese sentence. To get insights into the phonological representations of the produced material in the speaker’s minds, we further develop our experiment design during our fieldwork trip and introduce a third condition: speakers are asked to finally write down the material they reproduced in condition 1 and embedded in condition 2. As Vietnamese orthography reflects phonology and even uses diacritics for tones, this approach provides information on how the reproduced material is represented on a phonological level in the speaker’s mind, see Figure 3. As condition 3 differs from condition 1 and 2 in that the latter are oral and condition 3 is written, there is the possibility that this has certain influence on the results: in step 3, not only phonotactic requirements may play a role but also graphotactic requirements of Vietnamese orthography. We do not deepen a consideration of this possible factor of influence in our thesis.

For each slide, a picture of the significant of each lexeme is displayed, as can be see exemplarily in Figure 2a-b. This has no further meaning for the experiments than to make them pleasant and entertaining for the participants and to distract them to avoid boredom, which would have been reflected in the realisation of the lexemes. However, it is not observed that the pictures could have distracted or confused the participants to such an extent that this could influence the realisation of the lexemes.

Figure 2a: Slide for the first condition (oral, isolation) for the stimulus *griffe* [gʁif] ‘claw’. Speakers listen to the stimulus in this step. *Hãy lặp lại* means ‘please, repeat’.

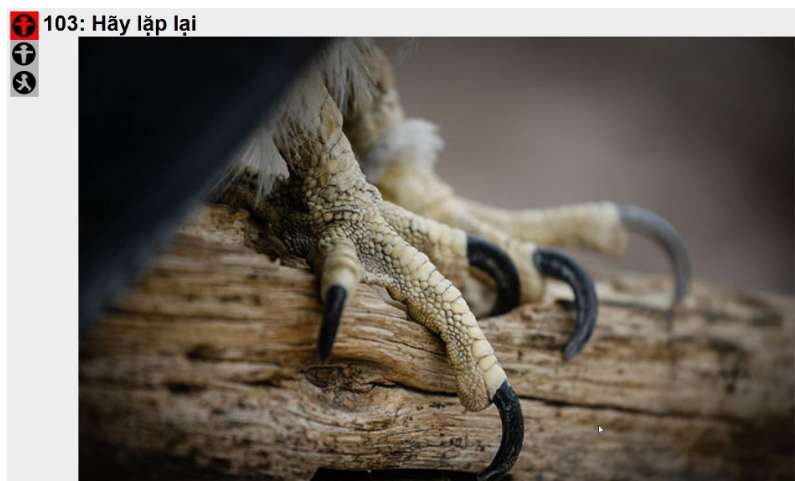
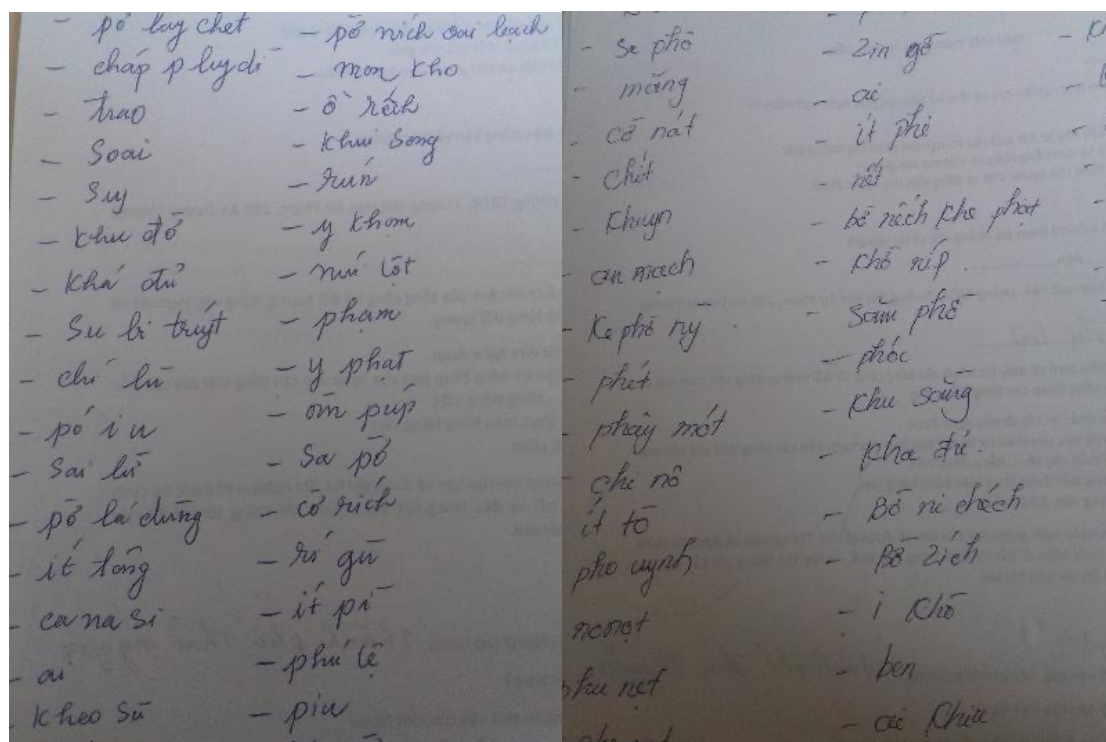


Figure 2b: Slide for the second condition (oral, embedding) for the stimulus *griffe* [gʁif] ‘claw’. Speakers do not listen to the stimulus again in this condition. *Vui lòng hoàn chỉnh: Con này tên ... bằng tiếng Pháp* means ‘Please complete: this means ... in French’.



Figure 3: Third condition (Writing): extracts of two exemplary transcripts made by two speakers.



After having described the experiment design for the experimental block 1+2, we have now reached the transition to the next section describing how the experiments have been conducted.

5.2.3. Procedure

In this section, we first mention the independent variables for the performance (dependent variables have been described in the previous section 5.1.2 and will be refreshed in the result section on p. 132). We also describe and justify in detail our choices and the circumstances, under which the experiments are performed. We finally move on to the description of the conduction. Our linguistic fieldwork was organized taking into account suggestions from Thieberger (2012) and Bower (2015).

Possible independent sociolinguistic variables are age, gender, and local variety. We disregard these variables in our study. The reason why we finally choose to not consider examining different local varieties is given in detail below. Gender and age are variables which are disregarded because they go beyond the scope of our study. A social independent variable which we control for, and which is most important for our study, is monolingualism vs. speakers of Vietnamese with expertise in French as a foreign or second language.

As we originally planned to also include local varieties of the south vs. the north as independent variables, experiments were conducted in both regions: the first location is Hồ Chí Minh City, the biggest city in the south of Vietnam, and the second two locations are Hà Nội, the capital

of Vietnam in the north and Thái Nguyên, a smaller town in the north with a distance of 80 km (1 hour by car) from Hà Nội. The plan to compare both varieties of the south and the north was abandoned during our trip due to several reasons and we only use the data gathered in the north, namely in Hà Nội and Thái Nguyên for our quantitative study. In Hồ Chí Minh City, we were working at Trường Đại Học Sư Phạm TP HCM (HCMC University of Education). We had a soundproof chamber to our disposition with all technical equipment which was necessary to get perfect recordings. Still, we met one problem: at first, we were in search of monolinguals, and there were only very few students with only a little knowledge of English, no one had none. Still, we recorded six of them. The day we did the experiment with the first real monolingual (the mother of a colleague was so kind to make her way to the university), we recognized a huge difference in the way of her performing and the performing by the students. Therefore, we started to search for other real monolinguals. The problem was that those we knew who had never (even not some weeks or months in the distant past) learned neither English nor Russian nor any other language were living far away from the University. As traffic in HCM City is stressful and it takes a long time to get from one place to another, we did not want to harm people after a hard-working day to drive to the university to repeat French words. Thanks to the colleague's mother, we finally solved the problem: she organized lunch with her friends from the block and invited us to join. This was very helpful, although the recordings were of course not as perfect as in the soundproof chamber. A more serious problem we met here was that the group was not very homogenous: some of the women were from HCM city and its surroundings, but others were from northern and central regions. We made one interesting observation during one experiment run: one of those women behaved more like the students with a little knowledge of English rather than the other monolingual women of her block. We asked her if she really had never in her life learned any foreign language. She conceded that she had learned Russian for a very short period many years ago but that she forgot everything and therefore at first did not count it. With this incident, the woman had helped us to prevent this problem in the future: When we continued to recruit participants, we always told everybody with more emphasis that participants like her were not monolingual in the way we needed them to be, even if they forgot everything they had learned in the past.

Finally, a friend invited us to visit his company, but there, we met the same problem as already described: as HCM City functions as a melting pot for all regions of Vietnam and is moreover very international, it was not possible for us to gather data of a homogenous monolingual group from the region in this short time period. Therefore, we finally had to abandon to consider the data we gathered in HCM City for our quantitative studies. But without the help of the

experience we got in HCM City, we would not have been able to control for many factors and exclude problems some of which the above described.

As a result, we decide to focus on the data collected in North Vietnam. There are two groups: a monolingual group and a group of speakers of Vietnamese who are learning French as a foreign language. As we were able to establish in advance contacts with the French Department of the University of Hà Nội, we started by recording students of French in Hà Nội and finally got 11 repetitions of experiment 1 and 10 repetitions of experiment 2 with speakers of Vietnamese who had learned French as a foreign language. In total we recorded 21 speakers. Thus, the street in front of the room we had to our disposition was quite noisy and classes were given in the adjoining rooms. Also, we would not have been able to get to know monolinguals in Hà Nội, because it is a quite international city, too and we had less contacts there. Therefore, we decided to run experiments with monolinguals in Thái Nguyên. It was much easier to find monolinguals in Thái Nguyên than in the big cities we had been before, even in the neighbourhood of the university; and thanks to the very helpful colleagues and cleaning staff working at Trường Đại Học Khoa Học (Scientific University) of Thái Nguyên. We recorded 34 speakers, 16 runs of experiment 1 and 18 runs of experiment 2 in Thái Nguyên. The room we had to our disposition at the department of literature, journalism and linguistics was much quieter than the room in Hà Nội: there was only a little echo, but the room was under the rooftop of the building so that no classrooms were around and the street in front of the house was more distanced and not as busy as in Hà Nội. This was the quietest room of the university.

An auto-critical objection might be that we choose two different locations, although both in the north and very close to each other, for the group of monolinguals and French as a foreign language speakers. At the end of our time in in Thái Nguyên, we were able to also contact a colleague of the French department, but this was too late for running again experiments with Vietnamese students of French. As we did not know in advance that we would be able to get this contact at all, we felt safer to run experiments at the French department of the University of Hà Nội, where we already had the contact in advance. Anyway, varieties from Hà Nội and Thái Nguyên are not very distant from each other and the students in Hà Nội are also not uniformly from Hà Nội either but partly from other northern regions. Therefore, it should not be drawn too much attention to the possibility that different locations of the northern area may have different responses, although this cannot totally be excluded. Other possible disturbing factors which are not included in our study are age and social class, as outlined briefly at the beginning of this section. The participants in Hà Nội are students aged 18-22 years, while the

participants in Thái Nguyên are on average 45 years old, with a dispersion between 24 and 66 years. The reason why we could not find participants of the same age group as in Hà Nội is that monolingualism is extremely rare in this generation. French as a foreign or second language speakers at a feasible distance from the university with an average age of 45 years would have been just as difficult as finding a large group of monolinguals in their twenties. Concerning the level of education, the monolingual participants, unlike the group of French students, did never attend University for studies. The reason why participants of both groups are not very homogenous in terms of education level is that it is much more likely that academics had or have some form of contact with foreign languages such as Russian or English during their studies or afterwards than non-academics. To the contrary, the professional groups of the monolingual participants (cleaning staff, parking attendants, owners of small groceries) practically exclude contact with foreign languages. Private contact with foreign languages is equally unlikely or, if at all, very rare, since Thái Nguyên, unlike Hà Nội and HCM City, is not a tourist city with a high percentage of people who do not speak Vietnamese.

To sum up, the recordings we did in Hà Nội with the group of students of French do not have an optimal quality due to the above-described background noise. But this was not the only reason why we decided to record some more speakers of the northern Vietnamese variety with French knowledge during a second trip to France. We also wanted to compare Vietnamese speakers of French as a foreign language and as a second language. Since these speakers have been living in France for some time, they have a completely different access to French as their second language than the Vietnamese speaker group with knowledge of French as a foreign language: one can assume that this group, unlike the group in Hanoi, is confronted with French on daily basis. Therefore, we cannot combine the results of these four people with the results of the group in Hanoi but must evaluate them separately. Unfortunately, due to the pandemic outbreak in early 2020, we decided to stop field research after having recorded only four participants (among them two did experiment 1 and two did experiment 2).

While we used a Zoom H2 for recordings in Thái Nguyên and Hà Nội, we equipped ourselves with an upgrade, namely a Zoom H5, in Paris. Also, we had a soundproof chamber to our disposition at the Institute LACITO at Université Sorbonne Nouvelle, which we finally did not use for these participants because they preferred to be recorded at home, but luckily in very quiet surroundings. The headphones the participants used to hear the stimulus signal were K121Studio both in Vietnam and in France.

To sum up metadata about the L1 speakers of Vietnamese group with L2 proficiency of French, there are two different groups with L1 speakers of Vietnamese and L2 French knowledge. The first one is a group of 21 bachelor students of French residing in Hanoi. French is not a second language for them, as they do not communicate in French in their daily life, but a foreign language they study in class. The second group is a group of four persons residing in France for some years and therefore speaking French as a second language in their daily life. The data of both groups have, as already mentioned, advantages and disadvantages, which is the reason why we decide to use the data of the group of 21 French as a foreign language speakers only for the study of tonal aspects and the other dataset of four French as a second language speakers for the main study on consonant and consonant cluster repair and syllabification as a reference for the monolingual group. The dataset we gathered in Vietnam is therefore larger. This is what we need for our phonetic study on tone, and we therefore decide to take the disadvantage that the data has background noise. The data gathered in Paris has no background noise, but we only have a small group of four participants to our disposition. As the study of consonants, clusters and syllabification is very extensive for the monolingual group and as patterns already emerge quite clearly for the four speakers, we decide to only take this smaller group into consideration. Also, for this study, it is more interesting to look at data of a group with a higher exposure to French, as we are interested in how different data can be if speakers have no vs. a high exposure to French. To the contrary, for the phonetic study on tone, it is more interesting to us to see if already a lower exposure to French may have a strong impact on the results.

After having described independent variables and circumstances under which experiments were performed, we now move on to describing the experiment conduction itself. Speakers are informed about the procedure by a detailed instruction written in Vietnamese. They are also informed that they could stop or interrupt the experiment at any time they wanted. Readers of this work find this instruction in the appendix on p.319. Afterwards, participants are asked to sign the declaration of consent if they want to participate after having read the instructions. This declaration can be found in the appendix on p.320. Speakers are also asked to give some information which is important for the metadata: their age, where they were born, where they grew up, which varieties of Vietnamese their parents speak/they use to hear in their daily live and to which occasions; and finally, if/when/how long they learned a foreign or second language; if yes, which one(s). The detailed questions about the regions/varieties are to find out whether a group was homogenous within itself or not and to make sure the participant's language proficiencies. The group from Thái Nguyên is most homogenous with nearly everybody coming from and living in exactly the same region. These questions together with

the invitation letter can be found in the appendix on p.318, and the metadata taken from an excel table where answers are translated into English, see p.321. The speakers are anonymized for reasons of privacy, and if readers wonder why there is a speaker 3 and 5, for instance, but no speaker 4 and instead a speaker 3A, we give the following explanation: tetraphobia traditionally plays a role in Vietnam, and the number 4, as well as 14, 14, 24 (but also 13), is avoided as it brings back luck. We respect the possibility that speakers may feel inconvenient if they are assigned one of these numbers and therefore use a system which is often made in elevators or parking slots as well: we replace the number 4, for instance, by number 3A.

An experiment run starts with a short training session. When the experiment is done, participants get a little present or are paid. Participants in HCM City as well as the students in Hà Nội could choose between different souvenirs from Berlin, branded cosmetics, and costume jewellery. Students of French also get feedback on their French pronunciation if they wish. Participants in Thái Nguyên are paid with an amount of 100 000 VNĐ which was suggested by a colleague of the department. One run including instruction lasts around 20-30 minutes, if participants take their time to talk a bit after or before the run was done, which often happened, 30-40 minutes. As to the runs in Hà Nội, we ask the students to read a short text in French and to have a short conversation in French with the experiment conductor to have some idea about their phonetic and phonological proficiency in French and which takes about 5 minutes (General language tests often say little about how well a language learner has mastered pronunciation, cf. Derwing & Munro, 2015). As to the runs in Thái Nguyên, the third condition we described in 3.2.1.2. (orthographic transcription by the speakers themselves) is added to the procedure. Vietnamese speakers in Paris are also asked to write down the orthographic transcription of each lexeme but with a slightly adapted instruction: as they know both the Vietnamese and the French writing system, they are asked to write down each word as if it was/had become a Vietnamese word, and to use the Vietnamese orthography, not the French one. This more detailed instruction is not necessary for the monolingual speaker group in Thái Nguyên as they only have one orthographic system to their disposition, namely the Vietnamese one. Also, the four speakers in Paris participate in pairs on a short recording session where they speak to each other freely about a topic of their choice in French. We only ask them to avoid topics which are too private to be recorded. This is to get an overall impression about how strong their Vietnamese accent generally is and whether there is a difference between repairs made during the imitation task and in free speech. We will not be able to carry out this comparison in detail within the framework of this thesis but leave it up to the future. In Paris,

we payed 15 Euros per participant. After having described the circumstances, we now move on to how experiments were edited to be ready for the analysis.

5.2.4. Data editing

In this chapter we start by describing the methods we apply for the segmental transcriptions which can be used in our studies concerning single consonants, consonant clusters, specific syllabification patterns and phonological considerations of tonal aspects. For the phonetic study on tone, we used another procedure. This method is described at the end of this section.

Oral results are transcribed by the researcher and the orthographic transcription by the participants themselves typewritten. Most of the participants wrote well legibly, for some we needed some training and time for deciphering and finally there are only two participants for whom many items could not be deciphered at all.

The pronunciation can be mostly derived from the orthography and the orthography can be easily converted to IPA. We have done this automatically for the loanword data with the help of an IPA script (cf. p. 66). For the reason that this experimental data is very extensive, we do not convert orthography to IPA for each speaker for each lexeme, as this would cost us time to convert the total of 1700 orthographic responses for the monolingual group alone, even with an automatic script. After all, there are always things that must be added by hand, for example, when participants have written down structures that do not correspond to native Vietnamese structures, for instance the consonant clusters in <plai sɔ> transcribed by one speaker or <clai sɔ> by another corresponding to French *glace*. In this case the script gives an error message. This is also the case if participants have used a spelling variant that does not correspond to the Vietnamese standard but is rather used in the chat, e.g., the spelling of the [z] by the grapheme <z> instead of <d> or the grapheme sequence <gi> (cf. Michaud, Nguyễn, & Pham, 2016). For instance, the orthographic transcription corresponding to the French stimulus *gigot* [ʒigo] by one speaker is <zi gù> and by another [di gù]. Both can be phonetically transcribed as [zi^{A1} yu^{A2}] but the second refers to the standard writing form and the first to the writing form used in text messaging, which is not implemented in the script. Although most participants do not belong to the youngest generations, it seems that many of them have caught this trend to use the grapheme <z> for the sound [z]. Also, some speakers make use of the trend to spell the sound sequence [ik] as <x>. For instance, a written response of one speaker <x khan>, corresponds to the oral conditions [ik.khan] and the stimulus *écran* [e.kʁɑ̃] ‘screen’. So far, we have described the editing of the third step, the orthographic transcription by the participants.

Let us now turn to the first two conditions and discuss how we edit the oral data. Remember that the first step is to imitate the stimulus and the second step is to embed the response in a Vietnamese carrier sentence. Again, we first transcribe them according to the Vietnamese orthography, since this procedure is more time-efficient for us on the one hand, and on the other hand the data could be compared immediately with the data of the writing condition. Sometimes, however, speakers pronounce a sound in a certain way which is perhaps unusual in Vietnamese, and Vietnamese orthography fails to reproduce this in such a concrete way. In these cases, we use the IPA for the corresponding sounds and describe the phonetic characteristics even more precisely than is possible with the IPA. This is the case, for example, when it is unclear whether a sound is aspirated or not, because it neither clearly shows the characteristic [+ aspirated] nor the characteristic [- aspirated] but can be located somewhere between binary categories. To summarize, we transcribe the oral stimuli according to Vietnamese orthography, punctually complemented by the IPA and more detailed explanations of fine details beyond binary classifications. The fact that we do not convert the oral responses of the two oral conditions completely into IPA is again a time efficient decision. Moreover, this way it is immediately recognizable whether a response corresponds to the native Vietnamese syllable structure or not: if everything is written in graphemes, the structure is perfectly Vietnamese, but if some IPA symbols are inserted, this indicates segments and structures not allowed or common in native Vietnamese. Due to the procedure just described and the resulting mixture of phonetic signs and graphemes of Vietnamese orthography, the effort would have been much greater than pressing Enter once and running the automatic script through the data. However, when we evaluate our data in the results section, we provide a complete IPA transcription for the selected data which we document exemplarily. Readers with knowledge of Vietnamese and its orthography will be able to deduce from our whole dataset the pronunciation anyway. For those to whom the documented examples in the results section are not sufficient, but who do not know Vietnamese, we recommend using the script Vphon (Kirby, 2008) for the items they are particularly interested in. In (33), we document some examples to illustrate our editing procedure.

(33) Raw data editing, four examples

	First oral condition:	Second oral condition:	Third condition:
Stimulus	Isolation	Embedding	Writing
<i>gigot</i>	[dʒ̥]i.gô	zin.gò	zin gù
<i>crépuscule</i>	phe.ne.[ts]i	phê.chi	pé chu

<i>yeuse</i>	[d̥z̥]úi	ruói	ruói
<i>piáf</i>	phe[p̥f̥]	phep	phep

Whenever we use items as examples during the result section, we additionally transcribe them according to the IPA. Although we have, in the above-described procedure, also used the orthographic diacritics for Vietnamese tones for syllables which are characterized by the typical tonal features in Vietnamese, we do not transcribe tonality in the IPA transcripts of the oral results, as we cannot be sure if the features were by chance similar to Vietnamese tones or intentionally and mapped as such. Also, we would have to do perception experiments with a certain number of speakers of Vietnamese to have insights on if they would map the syllables to tones and if yes, to which ones. We did test our transcription method against the perceptual evaluation of one speaker of Vietnamese, but this is far too little evidence to be sure about tonality in the oral conditions, which is why we do not specify it for tonality in examples we provide in IPA. This can only be sure in the transcription of the writing condition into IPA, as the speakers there decide for themselves if they want to assign tone diacritics or not. Therefore, in the examples we provide for the two oral conditions, there is no IPA transcription of tones, only in the writing condition.

As for the dataset of the four speakers of French as a second language we transcribe the whole oral dataset directly according to the IPA (as this is a smaller dataset, this is a less huge amount of work compared to the dataset of the monolingual group). The rest of the procedure is just as for the monolingual group data: written data is typewritten. For this speaker group, we have 49 lexemes x 4 participants x 3 conditions, which makes 588 responses in total. Additionally, we have edited data of 5100 responses for the monolingual speaker group. These consist of 49 lexemes x 34 participants x 3 conditions. This makes in total 5688 responses both speaker groups added together. After having transcribed all the data of these two groups, we order and label them in an excel file which we subsequently undergo a restructuring, ordering and labelling. A link to the list of the transcribed raw data as well as the recordings can be found in the appendix on p. 321.

On the left-hand side of the table, we find information about the stimuli (column A-P): the stimuli themselves follow the syllable number, the onset- and coda consonants under investigation, onset- and coda clusters under investigation, syllable structures under investigation. Onset- and coda consonants are grouped into features (manner and place of articulation) and consonant clusters are also organized into several groups: onsets vs. codas,

whereas we have a special look at onset clusters and divide this group into C+[ɣ] vs. C+[l], as we expect different results for those groups, referring to the loan results.

The next columns (Q-T) are important in terms of metadata: experiment 1 vs. 2, the monolingual group vs. the group with French as a second language knowledge. The following column provides information which condition is referred to: 1 (imitation in isolation), 2 (embedding in a carrier sentence) or 3 (orthographic transcription by the speakers).

On the right-hand side, we find all the information about the results: first the results themselves, then two columns with more detailed remarks on general and tonal aspects. These partly very detailed remarks have been made rather for us, but we allow readers to take a look and to have an insight in our thoughts and the whole working process. As to the use of tone diacritics in the raw data annotation of the oral conditions, we only make use of these diacritics for an orientation to see if f0 movement which come close to Vietnamese tones in the oral conditions will receive a Vietnamese tone diacritics in the writing condition. Still, as we cannot be sure if these f0 movements are simply imitations of French intonation contours or if speakers assign Vietnamese tones, we do only use these diacritics in our raw data for a personal orientation, but not in the result section. If an f0 movement is difficult to categorize into a Vietnamese tone category, we point out to this in the remarks about tones. What follows are columns with different result information, among them information about adaptation patterns of single consonants, consonant clusters and syllabification. All these descriptions will be exposed in greater detail at the appropriate point when we discuss the results. For the different syllabification phenomena we list all the structures for which we expect gemination on the left-hand side of the table: for instance, if we expect a certain consonant in a certain segmental and syllabic surrounding to be geminated. Each stimulus item is written in one line. If the response surfaces with the expected pattern, we put a yes into the column for syllabification on the right-hand side and a no if the expected pattern does not surface. This procedure is applied to all phenomenon investigated in our main part. What we have described so far is the first table in the excel file, which is called *experimental data Vietnamese*. There are six additional tables. These tables are used to contrast or to combine the results of single onset consonants to/with single coda consonants, which the ordering in the first and main table cannot deliver.

Extensive and detailed insights into the results of our data are displayed with the help of numerous mosaic charts and contingency tables. Complete numbers in the contingency tables increase the transparency of very detailed and complex results. Still, we aim at being as clear as it is possible which is why we decided for easily understandable visualizations by mosaic

charts. Dependent variable values are marked in different colours, while missing data is marked in grey colour. We still have missing data included in our charts and tables to be complete and transparent. Charts and tables are created in JMP, a statistics program which can be used for free by students of Freie Universität Berlin. Our decision to create charts with this program instead of python or R is motivated by the fact that it would have costed us much more time to create equally good-looking graphs in python or R.

Additionally, as we have a large amount of quantitative data to our disposition, we evaluate it statistically. Our task herein is to find out whether certain structural linguistic features are dependent from several independent variables such as the speaker group or the position of the structure in a syllable. This can be done by modelling the features, namely the dependent variables, and the different independent variables as random variables and apply pairwise tests of independence between the independent and dependent variables. Stochastic independence of two random variables means that the distribution of one is not affected by the other. Let x and y be two random variables independent from each other, then the following equation

$$p(x, y) = p(x) p(y)$$

applies, where $p()$ indicates the probability of occurrence. All variables are categorial variables, therefore the method of choice is the Pearson's χ^2 test of independence, where we aim to reject the null hypothesis of independence. If the null hypothesis is rejected, then the assumption that the dependent variable is stochastically independent from the independent variable cannot be proven by our data, which supports the hypothesis that the independent variable might influence the dependent one. The Null-hypothesis of independence is to be rejected if the computed p-value is below a predefined significance level α (in this work, we set it to 0,05 which means 95% confidence interval).

A χ^2 test of independence can be applied to data of samples of unequal size where variables are nominal or ordinal, which is the case for our data. There are several assumptions of the χ^2 test of independence (cf. McHugh, 2013), and we mention two of them, for which it has to be discussed if they can be verified for our data. The first assumption is that study groups must be independent. This is very important in medicine, for example if we consider a medication and participants are relatives, then they are not independent. In a strict sense, this is not always met in our experiment design: for instance, if one speaker utters one lexeme two times in the two oral conditions, and if these are then grouped together, the two repetitions are not independent from each other as they are uttered by the same speaker. If a consonant cluster in the stimulus

is repaired in the first repetition by epenthesis and in the second by deletion, there is, strictly speaking, a dependence of both. A problem which cannot be solved in retrospect and which we do not want to gloss over is that we have designed our experiment before we have equipped ourselves with the necessary knowledge to set up an experimental design perfectly suited for statistical investigations. The article *Researcher degrees of freedom in phonetic research* (Roettger, 2019) points out to problems which exist not only in phonetics but also in other linguistic disciplines. In this sense, we disclose that we have in our beginner's overzealousness set up too many independent and dependent variables, and the data gained is thus very multidimensional. Still, the χ^2 test of independence seems to us the test which fits best to our data, and even if from a statistical perspective, problems must be discussed and a confirmatory strength is limited, we consider the results revealing and instructive. Another consequence we had to deal with in analysing our data is that oftentimes, there are too many variable values to get clear insights in which variable values may be responsible for the fact that the null hypothesis can be rejected. Therefore, we consider subsets of values whenever this provides a clearer picture. Herein, we concentrate on the most relevant variable values for our research hypotheses. We apply a two-step approach: first, we look at our mosaic charts and contingency tables for anomalies. Second, we analyse them further by applying the test. Let us conclude these considerations with the second assumption which should be verified when applying the χ^2 test of independence, and which is not a problem for most of our data: we do only run the independence test if sufficient samples are available. This is the case if for at least 80% of the cells, the expected frequency is at least 5 (cf. McHugh, 2013).

After having described the procedure for most aspects under investigation, we now move on to a detailed description of a special procedure for our smaller phonetic study on tonal aspects. For our study on tonal aspects, we decide additionally for a different procedure as we are not interested in segments but f_0 values. If we look at the orthographic transcriptions by the speakers, of course, we can see whether they map certain f_0 progressions to tones of Vietnamese. This, of course, is insightful from a phonological perspective, but we additionally want to get phonetic evidence for these findings which complements the phonological evidence and makes it stronger. Therefore, we investigate a phonetic study of the f_0 values. As readers may remember, f_0 values do not cover the whole characteristic repertoire of Vietnamese tones, but they are in the focus of this study as a main characteristic of the investigated tones B1 (high-rising) and A2 (mid-falling). In the framework of this study, we limit ourselves to these two tones but could expand our investigations in the future to other tones and tonal characteristics.

For the phonetic study, we first segment the recording of each lexeme under investigation in PRAAT, following the segmentation criteria provided by Turk, Nakai, and Sugahara (2006) and Ladefoged (2003, chapter 6). Then, we mark the tone bearing unit, which is the rhyme in Vietnamese (cf. Coupe 2014) and make manual adjustments to the pitch settings if the fundamental frequency is not displayed correctly in the automatic settings. For some items, we must change the voicing threshold settings manually, for instance, if the screen displays an octave jump in the visualization of the f_0 values in the programme PRAAT. Our listening impression then is a first orientation. If we could not hear the octave jump with our musically well-trained ear in the signal, this is a sign that we should change some settings to get the f_0 movement visualized as we hear it. The fact that, for instance, strange jumps which are not audible disappear by increasing the voicing threshold is a good indication for problems which arise due to aperiodic background noise. We must do some manual adjustments for the data collected in Hà Nội, as the room we had to our disposal in Hà Nội had a lot of background noise. As to the data collected in Thái Nguyên, less adjustment is needed.

Subsequently, we extract the f_0 values for each tone bearing unit at 20 equidistant points which results in the normalization of time. Finally, we insert the values for each tone bearing unit under investigation in a self-written R script for each group of investigation for each stimulus realization (i.e., falling vs. rising f_0 of the tone bearing unit in syllable 2 in *bamboo/boyau*). With the help of this R script, we create graphs with mean and standard deviation. Using R for this specific task is easier for us than using the statistics program JMP we use to create contingency tables and graphs for visualizing other results. The reason is that for this task, a good visualization causes less complications for us in scripting and as certain functions we need here work less good for us in JMP. After having described in detail our experimental methods from the choice of stimulus lexemes to data editing and statistical analysis, we move on to presenting our results on segmental, syllabic, and tonal aspects.

5.3. Results

Investigating loan data has been fruitful to shed light onto issues regarding repair of illicit segments, consonant clusters, syllabification, and tone. But as we want to get a more detailed view at these issues from another perspective of language contact, we choose to continue with a production experimental approach. The main goal is to find out peculiarities of the experimental data, not only respective to loan data but also to test several variables within the experimental data itself: among other variables, we want to compare data of two speaker groups,

monolingual speakers of Vietnamese, and speakers of Vietnamese with second language knowledge of French.

At the onset of this chapter, it appears necessary to recapitulate from our results on loan data that these results do not deliver evidence for the possibility that borrowers could have been bilingual to some extent, but also do not deliver strong counter evidence. This is so since a control group is simply missing. If we want to be more explicit about this issue, we need a monolingual group for comparison. In this way, we can address questions we had asked ourselves when looking at loanwords with a more significant and controlled set of data than with loans (i.e., can exclude the possibility of reading adaptations, see p.25, and come to more detailed conclusions.

Still, we emphasize that this experimental approach captures only one of various potential aspects that also play a role in borrowings. In the previous chapter, we have addressed the question how borrowing processes might have looked like about hundred years ago. But as we imagine borrowing to be a very complex and multidimensional process with so many different heterogenous actors, definitive conclusions about the discussion on monolingualism vs. bilingualism in borrowing are not what we strive for with the perspective change to an experimental approach. Instead, in this chapter, we leave this question aside to focus specifically on contemporary synchronic aspects: we are able get a comprehensive idea on processes active in imitation when the stimulus items are not the first language of the speakers. We will then be in a position to return to diachronic questions with fresh hypotheses: as imitation can also play a role in certain borrowing contexts, this very specific experimental perspective sheds light on very specific problems which could be active also in very specific borrowing situations.

More interesting than a comparison of two very different datasets is to consider the findings on experimental data as interesting findings in themselves. Comparing the results to the loan data results and finding parallels and differences is therefore only one perspective. Another is to learn more also about mechanisms in second language acquisition and to find out more about the difficulties to deal with prosodic aspects of a languages we are not familiar with, or which are very distinct from our first language in production. The investigation is of quantitative and qualitative nature, as we have a large dataset but also want to present certain interesting patterns in more detail. Overall, with a larger amount of data than for loanwords, we have insights on what might happen in imitation processes, which also may play a certain role in borrowing, but in many other settings such as second language acquisition.

The main questions we address in all the subchapters of this chapter are very similar to the questions we have addressed in the chapter about loans (see p.67):

- 1.) Which are the repair strategies speakers of Vietnamese choose when they are asked to reproduce French stimulus lexemes they have heard before?
- 2.) What can we learn from this about the two languages Vietnamese and French?
- 3.) And what can we learn about universal mechanisms of language contact?

Let us now present the independent variables and related hypotheses which are the same for the data presented in the next subchapters. They are not analysed in detail for all aspects, but potentially play a role.

- a) Stimulus intra-speaker variability (Experiment 1 vs. 2): we expect rather little or no strong difference if the same stimulus is produced by the same speaker but with different f_0 movements for all aspects except tone assignment. Of course, fine-grained phonetic differences between the two stimuli can lead to different perceptions and therefore influence production results also for the other aspects. If the stimulus intra-speaker variability for these aspects is low, this strengthens the reliability of our result patterns. If it is high, then it is either a hint that our dataset is not big enough to make final predictions or that fine-grained phonetic details matter more than expected.
- b) Three conditions: if there are differences between the three conditions and the lexemes become more and more Vietnamese from the first to the third condition, this gives us evidence that in this experimental setting, material is adapted step by step, which in turn could be taken as first modest evidence for a step-by-step adaptation in borrowing processes involved in loanword adaptation as well. If there are differences but if those are not stable, then there is less evidence for the abovementioned assumption. If there are no systematic intra and inter-speaker differences between the three conditions at all, then there is no evidence for this assumption.
- c) Different segmental material: as our loan corpus does only partly deliver enough data to make predictions for all the issues concerned, we have no strong predictions but only directions: are place and manner of single consonants important for which adaptation pattern is chosen? Are features or rather position of consonants in clusters decisive?

- d) Two speaker groups: this is a variable for which we expect systematic differences. We expect the monolingual speaker group to be more similar to the loan data, but we have no predictions in which manner both experimental datasets differ from each other.
- e) Onset vs. Coda position in a syllable. We expect more adaptations to occur in coda position.
- f) Syllable number is a variable of minor importance and only discussed for some aspects. Our stimulus corpus consists of mono, bi- and trisyllabic lexemes.

In the following, we start with presenting the results for single consonants. This is important as we can only deeply understand patterns emerging in consonant cluster repair if we have a look at single consonants before. We continue with syllabic aspects by presenting results for consonant cluster repair and subsequently tackling the issue of syllabification. The studies of cluster repair and syllabification are in focus of our investigation and done in the greatest detail. Finally, in a smaller case study, we present preliminary results for tonal aspects.

5.3.1. Segmental aspects: single consonants

Single French consonants which are illicit in Vietnamese are mainly replaced by licit consonants by speakers of Vietnamese. Whereas many of French onsets have their direct Vietnamese counterpart, much more is expected to happen for codas, as the Vietnamese coda inventory is relatively small, compared to the French one. We recapitulate two examples for consonant repair from our loan data: for onset repair, we have the loanword *sóc* [sok̚p^{D1}] from French *choc* [ʃok] ‘choc’, in which the initial [ʃ] is replaced by an [s], an example for coda repair is *caramen* [ka^{A1} za^{A1} men^{A1}] from French (*crème*) *caramel* [kaʁamɛl] ‘crème caramel’, in which the final [l] is replaced by [n].

Our main hypothesis for single consonants is derived from our loan results:

French consonants lacking a direct counterpart are replaced systematically by similar segments. We therefore focus on consonants which are illicit according to Vietnamese phonotactic constraints.

In this subchapter, we present results for French single consonants which lack a direct counterpart. At first, we provide an overview picture and then discuss step by step the different independent variables. We also provide examples to illustrate qualitatively findings of special interest. Finally, we summarize the broad lines of our results.

At first, we provide a general overview, showing proportions between different repair strategy groups: *deletion*, *epenthesis*, *consonant replacement*, and *vowel replacement*. Moreover, we

have the group *ambiguous* and the group *missing data*. While the missing data items are mainly because the handwriting of two experiment participants is hardly decipherable, we will have a closer look at the group with the ambiguous items later. It is also possible that the respective sound segment, although illicit in Vietnamese, remains just as in the stimulus, these instances are called *no repair*. Finally, we also have instances of repair of the single consonant by a cluster. As a single consonant slot splits into two components, we call this strategy *fission*.

In what follows, we give one illustrating example for each of the other above-mentioned result groups, which will be more important in the following. Only the strategy *fission* will be shortly dealt with separately afterwards. For the other and more important groups, the exemplary stimulus is the same for all the results displayed below: it is the stimulus lexeme *saule* [sol] ‘willow’ from experiment 2. Its single consonant [l] is illicit in Vietnamese. For deletion, one result is [so], for epenthesis [so.lɿ], for consonant replacement [son] and for vowel replacement [suu]. In deletion and consonant replacement, speakers preserve the syllable number of the stimulus. Still, preserving the coda consonant would lead to an ill-formed structure in Vietnamese, which is why it is either deleted or replaced. If epenthesis is chosen, speakers decide for preserving the segment, but to have a well-formed Vietnamese syllable structure, it becomes the onset of an additional syllable. This way, faithfulness to Vietnamese structures seems important to most speakers, and to produce well-formed Vietnamese syllables, they cannot be both faithful to the stimulus syllable number and segment identity. A taxonomically ambiguous case is [son.lɿ]: the illicit coda consonant could be considered as replaced by a [n], but as its slot is doubled, it can be preserved in the second, epenthetic syllable as an onset. It seems that speakers who realize such structures strive to preserve both, a coda consonant, and the segmental features of this consonant, which, however, is not a licit coda, and therefore double its slot. Should we consider this repair as replacement or epenthesis? Should we assume that both strategies apply at the same time? Or should we assume a single, but even more complex strategy? Later, when it comes to syllabification, we look in a more detailed way at gemination and consonant slot doubling cases like these and deal with them in 7.3.3. Finally, there is one strategy of small frequency and minor importance: this strategy could be described as *fission*, as it results in a cluster although the stimulus is a single consonant. There is no example for the stimulus *saule* which results in a cluster, and we therefore give the example for the stimulus *pas* [pa] ‘step’, which results in [pfap]. For this example, the phenomenon occurs in onset position. As clusters are illicit in Vietnamese, its motivation cannot be to make the lexeme sound more Vietnamese, and speakers may rather not operate in their native phonological mode. It could rather be a hypercorrection phenomenon or be due to

misperception issues, and speakers may operate in a phonetic mode. As this strategy occurs very rarely, we do not consider it in detail, and only provide two more examples, see (34).

(34) Examples of fission for French stimulus single consonant which are illicit in Vietnamese

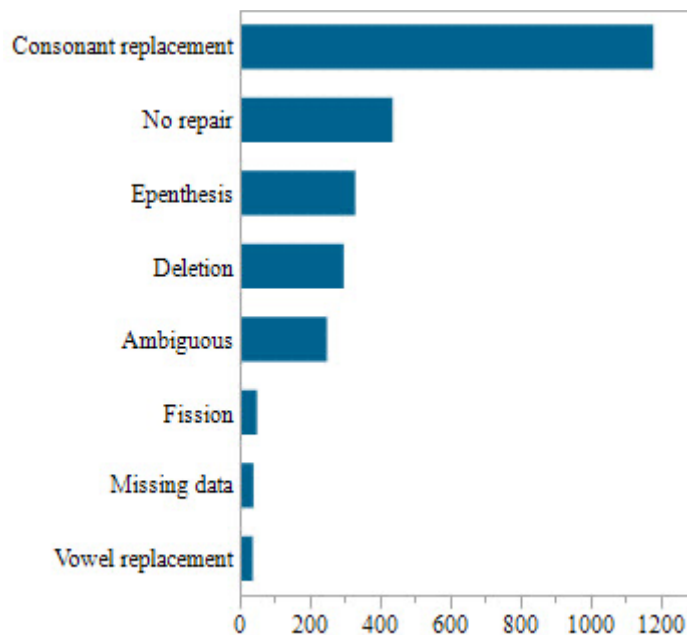
Stimulus	IPA Stimulus	IPA Result	Glosse
a) <i>griffe</i>	[gʁif]	[ripf]	‘claw’
<i>glace</i>	[glas]	[kɤ lats]	‘ice-cream’

The first of the two consonants can be explained with a regular replacement pattern: the coda consonant [f] or [s], which is illicit in Vietnamese, is replaced by the licit consonant [p] or [t]. Still, it is followed by the illicit consonant [f] or [s], as if the speaker has tried hard to imitate the strange and unknown sound faithfully, first not succeeded and then had another try.

From the picture of the experimental data, we can see that the repair strategies deletion and epenthesis not only play a major role in consonant cluster repair but also a certain role for single consonants. Vowel replacement also plays a certain, but minor role in both. The parallels between single consonants and consonant clusters, which are not so strong in loans but stronger in the experimental data, will be discussed after the presentation of consonant clusters (see p.277). Still, for single consonants, we focus on replacement, while we will not concentrate on replacement for clusters. This is so because after having understood how replacement works for single consonants, we can see that these same patterns can occur also for consonants occurring in clusters. This process of consonant replacement happens to consonants independently if they are in a cluster, and does not affect how a cluster is repaired: the replacement of one or two consonants in a cluster is not a decisive factor for which cluster strategy is chosen, neither in loans nor in the experimental data, and if we have once understood how replacement takes place in single consonants, we can transfer this knowledge to replacement patterns in consonant clusters but do not need to bring back this issue when discussing cluster repair strategies. In table and chart 23, we provide an overview of the proportions between different repair strategies in the whole dataset.

Table and chart 23: overview proportions single consonant repair strategies which are illicit in Vietnamese

Class	Number	Percent
Consonant replacement	1181	45
No repair	436	17
Epenthesis	330	13
Deletion	297	11
Ambiguous	249	10
Fission	49	2
Missing data	39	1
Vowel replacement	37	1
Sum	2618	100



From this proportional overview picture, we can derive that consonant replacement is the most frequent strategy, with 45%. The category with the second highest percentage is where we find no repair with 17%, which is much lower and closer to the percentages of epenthesis and deletion with a nearly equal percentage of 13 and 12 %. Of these three categories, only the latter, namely deletion, is also attested in the loan data whereas the first two, preservation of illicit consonants and epenthesis are never chosen in our loan data. The category with ambiguous data is a bit lower with 9%, while the categories cluster with 2%, vowel replacement with 1 % and missing data have the lowest frequency. Relative probabilities, of course, depend on the stimulus lexemes and occurrence of segments within the lexemes, therefore it is possible that another dataset would have led to different proportions. Which factors potentially determine the results, the choice of the different repair strategies? The independent variables and hypotheses we investigate are

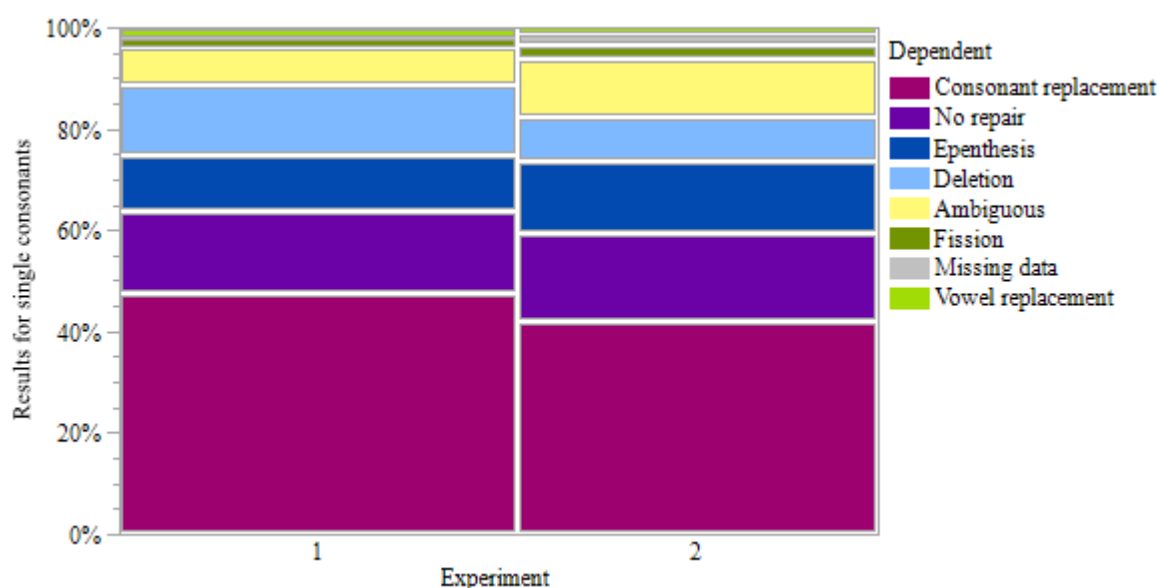
- a) The stimulus intra-speaker variability (Experiment 1 vs. 2), expected to be low.
- b) The three conditions (imitation, embedding in a carrier sentence and orthographic transcription), which we expect to be different from each other.
- c) Different stimulus consonant segmental material, which we group under the features place of articulation (coronal, dorsal, labial) and manner of articulation (plosive, fricative, others). We have no hypothesis on this issue.

d) We continue by presenting the variable speaker group (monolinguals vs. speakers with second language knowledge of French). Herein, we expect the second language speakers to rather preserve segments instead of repairing them according to the native Vietnamese phonotactic requirements, which is expected for monolinguals.

e) Finally, we present onsets vs. codas, which we expect to pattern differently. For the examination of the other independent variables, onsets and codas are pooled together, and only separated again if a more detailed look is necessary to explain the results.

For all variables, we provide contingency tables and mosaic charts. After a closer look at the diagrams and contingency tables, we refine our hypotheses and perform chi² tests for individual groups within the different variables to gain more detail. Thus, the diagrams and contingency tests each provide a general overview, while explanations and examples are driven by refined hypotheses. Let us begin with the stimulus intra-speaker variability, see chart and table 24.

Chart and table 24: single consonants: stimulus intra-speaker variability as independent variable with the values experiment 1 vs. 2; and the result categories ¹⁹for single consonants as dependent variable values



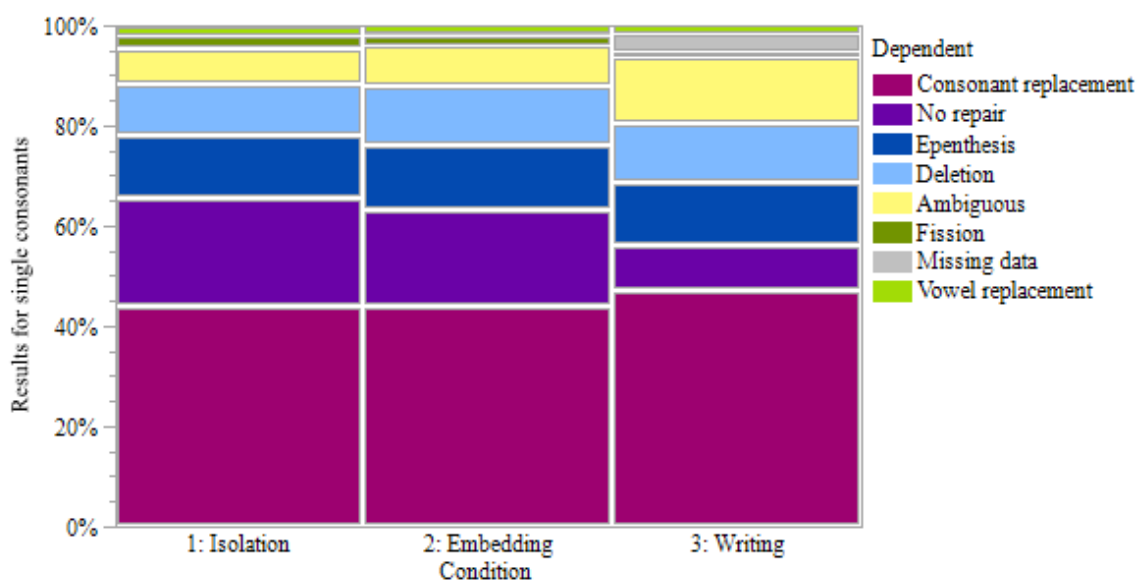
Number Percent	Cons. replacement	No repair	Epenthesis	Deletion	Ambiguous	Fission (Cluster)	Missing data	Vowel replacement	Sum
Exp. 1	659 47,75	222 16,09	153 11,09	190 13,77	105 7,61	19 1,38	5 0,36	27 1,96	1380
Exp. 2	522 42,16	214 17,29	177 14,30	107 8,64	144 11,63	30 2,42	34 2,75	10 0,81	1238
Sum	1181	436	330	297	249	49	39	37	2618

¹⁹ The grey colour is chosen for categories we do not focus on but which we include to deliver a complete picture

A first glance at the proportions in chart and table (24) shows us: proportions are not totally the same but quite similar between experiment 1 and 2. Actually, the intra-speaker variability is the only variable we expected to have only little or no influence on the tested dependent variables. Our hypothesis seems partially confirmed: a potential influence cannot be very high if we compare proportions for several categories. Still, for the whole data, the null hypothesis can be rejected as the p-value is below 0,0001, which is why we continue by testing subsets of dependent variables to see which of those might lead to this overall result. Most similar is the category *no repair* with 16 vs. 17%²⁰ in experiment 1 vs. 2, the highest differences can be found for deletion with 14 vs. 9%. The result of the Pearson probability χ^2 test for the pair deletion vs. epenthesis is that the null hypothesis can be rejected with the p-value of 0,0001, but for instance for the pair epenthesis vs. no repair or the pair no repair vs. consonant replacement, the null hypothesis cannot be rejected, and the p-values are 0,2119 and 0,0802. The fact that the null hypothesis cannot be rejected, as the p-value is not below 0,05 for most pairs, can be seen as a confirmation of our hypothesis. If the inter-speaker variability of participants leads to a not perfectly even distribution for all dependent variable values, this could be due to personal preference of speakers to use rather one strategy than the other and could probably be outbalanced by more data: two participants in experiment 1 have the tendency to rather use deletion. Overall, proportions are similar and comparable for experiment 1 and 2. After having addressed the independent variable stimulus intra-speaker variability, let us now proceed to the next independent variables, for which we can observe stronger frequency differences between the dependent variable categories than for the just presented independent variable of the intra-speaker variability. The next independent variable is the condition, and its values are imitation in isolation, embedding in a carrier sentence and orthographic transcription by the participants which we also refer to as the writing condition (see chart and table 25).

²⁰ In the continuous text, we always give rounded values in integers for percentages to increase the readability, whereas we provide more precise numbers rounded to two decimal places in the tables.

Chart and table 25: single consonants: conditions as independent variable with the values isolation, embedding and writing; and the result categories for single consonants as dependent variable values



Number	Cons. replacement	No repair	Epenthesis	Deletion	Ambiguous	Fission (Cluster)	Missing data	Vowel replacement	Sum
1 (isolation)	386	189	108	90	60	26	1	14	874
2 (embedding)	385	168	113	105	71	17	3	12	874
3 (writing)	410	79	109	102	118	6	35	11	870
Sum	1181	436	330	297	249	49	39	37	2618

Referring to chart and table 25, we can see that the first two conditions are against our expectations quite similar whereas differences to the oral conditions arise in the writing condition. Our expectations are that the lexeme gradually becomes more Vietnamese from the first to the third condition. Therefore, expectations are again partially confirmed in that this holds only for the oral conditions on the one hand and the writing condition on the other. The class for which results from the writing condition differ most from the oral conditions is *no repair* which decreases from 22 over 19 to 9% while we can observe increasing frequencies for *consonant replacement* (from 44% to 47%) and the ambiguous data (from 7 over 8 to 14%). We run a Pearson's χ^2 test of probability to check if the null hypothesis can be rejected. Again, this is the case for the whole data with a p-value below 0,0001, which is why we continue by considering subsets of the data: the embedding condition and the writing condition as the independent variable value subset, and the dependent variable values *no repair*, and *consonant*

replacement. With the p-value of 0,0001, the null hypothesis can be rejected. This is not the case if we do the same but by contrasting the two oral conditions: here, the p-value is at 0,3688. Although values of the oral conditions are more similar and the null hypothesis cannot be rejected, the trends which are strengthened from the embedding condition to the writing condition are observable as slight tendencies from the isolation condition to the embedding condition. Classes which remain quite stable are vowel replacement, deletion, and epenthesis, and if we consider this subset of dependent variables for the whole set of independent variables, the p-value is 08992. Missing data is only attested in the third step, which is, as already stated, only due to the fact the handwriting of two participants was hardly decipherable. Therefore, this category can generally be disregarded for statistic tests. Also, we do not consider ambiguous data as this is a heterogenous group. Having stated which proportions of classes remain stable among the three steps and which do not, we take a closer look at the data.

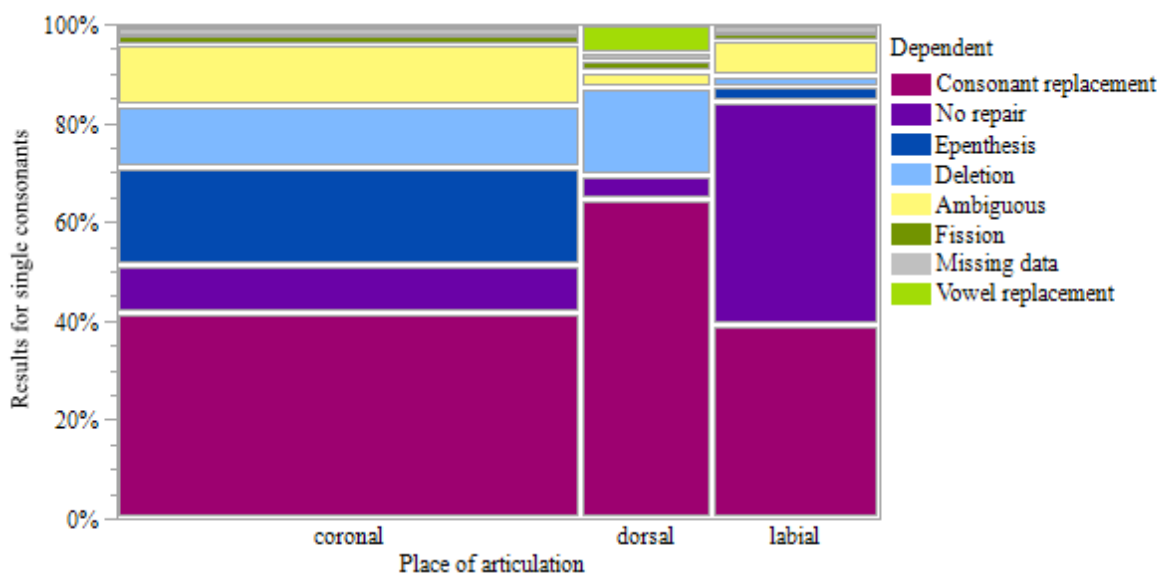
Stable patterns can be found for the group of speakers of French as a second language: while they tend to preserve consonants which are illicit in Vietnamese but not in French in the two first oral steps (which is due to their French proficiency), they decide for a response which results in a licit Vietnamese structure in the writing condition. As the instruction was to write down the word according to Vietnamese orthography, speakers apparently choose to be less faithful to the French stimulus than in the oral steps but to adapt the lexeme to phonotactic (or grapho-phonotactic) constraints of Vietnamese. This leads either to consonant replacement for onset clusters (cf. 35a), epenthesis (cf. 35b), to a strategy which we class as ambiguous as both consonant replacement and epenthesis take place simultaneously (cf. 35c), and most frequently consonant slot doubling on top (35d). For those items it is not clear which of the repairs can be seen as the important consonant repair strategy and which one takes part due to other reasons.

(35) Examples for differences between steps for the independent variable speaker group with the value speakers with L1 knowledge of Vietnamese and L2 knowledge of French

Stimulus	IPA stimulus	IPA con- dition 1	IPA con- dition 2	Orthography condition 3	IPA condition 3	Glosse
a) <i>chameau</i>	[ʃamo]	[ʃamo]	[ʃamo]	<sa mô>	[sa mo]	‘camel’
b) <i>épice</i>	[epis]	[epis]	[epis]	<ê pi sò>	[e ^{A1} pi ^{A1} sɿ ^{A2}]	‘spice’
c) <i>port</i>	[pɔʁ]	[pɔʁ]	[pɔʁ]	<po gò>	[pɔ ^{A1} ʁ ^{A2}]	‘harbour’
d) <i>ciel</i>	[sjɛl]	[sjɛl]	[sjɛl]	<xi en lò>	[si ^{A1} ɛn ^{A1} lɿ ^{A2}]	‘sky’

After having considered the independent variable of the three conditions, we now move on to different stimulus consonant material, which we group into the features place of articulation and manner of articulation. For place of articulation, there are three classes: labials, coronals, and dorsals. Among the category labials, there are [p] and [b]. For coronals, we find the largest number of consonants: [d], [f], [ʃ], [ʒ], [z] and [l]. Finally, we group [g], [j] and [ʁ] among the category dorsals. For manner of articulation, we look at the two groups with the highest frequency: fricatives [f], [ʁ], [ʃ], [ʒ] and [z] and plosives [p], [b], [d], [g]. Consonants with other manners are put into the category *others* and not considered further as they are not frequent enough to make a significant number on their own. Such a grouping of place and manner of articulation allows us to have enough data to be able to draw clear conclusions. Let us first turn to place of articulation (see chart and table 26) and then move to manner of articulation (see chart and table 27).

Chart and table 26: single consonants: place of articulation as an independent variable with the values coronal, dorsal and labial; and the result categories for single consonants as dependent variable values



Number	Cons.	No repair	Epen-	Deletion	Am-	Fission	Missing	Vowel	Sum
Percent	replace-		thesis		bigous	(Cluster)	data	replace-	
	ment							ment	
coronal	663	157	312	203	194	30	23	11	1593
	41,62	9,86	19,59	12,74	12,18	1,88	1,44	0,69	
dorsal	295	21	0	82	13	12	6	26	455
	64,84	4,62	0	18,02	2,86	2,64	1,32	5,71	
labial	223	258	18	12	42	7	10	0	570
	39,12	45,26	3,16	2,11	7,37	1,23	1,75	0	
Sum	1181	436	330	297	249	49	39	37	2618

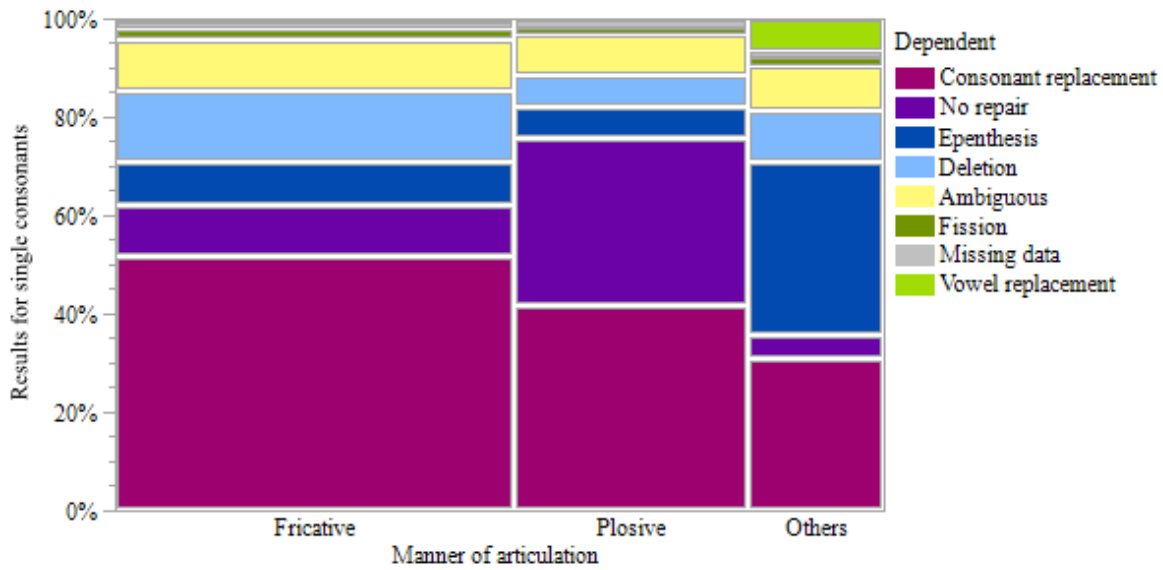
As can be seen in chart and table 26, proportions between the independent variables coronals, dorsals and labials are not of equal size: we have more data for coronals than for dorsals and labials. As to the dependent variables, the generally most frequent strategy consonant replacement takes place even more often for dorsals with a percentage of 65% than for coronals (42%) and labials (39%). Examples are given in (36)a-c. No repair instead is the most frequent pattern for labials with a percentage of 45 (see Example 36d), while it plays only a subordinated role for dorsals and coronals. A Pearson's χ^2 test of probability is performed to compare the most differing independent variables, namely coronals and labials, for the two dependent variable values consonant replacement and no repair, and as the p-value is lower than 0,0001, the null-hypothesis can be rejected. An explanation for why no repair is relatively frequently chosen for labials could be the fact that the labial [p] in onsets is oftentimes preserved in French loans as well (see p.68). The specificity of the group coronals is that the percentage of epenthesis is relatively high (see example 36e), whereas it plays a minor role for dorsals and is not chosen for labials at all. Finally, we can see that vowel replacement takes place only for dorsals (see 36f). If we compare the independent variable values coronals and dorsals for the dependent variable values epenthesis and vowel replacement, the p-value is lower than 0,0001.

(36) Examples for frequent patterns of different result categories for the independent variable place of articulation with the values dorsal, coronal and labial

	Stimulus	IPA stimulus	IPA Result	Glosse	Place of articulation	Result category
a)	<i>guinol</i>	[gijnɔl]	[ki ɲɔn]	'joker'	dorsal	Consonant Replacement
b)	<i>chameau</i>	[ʃamo]	[sa mo]	'camel'	coronal	
c)	<i>pas</i>	[pa]	[ba]	'step'	labial	
d)	<i>pas</i>	[pa]	[pa]	'step'	labial	No repair
e)	<i>ciel</i>	[sjɛl]	[siə li]	'sky'	labial	Epenthesis
f)	<i>port</i>	[pɔʁ]	[pwa]	'harbour'	dorsal	Vowel replacement

Until now, the independent variable place of articulation seems to have the highest chance to be influential. Let us continue with manner of articulation.

Chart and table 27: single consonants: manner of articulation as an independent variable with the values fricative, plosive and others; and the result categories for single consonants as dependent variable values



	Cons. replacement	No repair	Epenthesis	Deletion	Ambiguous	Fission (Cluster)	Missing data	Vowel replacement	Sum
Fricative	706 51,72	145 10,62	119 8,72	197 14,43	138 10,11	33 2,42	21 1,54	6 0,44	1365
Others	141 30,92	22 4,82	160 35,09	48 10,53	43 9,43	6 1,32	6 1,32	30 6,58	456
Plosive	334 41,91	269 33,75	51 6,40	52 6,52	68 8,53	10 1,25	12 1,51	1 0,13	797
Sum	1181	436	330	297	249	49	39	37	2618

At first, we want to explain our choice to collapse manner of articulation into the categories fricative, plosive and others. The category *others* constitutes labials and approximants, for those relatively similar categories we have not enough data so that they can constitute a category on their own. The most striking difference is the proportion of no repair, which is quite high for plosives, again due to the oftentimes occurring preservation of [p], with a percentage of 34% but much lower for fricatives, with 11%. Examples are provided in (37)a-b. The lower proportion of no repair in fricatives is probably due to the higher frequency of the category consonant replacement (ca. 52 vs. 42% in plosives) but also of the category deletion (ca. 14 vs. 6% in plosives), see examples (37)c-d. Two Pearson's χ^2 tests of probability are performed to compare the two independent variable values fricatives vs plosives: the first one is run for the dependent variable values nor repair vs. consonant replacement and the second for no repair vs.

deletion. For both tests, the p-value is below 0,0001 and the null-hypothesis can be rejected. The high amount for no repair in plosives is since the consonant [p] is oftentimes not repaired. Again, the fact that [p] is known to many speakers of Vietnamese since the existence of French loans in the Vietnamese lexicon, could serve as an explanation (see p.68).

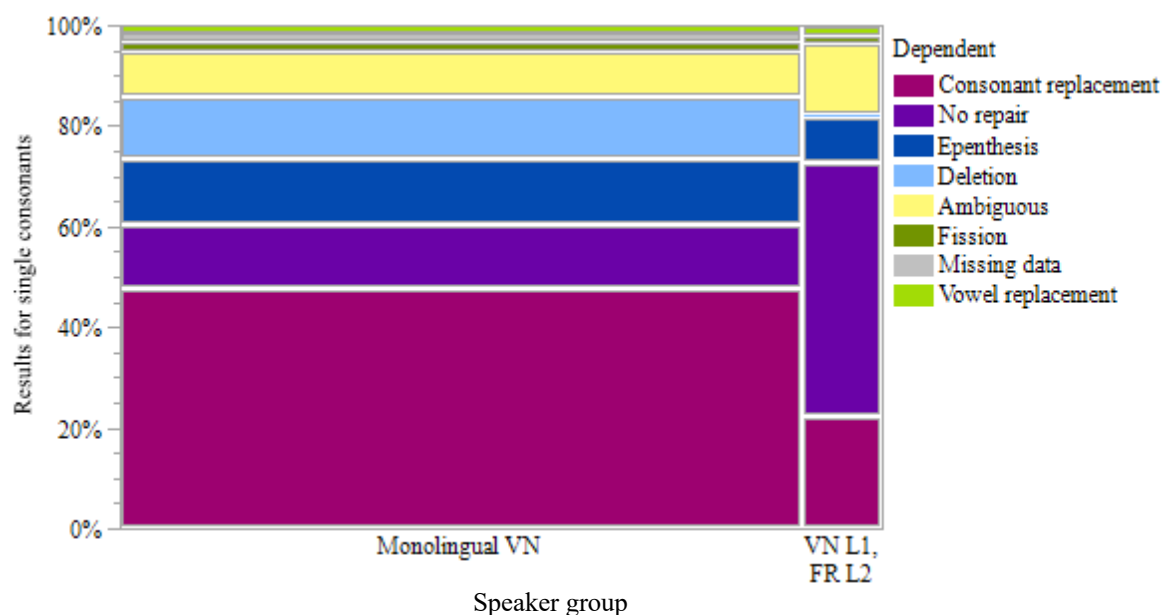
(37) Examples for frequent patterns of different result categories for the independent variable manner of articulation with the values plosive and fricative

	Stimulus	IPA stimulus	IPA result	Glosse	Manner of articulation	Result category
a)	<i>pas</i>	[pa]	[pa]	‘step’	Plosive	No repair
b)	<i>épice</i>	[epis]	[i pis]	‘spice’	Fricative	No repair
c)	<i>chameau</i>	[ʃamo]	[sa mo]	‘camel’	Fricative	Consonant replacement
d)	<i>port</i>	[pɔʁ]	[po]	‘harbour’	Fricative	Deletion

For the category *others*, which makes up the approximant [j] in onset position and the lateral [l] in coda position, there is in total a higher proportion of epenthesis attested (35 vs. 9 and 6 %) as well as a higher proportion of vowel replacement (7 vs. less than 1% for the other categories). Still, although laterals can be considered as approximants as they share articulatory similarities to approximants and the categorization of the two consonants into one group could therefore be justified, laterals and approximants do not pattern very similarly in this study. Also, it is problematic as two independent variables are mixed: manner (lateral and approximant) and position (onset and coda). Considering the results in more detail, the high pattern of epenthesis is due to the amount of epenthesis for the coda [l] and the high number of vowel replacement is due to the occurrences of vowel replacement for the onset [j]. Therefore, the categorization of laterals and approximants in one group is not justified, considering the results, and we should focus on the main categories plosives and fricatives, for which we also have more data.

To sum up the results for stimulus consonant material, this is the independent variable with the most frequency differences between its values so far. In what follows we consider the two remaining variables speaker group (monolingual speakers of Vietnamese vs. speakers of Vietnamese with French L2 knowledge) and finally position (onset vs. coda). Both variables are expected to be influential. Chart and table 28 are shown for the two speaker groups.

Chart and table 28: single consonants: speaker group as an independent variable with the values monolingual speakers of Vietnamese and speakers of Vietnamese with L2 knowledge of French; and the result categories for single consonants as dependent variable values



Number	Cons. replacement	No repair	Epen-thesis	Deletion	Am- bigous	Fission (Cluster)	Missing data	Vowel replacement	Sum
Monolin- gual VN	1120 47,74	299 12,75	305 13	296 12,62	210 8,95	46 1,96	39 1,66	31 1,32	2346
L1 VN, L2 FR	61 22,43	137 50,37	25 9,19	1 0,37	39 14,34	3 1,10	0 0	6 2,21	272
Summe	1181	436	330	297	249	49	39	37	2618

First, we can see that the size of the two groups is not equal: as explained in the method section, the monolingual speaker group consists of 34 speakers and the L2 French knowledge group of only 4 speakers. Still, as patterns are very consistent within the second group, we can draw conclusions and discern clear patterns: the distribution differs for its values, although not as much as for stimulus consonant material. Besides no repair, most striking differences between the two groups is that first we have hardly any instance of deletion in the group with L2 knowledge of French whereas its values are at 13% for the monolinguals. Apparently the second important difference is the proportions between consonant replacement and no repair: while monolinguals replace consonants by other consonants much more often (48 vs. 13% no repair), speakers with L2 French knowledge choose no repair more often than consonant replacement (50 vs. 22%). For the discussed subset of dependent variable values consonant replacement, no

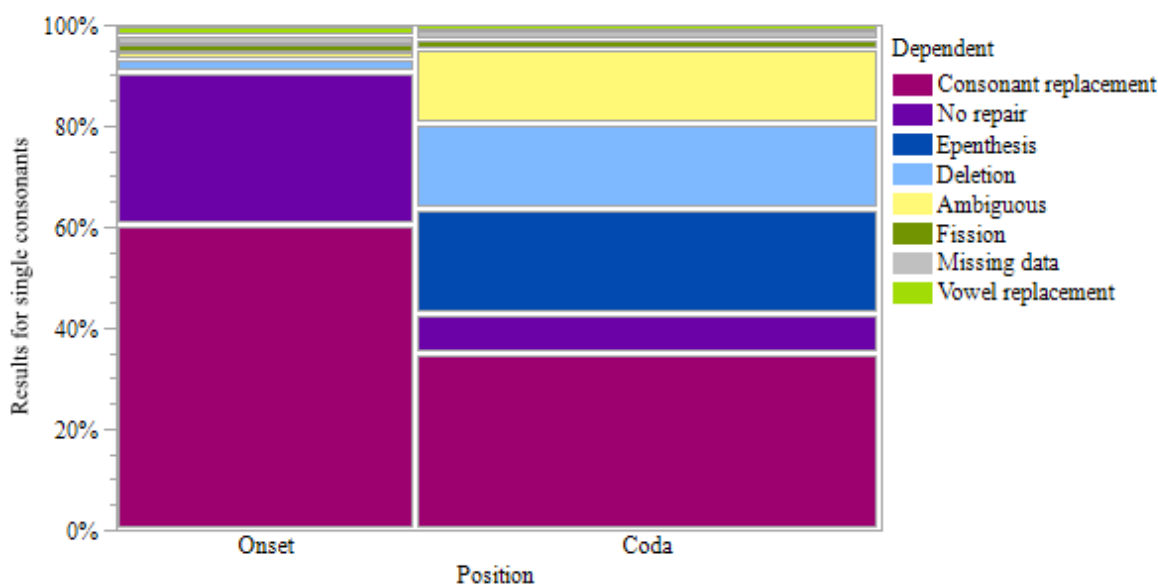
repair and deletion, the result of a chi² test shows that this distribution is not random: the p-value is below 0,0001. If we run the test pairwise for two of these three values, the three tests still deliver the same result with p-values between 0,0001 and 0,0002. Examples are shown below in (38), (38)a is a case of deletion and (38)b a case of replacement by a monolingual speaker of Vietnamese, while (38)c is an instance of no repair by a speaker of Vietnamese with second language knowledge of French.

(38) Examples of frequent result patterns for the independent variable speaker groups: different responses to the stimulus *port* [pɔʁ] ‘harbour’ from monolinguals and second language learners

	IPA result	Speaker group	Result category
a)	[pɔ]	Monolingual Vietnamese	Deletion
b)	[pɔk]	Monolingual Vietnamese	Consonant Replacement
c)	[pɔʁ]	L1 Vietnamese, L2 French	No repair

Let us finally come to the independent variable with the greatest difference between dependent variable values for the proportions, as can be seen in chart and table 29.

Chart and table 29: single consonants: position as an independent variable with the values onsets and codas; and the result categories for single consonants as dependent variable values.



Number Percent	Cons. replac- ment	No repair	Epen- thesis	Deletion	Am- bigous	Fission (Cluster)	Missing data	Vowel replac- ment	Sum
Onset	622 60,62	309 30,12	0 0	30 2,92	9 0,88	19 1,85	15 1,46	22 2,14	1026
Coda	559 35,11	127 7,98	330 20,73	267 16,77	240 15,08	30 1,88	24 1,51	15 0,94	1592
Sum	1181	436	330	297	249	49	39	37	2618

For onsets, we have the clear tendency of a binary pattern: data falls between the two categories no repair (30%) and consonant replacement (61%). On the other side, for codas, this is more diversified, and the frequency of epenthesis, deletion and ambiguous data are higher than in onsets. The only parallel is that consonant replacement plays the biggest role in both, but to a lower extend for codas (35%). Deletion (17 vs. 3% in onsets) and epenthesis (21 vs. 0% in onsets) only play a role for singleton codas, not for onsets. In loans, only deletion occurs, but epenthesis, if ever it occurs, occurs only in onset position as a cluster strategy, never for single consonants and never in coda position. The application of the Pearson's χ^2 test of probability provides the following result for the subset of the dependent variable values consonant replacement, no repair, epenthesis, and deletion: the p-value is below 0,0001 and the null hypothesis can be rejected. Also, if we apply the test pairwise to consonant replacement and no repair on the one hand, and deletion and epenthesis on the other, we get the same result. It will be interesting to look at consonant cluster strategies in the experimental data as there are parallels to the results just presented. Additionally, ambiguous patterns surface mainly in codas. The result patterns of the independent variable value coda can be illustrated with the exemplary stimulus *saule* [sol] 'willow', which results in deletion [so], epenthesis [so lɪ] or ambiguous patterns as in [son lɪ]. While it is noteworthy that ambiguous patterns surface at all, it is interesting that this occurs mainly in codas. In this chapter we continue by running a χ^2 test for the above discussed dependent variables, which shows that this distribution again is not random. Let us now move on to completing the picture on single consonants with taking a closer look at the most frequent strategy, which is consonant replacement.

Consonant Replacement

After having provided an overview of different repair strategies as dependent variables and discussed the different independent variables by providing contingency tables, charts, and

examples, we come to the last point for single consonants, focussing on the main strategy which is replacement. Our central question is if there are stable patterns, and we hypothesize that speakers choose segments which are close to the stimulus segments in terms of featural distance. Although consonant replacement occurs much more frequently than vowel replacement and no repair, we additionally provide the results for vowel replacement and no repair, grouping all results with single segment results together and leaving zero, bi- or trisegmental results (clusters, ambiguous cases, epenthesis, deletion) aside. We start by presenting a table in which we contrast the loan results, from which we derived our expectations, with the experimental data. We differentiate between monolinguals and the speakers with second language knowledge of French as well as between onset stimuli (see table 30) and continue with coda stimuli (see table 31). In what follows, we display tables with absolute and relative values for each result segment, but for reasons of space do not provide charts. Differently from the previous results, the absolute number for each dependent variable value is not very high, which is why we do not perform statistical tests.

Table 30: specific patterns of the result categories consonant replacement, vowel replacement vs. no repair of stimulus **onsets** with are not part of the Vietnamese segment inventory

Lexeme	IPA	English glosses	Stimulus consonant	Results loans ²¹	Results monoling.	Results L2 FR
guignol	gɲɔl	clown, joker	g	ɣ	g, ɣ, k, k ^h , ɲ, s, tɛ, v, x, z	g, ɣ, j, z, k
chameau	ʃamo	camel	ʃ	s	ʃ, s, tɛ	ʃ, s
gigot	ʒigo	leg (of mutton etc, gastr.)	ʒ	z	ç, m, n, s, tɛ, z, ʒ	s, z, ʒ
radeau	ʁado	raft	ʁ	z, r	f, ɣ, h, k, x	ɣ, x, r, ʁ
yeuse	jœz	holm oak	j	i, z	ɣ, h, i, j, p, r, z, s, tɛ, x, m, n, ɲ	i, j, ʒ, z
perle	pɛʀl	pearl	p	b or p (no repair)	p, p ^h , b, d, t, t ^h , tɛ, f, h, k, m, n, z	p, b, p ^h
port	pɔʁ	harbour				
poulet	pule	chicken				
crapaud	kʁa.pɔ	toad				
crépuscule	kʁe.pyskyl	dusk				
épice	e.pis	spice				

²¹ Results, of course, are not available for exactly these lexemes as these lexemes have not been integrated into Vietnamese. Therefore, this are patterns observed for the same consonants but with other lexemes. The results on loans are the starting point for the experimental approach and serve as a reference.

Table 31: specific patterns of the results categories consonant replacement, vowel replacement vs. no repair of stimulus **codas** which are not part of the Vietnamese sound segment inventory

Lexeme	IPA	English glosses	Stimulus consonant	Results loans ²²	Results monoling.	Results L2 FR
saule	sol	willow	l	n	ɾ, l, m, n, ŋ, s, t, w,	l, n
ciel	sjɛl	sky				
crépuscule	kʁɛpyskyl	dusk				
gignol	gijɔl	clown, joker				
coude	kud	elbow	d	t	i, j, d ^h , k ^h , t, t ^h , s, m, n,	t, d ^h
griffe	gʁif	claw	f	p	f, k, m, n, ŋ, p, s, ʃ, t, tɛ, w	f, p
piaf	pjaʃ	little bird				
épice	epis	spice	s	t	ç, j, k, p, s, s ^h , t,	s, t
glace	glas	ice-cream				
efface	efas	rubber				
cloche	klɔʃ	bell	ʃ	t, k	f, j, k, s, ʃ, t	s, ʃ
port	pɔʁ	harbour	ʁ	k	a, ɛ, k, k ^h , ŋ, p, s, x, ʒ	x, ʁ, k, k ^h
crabe	kʁab	crab	b	p	ŋ, m, n, p, t, w	P
yeuse	jœz	holm oak	z	t	a, f, γ, j, k, l, n, p, s, ʃ, t, w, z	s, z
cableuse	kabløz	wiring specialist				

The first thing which jumps into our eyes is that there is much more variation in the experimental groups than in the patterns observed in loan data, especially for the monolinguals. As to the proportions of results for each result, for instance, [p] is with a percentage of ca. 54% preserved, but also often replaced by [f] with 18% or [b] with 15%. To the contrary, the onset consonant [ʃ] is rather replaced (by the consonant [s] with a percentage of ca. 80) than preserved (16%). The respective percentages can be taken from the tables 32-37 for onsets and 38-45 for codas. The reason why we have one table for each consonant and do not group them all together in one table is that such a table does not fit into this format because of its size, also we would not understand it. Additionally, as there does not seem to be any systematic substitution patterns across consonants, we want to look at the results for each consonant individually. We describe frequent patterns and provide examples for some of them.

²² See previous footnote.

The following contingency tables help us to discern stable patterns. To get a visual overview in terms of frequencies, but to be more space efficient than with mosaic charts for each single stimulus consonant, we mark in pastel yellow all proportions below rounded 5%, in stronger yellow all proportions below rounded 10%. In pastel green, we mark all proportions below rounded 50% and in stronger green all proportions over 50%. We put the column in a bold frame for the result in which the respective consonant is preserved. In the contingency tables, however, the values are still rounded to two decimal places.

Table 32: frequency patterns of replacement results as well as no repair for the stimulus onset [g]

g	g	ɣ	j	k	k ^h	ŋ	s	te̞	v	x	z	Sum
Number	6	8	1	36	1	3	1	19	2	4	6	87
Percent	6,90	9,20	1,15	41,38	1,15	3,45	1,15	21,84	2,30	4,60	6,90	100

The most frequent pattern for stimulus [g] is [k] with 41%. There is only one featural difference between those two consonants: [g] is voiced and [k] is devoiced. The second part of the affricate [te̞] is one feature far away in place of articulation: it is a palatal while the [k] is a velar. The repair consonant with the third highest frequency is the fricative [ɣ], here it is only one featural difference in manner: plosive vs. fricative. Illustrating examples for replacement patterns of [g] by the just mentioned licit consonants of Vietnamese can be given with the stimulus *guinol* [gjinɔl] ‘clown/joker’, where the onset consonant [g] results in [k] for the result [ki nɔn], in [te̞] for [te̞i nɔn] and in [ɣ] for [ɣi nɔ].

Table 33: frequency patterns of replacement results as well as no repair for the stimulus onset [j]

j	ɣ	h	i	j	m	n	ŋ	p	r	s	te̞	x	z	ʒ	Sum
Number	1	1	22	8	1	3	8	1	1	3	2	3	36	13	103
Percent	0,97	0,97	21,36	7,77	0,97	2,91	7,77	0,97	0,97	2,91	1,94	2,91	34,95	12,62	100

For the approximant [j], the most frequent pattern is a replacement by [z]. There is more than just one featural difference between [j] and [z] but probably, this repair is chosen because [j] is used in southern varieties for the phoneme /z/, which is pronounced as [z] in the north. The sound [j] may be known to northerners like the experiment participants from television, for instance, which may be the reason why they replace the French stimulus [j] by [z]. This pattern has also been observed in loans (cf. p.71). The next highest frequency goes to the repair strategy vowel replacement [i] with 21%, which is the other attested strategy in loans as well. [ʒ] and [ŋ] with frequencies of 13 and 8% are the other relatively frequently chosen strategies. While the first differs in two features, the latter only differs in the feature manner (approximant vs.

nasal). Examples for the above discussed repair consonants can be provided for the stimulus *yeuse* [jøz] ‘willow’. An example for a replacement by [z] is [zu zɤ], for [i] is [iu zɤ], for [ʒ] is [ʒu ʒɤn] and for [ɲ] is [ɲu zi]. The consonant [ɲ] also is an attested repair for [j] in loans, but only in certain syllabic environments, which is presented in more detail on p. 87. We move on with the next stimulus onset, which is the bilabial plosive [p].

Table 34: frequency patterns of replacement results as well as no repair for the stimulus onset [p]

p	β	d'	f	h	k	m	n	p	p or b	p ^h	t	t̃	t ^h	z	Sum
Number	67	2	80	2	5	1	1	238	8	17	9	3	8	1	442
Percent	15,16	0,45	18,10	0,45	1,13	0,23	0,23	53,85	1,81	3,85	2,04	0,68	1,81	0,23	100

For the stimulus [p], the consonant is preserved with a high frequency of 54%. This can be explained by the fact that this sound is part of the Vietnamese sound inventory since the existence of some loans from French with this consonant as an onset. Still, half of the speakers do not preserve this consonant, which could be a hint that the sound [p] is not used by parts of speakers of Vietnamese, especially to those with no foreign language knowledge. Interestingly, the consonant [β] with just one featural difference in voicing is less frequent than the fricative [f] with 15 vs. 18%. Why could the fricative [f] be preferred over the plosive [p]? Probably, phonetic details play a role in perception. Our intuition is that French plosives, as they are more aspirated than their Vietnamese direct counterparts, could sometimes be perceived as fricatives due to the aspiration. In what follows, we do not continue providing examples for each onset stimulus consonant and its frequent repairs for reasons of space.

Table 35: frequency patterns of replacement results as well as no repair for the stimulus onset [ɸ]

ɸ	f	ɣ	h	k	r	ɸ	x	Sum
Proportion	3	17	23	1	1	5	59	109
Percent	2,75	15,60	21,10	0,92	0,92	4,59	54,13	100

The stimulus [ɸ] is replaced by [x] with a frequency of 54%, followed by [h] with 21% and [ɣ] with 16%. It could be surprising that [ɣ], as it is differing only in the feature manner (uvular vs. velar), is not chosen over the other two sounds which are differing in both manner and voicing. Why are devoiced consonants preferred over the voiced and very similar sound [ɣ]? Again, fine-grained phonetic details could make the difference in perception and lead to this interesting mapping. The results for the consonant [ɸ] differ considerably from the patterns observed in

loans. In loans, the sound is oftentimes replaced by a [z] or [r]. This can be explained by the fact that in Vietnamese, the phoneme /z/, which is pronounced in some local varieties as [z], is pronounced as [r] in others. As [ʁ] can be perceived to be similar to [r], this could be one explanation for a replacement of [ʁ] by [r] and subsequently by its allophone [z]. In loans, it could also be a reading adaptation, as the phoneme /z/ is mapped to the grapheme <r>. To the contrary, the different pattern in the experimental data could be a result of the fact that speakers do not have the written stimulus to their disposition, as they map the sound [ʁ] to featurally more similar consonants than [z]: the sound [z] is never chosen and [r] only one single time.

Table 36: frequency patterns of replacement results as well as no repair for the stimulus onset [ʃ]

Proportion Percent	s	ʃ	ʔe	Sum
ʃ	91 80,53	18 15,93	4 3,54	113 100

The sound [ʃ] is the stimulus with the most stable results: with 80%, the consonant [s] is the clearly preferred strategy, followed by preservation of the stimulus sound.

Table 37: frequency patterns of replacement results as well as no repair for the stimulus onset [ʒ]

Proportion Percent	ç	m	n	s	ʔe	z	ʒ	Sum
ʒ	2 1,83	1 0,92	1 0,92	19 17,43	35 32,11	40 36,70	11 10,09	109 100

For the stimulus [ʒ], the most frequent result is [z] with 37%, which has only one featural difference to the stimulus consonant: the place of articulation is alveolar, not postalveolar. It is not surprising that the results which differ in more than one feature are less frequent: [ʔe] with 32 % and [s] with 17%.

We can deduce from the picture of onset consonants that the most important factor seems to be featural similarity. Still, also fine-grained phonetic details could help explaining some repairs, and for other cases, phonemic mappings which may be influenced by the passive knowledge of other Vietnamese varieties. Although there is more variety in the experimental data than in the loans, these broad lines are the same. The possibility of reading adaptation as a potential factor in loans can be excluded here as speakers have no written stimulus to their disposition in the experimental approach. Orthographic factors could still come into play when it comes to the

writing condition, but for this issue, we do not find peculiarities. In the following, we present the results for coda consonants to see if this analysis also holds for codas.

Table 38: frequency patterns of replacement results as well as no repair for the stimulus coda [b]

b	m	n	ŋ	p	t	w	Sum
Proportion	7	30	1	7	1	1	47
Percent	14,89	63,83	2,13	14,89	2,13	2,13	100

Interestingly, for the stimulus coda consonant [b], the most frequent result is the consonant [n] with a percentage of 64% and not the consonants [m] or [p] with an equal distribution of 15% each. While the latter only differ in one feature, voicing or manner, [n] differs in both. We have no explanation for this surprising finding, which is very stable. A peculiarity for the consonant [b] is that it has never been preserved. Examples for current patterns can be given with the help of the stimulus *crabe* [kʁab] ‘crab’: the consonant [b] is replaced by [n] in [xã**n**], by [m] in [xam] and finally by [p] in [ka**p**]. We continue with the next voiced coda plosive.

Table 39: frequency patterns of replacement results as well as no repair for the stimulus coda [d]

d	d ^h	i	j	k ^h	m	n	s	t	t ^h	Sum
Proportion	3	1	6	1	2	7	2	10	2	34
Percent	8,82	2,94	17,65	2,94	5,88	20,59	5,88	29,41	5,88	100

As expected, the most frequent repair for [d] in coda position is [t] with 29%. The second frequent strategy can also be explained by featural proximity: for [n] with 21 %, there is just one difference in manner, which is nasal vs. plosive. The third frequent repair strategy is [j] with 18 % and rather unexpected, as this sound is not very close to [d]. Result examples for the just described patterns can be given for the stimulus *coude* [kud]: in [xu**t**], the coda is replaced by [t], in [ku**n**] by [n] and in [xu**j**] by [j]. We move on with the fricative stimulus coda [f].

Table 40: frequency patterns of replacement results as well as no repair for the stimulus coda [f]

f	f	k	m	n	ŋ	p	s	ʃ	t	t̃e	w	Sum
Proportion	19	13	1	2	1	48	7	4	57	3	1	156
Percent	12,18	8,33	0,64	1,28	0,64	30,77	4,49	2,56	36,54	1,92	0,64	100

For the stimulus [f], the most frequent strategies are [t] with 36, 54 % and [p] with 31%. The last one is also the attested strategy in loans. In about 12% of the data, speakers preserve the sound [f] and do not repair it. The reason why no replacement is chosen which is closer to the stimulus sound in terms of featural distance is simply the fact that there is no such more similar consonant available which is licit in Vietnamese coda position.

Table 41: frequency patterns of replacement results as well as no repair for the stimulus coda [l]

l	ɾ	l	m	n	ŋ	s	t	w	Sum
Proportion	1	7	2	47	1	1	1	7	67
Percent	1,49	10,45	2,99	70,15	1,49	1,49	1,49	10,45	100

The most frequent replacement pattern for the lateral [l], which is licit in Vietnamese onset but not in coda position, is the nasal [n] with 70%. The featural difference is manner, but the alveolar place of articulation stays the same. With an equal distribution of 11%, the second place goes to replacement by the approximant [w] and no repair. The approximant is not as close as the nasal [n] as also the place of articulation is bilabial and therefore different.

Table 42: frequency patterns of replacement results as well as no repair for the stimulus coda [ɣ]

ɣ	a	ɛ	k	k ^h	ŋ	p	ɸ	s	x	ʒ	Sum
Proportion	3	1	20	3	1	3	2	3	5	4	45
Percent	6,67	2,22	44,44	6,67	2,22	6,67	4,44	6,67	11,11	8,89	100

For the stimulus [ɣ] in codas, the pattern differs expectedly considerably from the pattern in onsets. The most frequent strategy is a replacement by [k] with a percentage of 44. Manner, voicing and place of articulation change, but the place is still very similar: uvular in the stimulus and velar in the result. The next frequent strategy is [x], an also illicit consonant in Vietnamese but apparently less difficult to pronounce by the speakers. This fricative differs again in place and voicing, but not in manner. This second highest frequent strategy is chosen mostly by speakers with knowledge of French in the oral steps whereas the highest strategy is mostly chosen by them in the third step and by the monolingual speakers of Vietnamese in all steps.

Table 43: frequency patterns of replacement results as well as no repair for the stimulus coda [s]

s	ç	j	k	p	s	s ^h	t	Sum
Proportion	2	17	24	5	69	1	66	184
Percent	1,09	9,24	13,04	2,72	37,50	0,54	35,87	100

The most frequent strategy for the stimulus [s] in codas is unexpectedly the maintenance of [s] with 38%, although it is illicit in Vietnamese in coda. An explanation could be the perceptual salience of this sound. The next most frequent strategy with a quite similar percentage is the expected replacement of the plosive by the fricative [t] which differs only in manner of articulation. The third and fourth most frequent strategies are [k] with 13 and [j] with 9%. As already mentioned, the last strategy is also attested as a replacement strategy for the coda [d].

Table 44: frequency patterns of replacement results as well as no repair for the stimulus coda [ʃ]

ʃ	f	j	k	s	ʃ	t	Sum
Proportion	1	1	6	18	9	1	36
Percent	2,78	2,78	16,67	50	25	2,78	100

The second last coda consonant we consider is the postalveolar fricative [ʃ]. The equally illicit alveolar fricative [s] is chosen with a percentage of 50 and differs in only one feature. With the second highest percentage of 25%, the sound [ʃ] is preserved. This relatively high percentage of preservation could, in parallel to the just described preservation of the stimulus [s], be again due to a perceptual salience of the sound. Possibly, [s] in codas is easier to pronounce than [ʃ], although both are illicit sounds. With the third highest percentage of 17, the stimulus is replaced by the licit sound [k] which has also been observed as a repair strategy in loans.

Table 45: frequency patterns of replacement results as well as no repair for the stimulus coda [z]

Proportion	a	f	ɾ	j	k	l	n	p	s	ʃ	t	w	z	Sum
Percent	1	1	1	7	11	1	8	3	17	1	27	1	12	91
	1,10	1,10	1,10	7,69	12,09	1,10	8,79	3,30	18,68	1,10	29,67	1,10	13,19	100

Finally, we consider the results for the stimulus coda [z] which are quite variable. With a percentage of 30, this alveolar voiced fricative is replaced by the alveolar devoiced plosive [k]. This is the most similar consonant in terms of featural distance which is licit in Vietnamese

codas. The other licit relatively high frequently chosen licit consonant is the velar plosive [k] with 12%, but the illicit fricatives [s] and [z] are preferred over this velar plosive with percentages of 19 and 13. Again, speakers are more faithful to the stimulus than to Vietnamese phonotactic requirements for those two results, as has also been shown previously for [s] and [ʃ]. This is probably due to the perceptual salience of the coronal fricatives. In this respect, the loan data differs from the experimental data where Vietnamese phonotactic requirements are always respected and even perceptual salient illicit sounds are never preserved.

Interim conclusion single consonants

To sum up the results on preservation and replacement patterns we have looked at so far, we can see that speakers choose a compromise between feature preservation and phonotactic adaptation. When repairs are made, speakers mostly choose a segment with shares as many features as possible with the stimulus, but in some cases, saliency of certain features seem to play a role as well.

After we have discussed all the independent variables and considered the values replacement and no repair for the dependent variable in detail, we now come to the summary of our findings on the results for single consonants. Differently from the loan data, the main peculiarity in our experimental data is that there is much variation. This holds especially for the monolingual speaker group, but similar patterns to those in loans still emerge. To the contrary, speakers of Vietnamese with French as a second language knowledge repair only some of those illicit consonants in the oral data. Still, in the written data, they systematically repair consonants according to Vietnamese phonotactic constraints, but differing in several aspects from the monolingual group. In this regard, aspects differing between the groups are the most interesting as they reveal how different monolingual and non-monolingual speakers process the same stimuli and consequently decide for different repair strategies.

Also, not all the stimulus consonants are mapped to their direct counterpart if there is one available, but a detailed description of this issue goes beyond the scope of this work. We expect fine phonetic details to have a much higher influence in perception for the monolingual group, also compared to the group with French as a second language which behaves more like loans in this respect. Another peculiarity is that apart from replacement, not only deletion but also epenthesis takes place, especially for coda consonants. One example is the stimulus *ciel* [sjɛl] ‘sky’ and its imitation by a monolingual speaker of Vietnamese as [siə li]. This has not been

attested in loanwords, where epenthesis only applies to onset clusters, but not to single consonants.

On the other hand, experimental results of the second language speaker group also differ from the loan data: material is rather preserved than replaced in the oral data, as Vietnamese phonotactics plays a minor role for this speaker group due to their French proficiency. Still, in the written data, where they are asked to write down the word according to Vietnamese orthography as if this became a Vietnamese word, they decide to rank Vietnamese phonotactic constraints higher again, but still being more faithful to the stimulus segments than has been carried out for loan data. Speakers of Vietnamese as L1 with French as L2 solve the conflict by making even more extensive use of epenthesis than the monolingual speaker group. One example is the imitation of *épice* [epis] as [epis] in the two oral steps but <ê pi sò> in the speaker's orthographic transcription, converted into IPA as [e^{A1} pi^{A1} sɔ^{A2}]. A similarity between loan and experimental data is that replacement of illicit segments by licit ones is the main strategy. We first presented an overview of all occurring repair strategy groups, continued by testing several independent variables and finally looked at the main strategy replacement in greater detail. After having presented single consonant repair, we now leave the segmental domain, but before considering complete syllables, let us deal with consonant clusters. The presentation of the results on single consonants are fundamental to deeply understand repair processes active in clusters.

5.3.2. Consonant clusters

So far, we have looked at the repair of single onset and coda consonants which are illicit in Vietnamese. But what happens if single consonants merge and build a cluster? Clusters, apart from C+[w], are illicit in Vietnamese and as these structures are more complex than segments, we expect more complex repair strategy patterns as well. One example cluster repair from our loan data is *pho mát* [fɔ^{A1} mat^{D1}] from French *fromage* [fʁɔmaʒ] 'cheese', in which the second consonant of the cluster is deleted, namely [ʒ].

Recapitulating the results derived from the loan data, onset and coda clusters can enable different repair strategies, which is the reason why we consider position with the values onset and coda as an independent variable, just as we did for single consonants. Also, we look at different consonantal material. These are the most important independent variables, but also syllable number and the position of a cluster within a word may have some impact on the repair. The two important overall cluster repair strategies in our loanword data in general are deletion and epenthesis and we expect them to apply also in the experimental data. Of course, one of the

consonants can also be replaced by another consonant or even both. Replacement of one consonant by another still is no cluster repair strategy. As we have looked in detail on the patterns of replacing one consonant by another, we will not consider replacement of one consonant by another in this chapter, even if it is part of a cluster. Our main hypothesis is:

According to our results from the loan data, we mostly expect the repair strategy deletion to occur, and only for onsets a smaller amount of epenthesis.

This way, deletion and epenthesis are the expected dependent variable values, and in more detail, we look at which consonants are deleted or, if epenthesis is the repair strategy, which vowel is inserted between the two consonants of a cluster, for which hypotheses will be outlined later. During our analysis we will find out that there are also other repair strategies to play a role as well and ambiguous cases and cases in which the cluster is maintained as such. By doing so, we will find some parallels to patterns in second language acquisition.

The chapter is organized as follows: we start by presenting the different result categories and giving examples and explanations for each. Subsequently, we provide a proportional overview of the different strategy groups and the main hypotheses. We continue by discussing different independent variables, in parallel to our presentation on single consonants. After that, we look in a more detailed fashion on the strategies epenthesis and deletion and finally summarize our findings. This chapter is structured very similarly to the previous chapter on single consonants.

As in the previous subchapter on single consonants, we group all results into several categories²³. Notice that generally, we have the same categories as for single consonants, with two differences: two categories miss and two are added. The missing categories are *no repair* and *fission*. As the outcome of fission is a cluster, there is a parallel to the new category called *cluster*. There is also a parallel between this category and *no repair* as the category *cluster* can be seen as such: if the result is a cluster, then the cluster has not been repaired but preserved. Still, it is possible for this category that not all features of the clusters are the same for stimulus and result, and therefore, we do not call this strategy *no repair* for reasons of accuracy: one or both consonants can be replaced, but such replacement is not in focus of this chapter. What counts, is that the consonant cluster itself is maintained, even if with other consonantal material.

²³ Trần (2011) in her thesis also does but has not found in her corpus all the categories we have found: she has found deletion (which she refers to as suppression), and epenthesis. Also, she lists the replacement of one or two cluster consonants (*déplacement*, substitution), which we do not see as a cluster repair strategy but a segmental substitution mechanism independent of cluster repair. Our view will be explained in more detail soon.

Examples are given in (39). In (39)a, there is no repair: the cluster is composed of the same consonants in the same order in the stimulus and in the response. In (39)b-c, the cluster is maintained as a whole, but features of one or the two cluster consonants are changed.

(39) Examples for cluster preservation with and without replacement of one or two consonants, the stimulus is *bisque* [bisk] ‘bisque’

	IPA result	Result category	Details
a)	[bisk]	Cluster	No repair
b)	[bist]	Cluster	Repair 1 st consonant
c)	[bits]	Cluster	Repair both consonants

The other new category is *coalescence*, a strategy in which several features of the two cluster consonants merge into one consonant. To our knowledge, it has not been reported to occur in borrowing processes since but is described under the term *coalescence* in the literature of first languages acquisition (cf. Barlow 1997; Rose 2000; and Kehoe et al. 2008). This strategy occurs in our data, for instance, quite often within the French stimulus *stuc* [styk] ‘stucco’. One result is [tɛwik], another speaker realizes it as [tɛyt]. In both results, the cluster [st] is replaced by a single consonant which shares features of both stimulus cluster consonants: the approximant unites a plosive and a fricative into one slot, even though plosive and fricative features of the approximant are not identical, and the order of fricative and plosive (parts) is not the same. These examples fall into the category *coalescence*, but there are also other examples for which we cannot be so sure whether we deal with *coalescence* or something else. They are grouped within the category *ambiguous*. We will come back to them in the discussion (see p.276). The following categories are those which are already known from the chapter on single consonants: epenthesis, deletion and vowel replacement. Some data is missing again due to the fact that the writing of two participants is hardly decipherable. For the three strategies, we give one example each: in (40)a, there is epenthesis, in (40)b deletion and (40)c vowel replacement.

(40) Examples for the other remaining strategies: epenthesis, deletion and vowel replacement on the example of the stimulus *perle* [pɛrl] ‘pearl’

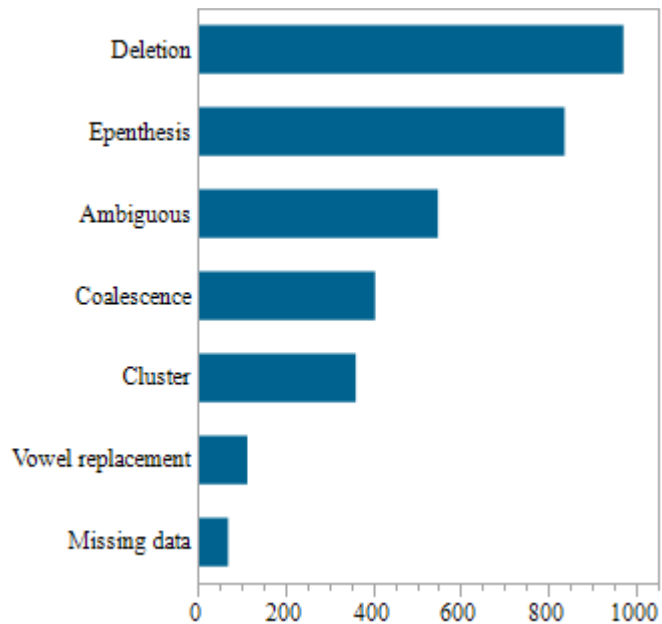
	IPA Result	Result category
a)	[pɛk lɾ]	Epenthesis
b)	[pɛn]	Consonant replacement

c) [tɛ ʔɔn] Vowel replacement

In the first example, the first consonant of the cluster [ɾl] is replaced by a [k]. The second consonant is maintained as such and followed by an epenthetic vowel. In the second example, the first consonant is deleted and the second consonant [l] replaced by a [n]. Finally, in the third example, the first consonant is replaced by the vowel [ɔ] and the second consonant is again replaced by the consonant [n]. In all these three cases, also consonant replacement patterns can be observed as well. Therefore, to understand how repair patterns of consonant clusters work, one must understand the replacement patterns of single consonants. Replacement of one of the two cluster segments follows the same logic as single consonant replacement and apparently take part independently from cluster repair strategy patterns. In this introduction, we got an idea how complex the results can be. But before we go into more complexity and explain each of the categories in detail, we provide the overall distributions, see table and chart 46.

Table and chart 46: overview proportions of the results for stimulus consonant clusters

Class	Number	Percent
Deletion	971	29
Epenthesis	837	25
Ambiguous	548	17
Coalescence	405	12
Cluster	361	11
Vowel replacement	114	4
Missing data	70	2
Sum	3306	100



For the dependent variables, which are the result categories, we want to test the following independent variables and related hypotheses:

Different independent variables (more detailed description see p. 132)

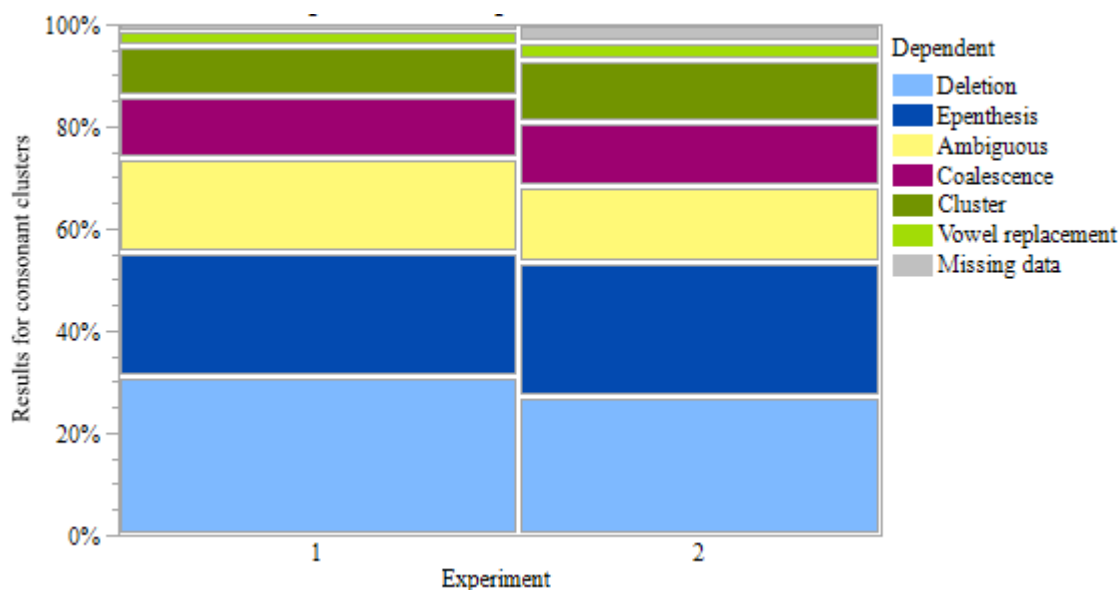
- a) Stimulus intra-speaker variability: we expect rather little or no strong difference if the same stimulus is produced by the same speaker but with different f0 movements.
- b) Condition: differences expected. If there are differences between the conditions (isolation, embedding, and writing) and the lexemes become more and more

Vietnamese from the first to the last condition, there is first modest evidence for a step-by-step adaptation to Vietnamese constraints.

- c) Different consonantal material of the clusters: differences expected.
- d) Two speaker groups, referring to loan data: strong differences expected. We expect monolinguals to make more use of repair strategies, especially in the oral data.
- e) Position (Onsets vs. codas): strong differences expected. According to our loan data, we mostly expect the repair strategy deletion to occur in onset clusters, but also a smaller amount of epenthesis. In codas, we only expect deletion to occur.
- f) If the lexeme is monosyllabic, we expect epenthesis to occur more often compared to bisyllabic or trisyllabic lexemes. This is due to the native Vietnamese distribution of syllables per lexeme: about half of the vocabulary is monosyllabic, another half bisyllabic and only a very small number has more than two syllables (see p.51). The loan data again is too limited to make predictions about this issue.

In following, we deal with all those variables and discuss whether our hypotheses hold. We also run χ^2 tests for the variables we are going to discuss which are most differing, in parallel to our procedure for single consonants. Again, the category missing data can be disregarded as it is not a variable. The category of ambiguous cases is not very instructive to look at neither. Therefore, we focus again on the other result categories within this chapter. In parallel to the documentation of the results for single consonants, we start with the dependent variable which we expect to be not very influential: stimulus intra-speaker variability, see chart and table 47.

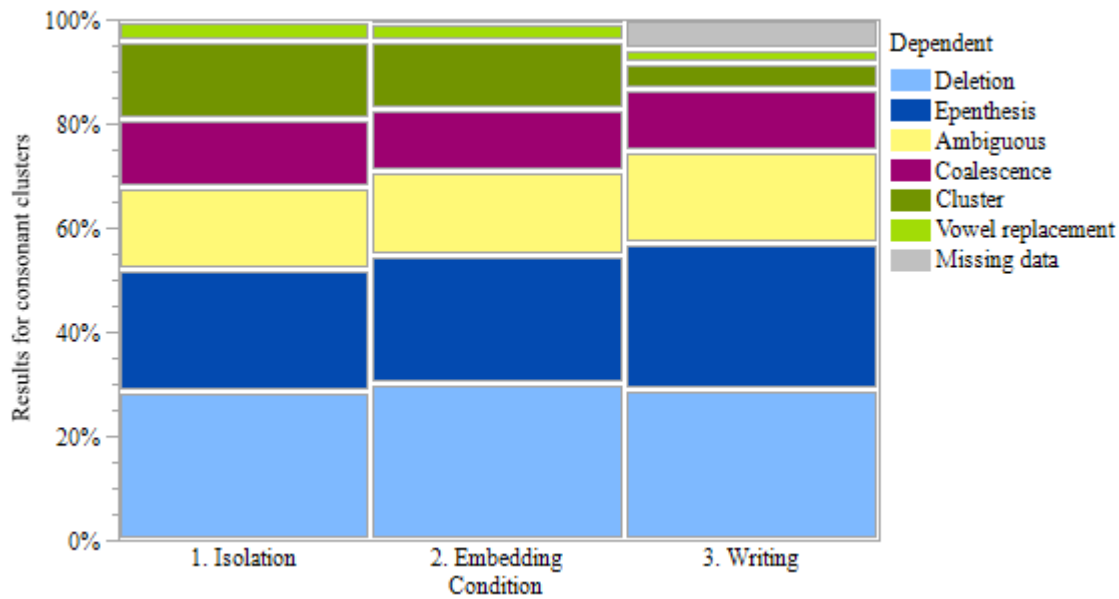
Chart and table 47: consonant clusters: stimulus intra-speaker variability as an independent variable with the values Experiment 1 vs. 2, the dependent variables are the result categories



Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
1	542	426	315	212	171	57	17	1740
Percent	31,15	24,48	18,10	12,18	9,83	3,28	0,98	
2	429	411	233	193	190	57	53	1566
Percent	27,39	26,25	14,88	12,32	12,13	3,64	3,38	
Sum	971	837	548	405	361	114	70	3306

Proportions for experiment 1 and 2 are similar. There is slightly less deletion in experiment 2 than in experiment 1 (27 vs. 31 %) but slightly more clusters (12 vs. 10 %), which could be since per chance, some speakers who participated in Experiment 2 are better at pronouncing clusters. The result of a Pearson's χ^2 test of probability for these two variable values is still that with a p-value of 0,06, the null hypothesis is rejected, which goes against our expectations. But if we test the subset of dependent variable values epenthesis, coalescence and vowel replacement, the p-value is 0,8573 and the null hypothesis cannot be rejected, as expected. This does not change even if we add ambiguous data to the subset, even though the p-value decreases to 0,0935. Overall, differences, if they arise, are low and not systematic, and we continue with the independent variable condition, see chart and table 48.

Chart and table 48: consonant clusters: conditions as an independent variable with the values isolation, embedding and writing; the dependent variable values are the result categories

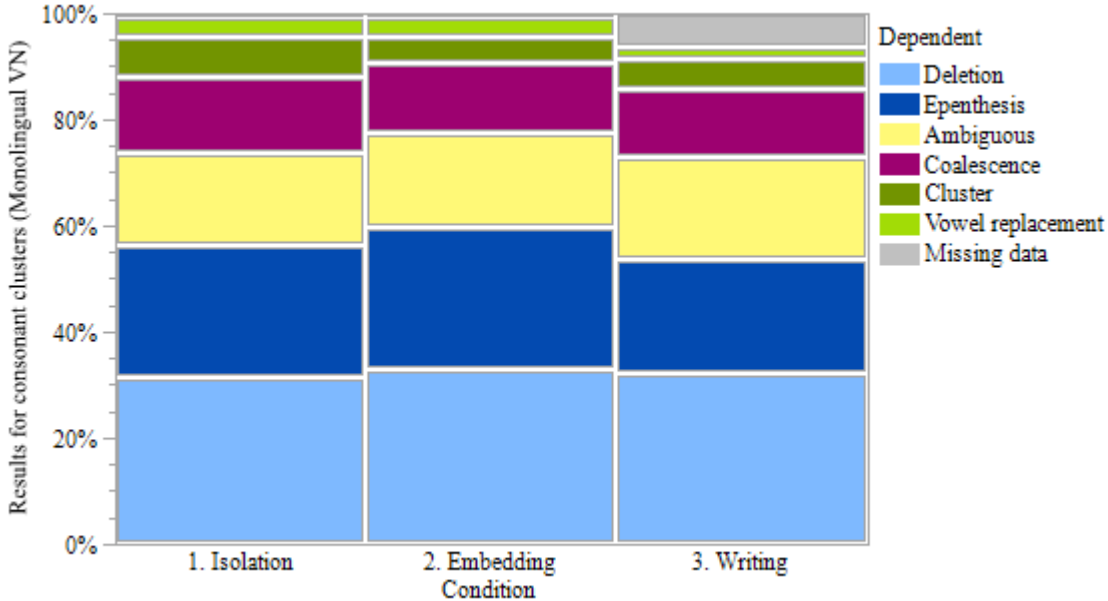


Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
Percent								
Isolation (oral)	316	257	174	144	165	42	4	1102
	28,68	23,32	15,79	13,07	14,97	3,81	0,36	
Embedding (oral)	333	272	178	132	141	41	5	1102
	30,22	24,68	16,15	11,98	12,79	3,72	0,45	
Writing	322	308	196	129	55	31	61	1102
	29,22	27,95	17,79	11,71	4,99	2,81	5,54	
Sum	971	837	548	405	361	114	70	3306

For this variable, we find stronger differences between the conditions than for the previous variable, especially between the oral conditions and the writing condition. This goes in line with the results for single consonants. Tendentious slight differences between the first two conditions are strengthened in the writing condition: while the proportions of cluster preservation decrease from ca. 15 over 13 to 5%, the proportions of epenthesis increase from 23 over 25 to 28%. The decreasing proportion of preservation from the first to the third condition is another parallel for stimulus single consonants and clusters. The difference is the repair strategy which is increasing: for single consonants, it is consonant replacement whereas it is epenthesis for clusters. We run a Pearson's χ^2 test of probability to compare first the subset of the oral conditions to see if the null hypothesis can be rejected for the whole set of dependent variable values, as they overall seem quite similar. The p-value is 0,9712, and our expectation that the null hypothesis is rejected cannot be met. Still, it can be met if we consider the embedding vs.

the writing condition: the p-value is below 0,0001. The same also holds for the isolation vs. the writing condition. But if we consider the three dependent variable values coalescence, deletion, and vowel replacement for the whole set of independent variable values the p-value is 0,6111 and the null hypothesis cannot be rejected. But it can be rejected if we consider the subset of dependent variable values epenthesis and clusters: here, the p-value is below 0,0001. As we discover differences between the two speaker groups in how they differ concerning the variable condition, we continue by providing two charts and tables, one for each speaker group extra. We start by providing results for the monolingual group in chart and table 49.

Chart and table 49: consonant clusters: the subset of monolinguals, condition as an independent variable with the values isolation, carrier sentence and writing; the dependent variable values are the result categories



Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
Isolation condition	309	246	172	142	75	38	4	986
	31,34	24,95	17,44	14,40	7,61	3,85	0,41	
Embedding condition	326	264	175	129	51	36	5	986
	33,06	26,77	17,75	13,08	5,17	3,65	0,51	
Writing condition	317	212	190	129	54	23	61	986
	32,15	21,50	19,27	13,08	5,48	2,33	6,19	
Sum	952	722	537	400	180	97	70	2958

By comparing these results for the monolingual group to the overall picture, we find important differences: at first, differences between the three conditions are much weaker herein, and the only considerable difference is that the proportions of epenthesis are weaker in the writing condition than in the oral conditions: in the first oral condition, namely isolation, it is at 25%

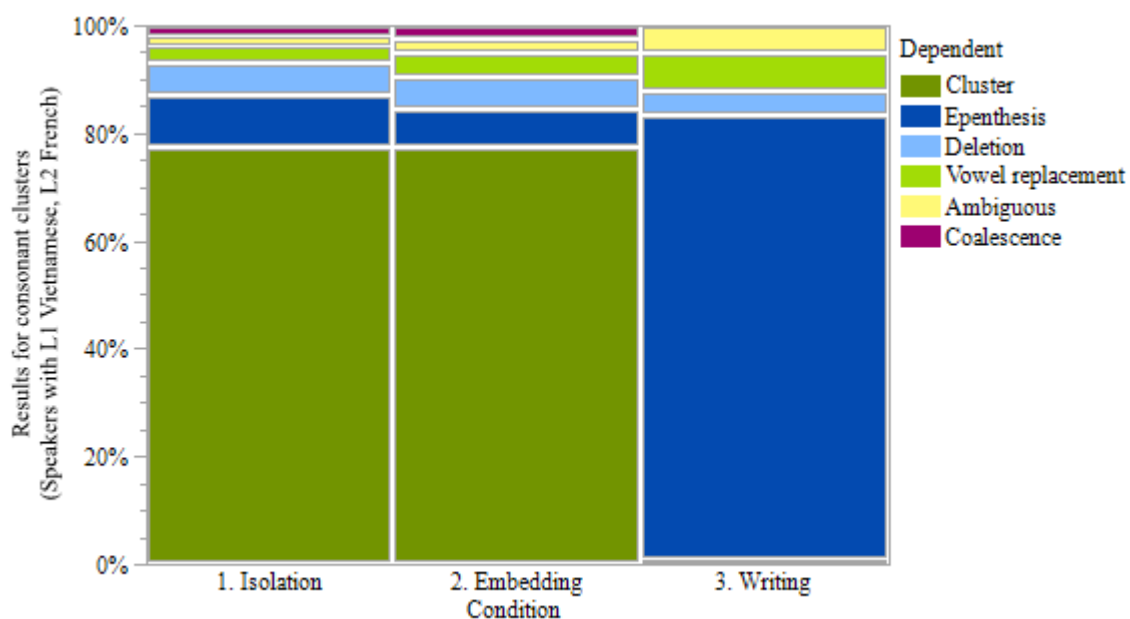
and in the second one, namely embedding, at 27%, but in the writing condition at only 22%. For the subset of the dependent variable values epenthesis and clusters, the p-value is at 0,053, which means that the null hypothesis cannot be rejected despite these slight differences. One interpretation of these could be that some speakers are able to perceive the cluster in the stimulus, but not to produce it: therefore, they use an epenthetic vowel in the oral conditions but write down the cluster in the writing condition. An example for this tendency is given in (41)a. Still, the tendency is not strong or significant, and there are also counterexamples that go the other way round, as can be seen in (41b). Individually, there is much variation between the three conditions for the monolingual group, an example is given in (41)c. Still, this inter- and intra- speaker variation in the monolingual group is without strong tendencies.

(41) Examples for the independent variable of the three steps, subset of monolinguals

Stim.	IPA Stim.	IPA Step 1	IPA Step 2	Ortho. Step 3	IPA Step 3	Glosse
a) <i>briquet</i>	[bʁikɛ]	[bʁ rɛ tɛɛ]	[bʁ ra tɛɛ]	<pre che>	[pʁɛ ^{A1} tɛɛ ^{A1}]	‘lighter’
b) <i>ferme</i>	[fɛʁm]	[fɛwm]	[fɛwm]	<feo mò>	[fɛw ^{A1} mʁ ^{A2}]	‘farm’
c) <i>glace</i>	[glas]	[bʁ las]	[bla ʃʁ]	<bờ nai sò>	[bʁ ^{A2} naɲ ^{A1} sʁ ^{A2}]	‘ice-cream’

Having considered the monolingual group data, the consequence is that the differences in the overall picture between the oral conditions and the writing condition arise because they are very strong in the speaker group with second language knowledge of French, see chart and table 50.

Chart and table 50: consonant clusters: the subset of Vietnamese L1 speakers with French L2 knowledge, the condition as an independent variable with the values isolation



Number Percent	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Sum
Isolation condition	7 6,03	11 9,48	2 1,72	2 1,72	90 77,59	4 3,45	116
Embedding condition	7 6,03	8 6,90	3 2,59	3 2,59	90 77,59	5 4,31	116
Writing condition	5 4,31	96 82,76	6 5,17	0 0	1 0,86	8 6,90	116
Sum	19	115	11	5	181	17	348

As expected, and in contrast to the monolingual group, strong differences arise between the two oral conditions on the one hand and the writing condition on the other. This is a parallel to the results for single consonants (see p.140). While the far strongest tendency is to preserve the cluster in the two oral conditions with a stable percentage of about 78, this high proportion decreases drastically in the writing condition to 1%. The other way round, epenthesis is chosen only for 9,5% and 7% in the isolation and embedding condition, but for 83% in the writing condition. The p-value is below 0,0001 if we consider all three conditions. The same holds if we consider pairwise one of the oral conditions and the writing condition. In contrast, the null hypothesis cannot be rejected for the subset of the oral conditions, where the p-value is at 1. In (42), we give examples for the described patterns. Results can be directly compared to the exemplary results for monolinguals in (41). As the dataset consists of only four speakers with second language knowledge of French, we can provide three exemplary results of all the participants to show that results are relatively consistent within this group.

(42) Examples for differences between the three steps, subset of Vietnamese L1 speakers with French L2 knowledge

a) Results for the stimulus *briquet* [bʁike] ‘lighter’ by four different speakers

IPA Condition 1 (isolation, oral)	IPA Condition 2 (embedding, oral)	Condition 3 (writing)	Condition 3 (converted into IPA)
[bʁikeʁ]	[bʁikeʁ]	<bờ ri ke>	[bʁ ^{A2} ri ^{A1} ke ^{A1}]
[bʁike]	[bʁike]	<bờ ghích ke>	[bʁ ^{A2} ɣik ^{D1} ke ^{A1}]
[bʁike]	[bʁike]	<bờ rích ke>	[bʁ ^{A2} rik ^{D1} ke ^{A1}]
[bʁike]	[bʁike]	<bờ ri ke>	[bʁ ^{A2} ri ^{A1} ke ^{A1}]

b) Results for the stimulus *ferme* [fɛʋm] ‘farm’ by four different speakers

IPA Condition 1 (isolation, oral)	IPA Condition 2 (embedding, oral)	Condition 3 (writing)	Condition 3 (converted into IPA)
[fɛʋmə]	[fɛʋmə]	<phéc mò>	[fɛk ^{D1} mɻ ^{A2}]
[fɛʋmə]	[fɛʋmə]	<phéc mò>	[fɛk ^{D1} mɻ ^{A2}]
[fɛʋmə]	[fɛʋmə]	<phéc mò>	[fɛk ^{D1} mɻ ^{A2}]
[fɛʋmə]	[fɛʋmə]	<phép mò>	[fɛp ^{D1} mɻ ^{A2}]

c) Results for the stimulus *glace* [glas] ‘ice-cream’ by four different speakers

IPA Condition 1 (isolation, oral)	IPA Condition 2 (embedding, oral)	Condition 3 (writing)	Condition 3 (converted into IPA)
[yas]	[kʋas]	<gò da sò>	[yɻ ^{A2} za ^{A1} sɻ ^{A2}]
[glas]	[glas]	<gò lát xò>	[yɻ ^{A2} lat ^{D1} sɻ ^{A2}]
[ylas]	[ylas]	<gò lát xò>	[yɻ ^{A2} lat ^{D1} sɻ ^{A2}]
[glas]	[glas]	<gò lát xò>	[yɻ ^{A2} lat ^{D1} sɻ ^{A2}]

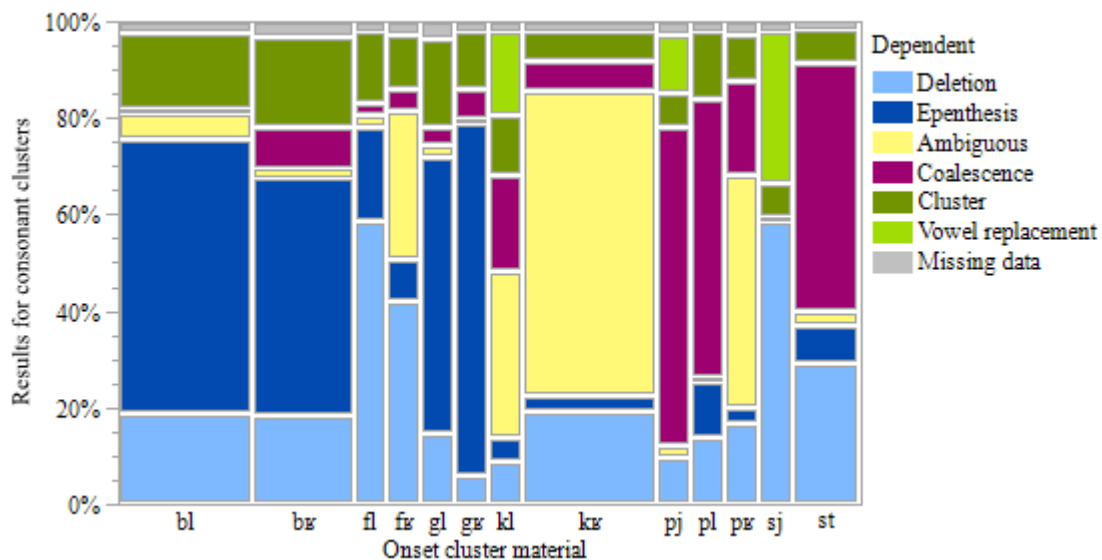
The usual pattern can be observed in (42)a and c: in the first two conditions, namely the oral ones, the cluster is preserved, but in the third condition, epenthesis is chosen instead. A different pattern arises in (42)b: epenthesis already applies in the oral conditions. In those cases, it is a schwa-vowel which could either be a hypercorrection feature, be due to illusory perceptive cues or a very slight releasement of the stimulus coda.

To sum up our results, the hypothesis that lexemes become more and more Vietnamese from condition to condition is not confirmed for the monolingual group. Although there are interesting individual patterns of variation for each lexeme and speaker, this variation is not manifested in a consistent pattern. The results for the group with second language knowledge of French are contrasting with the results for the monolinguals: there is much less variation between speakers and lexemes and instead a high stability of patterns. Between the two oral conditions on the one hand and the writing condition on the other, there is an extremely high difference: while speakers are very faithful to the French stimulus orally, they decide to consequently vietnamize sounds and structures in the writing condition. This adaptation to

phonotactic (or, more precisely, grapho-phonotactic) requirements of Vietnamese is still different to the adaptation which takes part in the monolingual speaker data. Speakers with L2 knowledge of French tend to preserve all stimulus consonant slots and decide for epenthesis to a much higher degree.

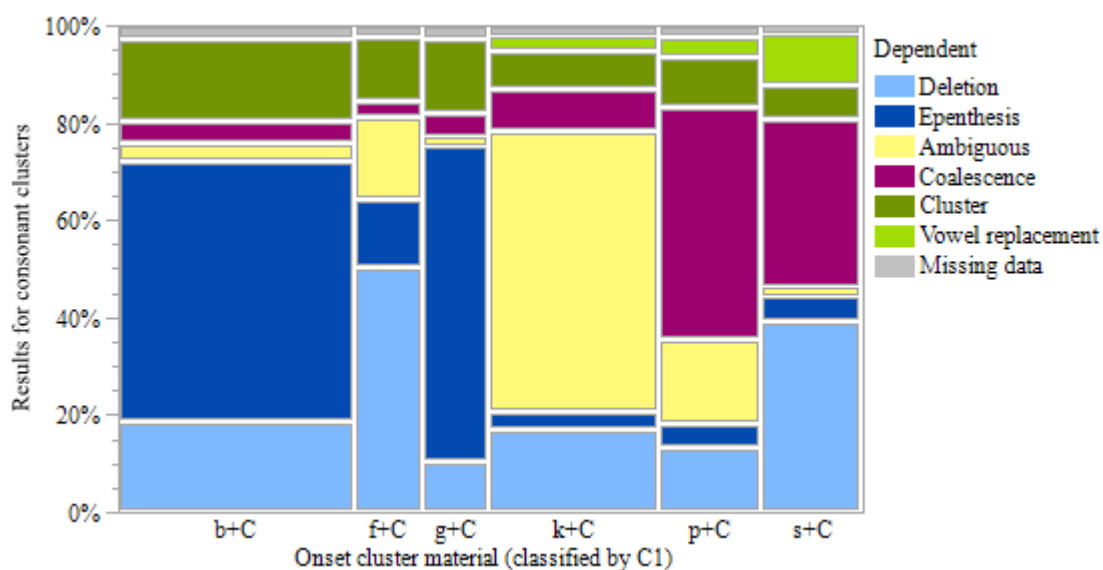
After having considered the three conditions in detail, let us now come to another variable which seems to be very influential for single consonants and consider it for clusters: the consonantal material of the clusters. The cluster material we choose to consider is very different for onsets and codas, as we derived different hypotheses from our loan data to be tested. Therefore, we decide to look at onsets and codas separately and start with onsets. For reasons of space, we do only provide a chart and not a table in 51, and subsequently put the onset clusters into larger categories, for which we will show again both chart and table.

Chart 51: onset cluster material



After a first look at the chart, it seems that features of the first consonant of a cluster may have a role to play: proportions of the dependent variable categories are comparable for the clusters [bl] and [bɣ], for the clusters [fl] and [fɣ], the clusters [gl] and [gɣ] etc. The features of the second consonant seem to play a smaller role for this issue. But the amount of data is not overall sufficient to run chi² tests on the group of coda clusters with a reliable outcome: 20% of the cells have an expected frequency smaller than 5. To have a larger amount of data in each cell and to find more evidence for our first impression, we continue by classing the clusters according to their first consonant: [b], [f], [g], [k], [p] and [s]. The picture is the following, as can be deduced from chart and table 52:

Chart and table 52: onset cluster material, classified by C1



Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
b+C	149	428	30	34	136	0	21	798
	18,67	53,63	3,76	4,26	17,04	0	2,63	
f+C	115	32	38	8	30	0	5	228
	50,44	14,04	16,67	3,51	13,16	0	2,19	
g+C	24	148	4	11	35	0	6	228
	10,53	64,91	1,75	4,82	15,35	0	2,63	
k+C	98	21	327	51	43	20	10	570
	17,19	3,68	57,37	8,95	7,54	3,51	1,75	
p+C	46	17	59	163	35	14	8	342
	13,45	4,97	17,25	47,66	10,23	4,09	2,34	
s+C	134	18	6	119	24	36	5	342
	39,18	5,26	1,75	34,80	7,02	10,53	1,46	
Sum	566	664	464	386	303	70	55	2508
	22,57	26,48	18,50	15,39	12,08	2,79	2,19	

While epenthesis is a frequent strategy when the first cluster consonant is a voiced plosive, [b] and [g] (54 and 65%), the preferred strategy for clusters with the devoiced fricatives [f] and [s] as a first consonant is deletion (50 and 39%) see (43)a-b. First cluster consonants [p] and [s] show a high proportion of coalescence (48 and 35%, cf. 43c) and ambiguous cases emerge high frequently when [k] is a first consonant of a cluster, see (43)d. If we run a Pearson's χ^2 test of independence for the subset of the just mentioned dependent variable values, the p-value is

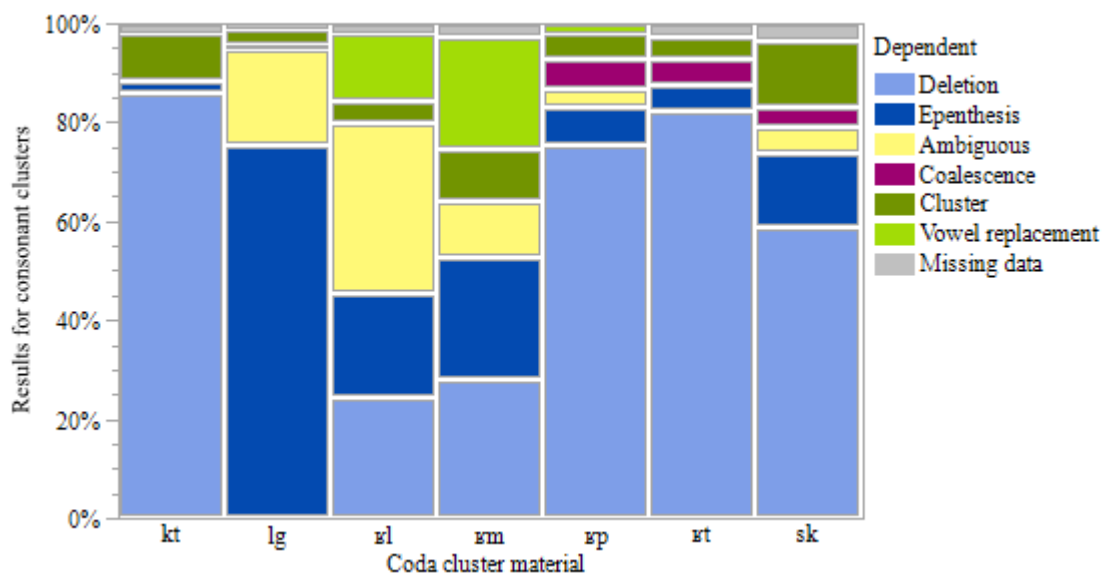
below 0,0001 and the null hypothesis can be rejected. This result does not change if we consider subsets of independent and dependent variable values pairwise. We now turn to the examples.

(43) Examples for common patterns for the independent onset cluster material, categorised according to their first consonant

	Stimulus	IPA stimulus	IPA result	Glosse	Onset cluster	Result
a)	<i>glace</i>	[glas]	[kʁ lat]	‘ice-cream’	[gl]	Epenthesis
	<i>blé</i>	[ble]	[bʁ le]	‘wheat’	[bl]	Epenthesis
b)	<i>flaque</i>	[flak]	[fæk]	‘puddle’	[fl]	Deletion
	<i>stuc</i>	[styk]	[sut]	‘stucco’	[st]	Deletion
c)	<i>stuc</i>	[styk]	[tɛit]	‘stucco’	[st]	Coalescence
	<i>prune</i>	[pʁyn]	[fin]	‘plum’	[pʁ]	Coalescence
d)	<i>cloche</i>	[klɔʃ]	[xɛw sʁ]	‘bell’	[kl]	Ambiguous

Having set a picture of onset cluster material, we turn to coda clusters, see chart and table 53.

Chart and table 53: consonant clusters: coda cluster material as an independent variable; the dependent variables are the result categories



Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
kt	98	3	0	0	11	0	2	114
Percent	85,96	2,63	0	0	9,65	0	1,75	
lg	0	86	22	1	4	0	1	114
Percent	0	75,44	19,30	0,88	3,51	0	0,88	

ɸl	28 24,56	24 21,05	39 34,21	0 0	5 4,39	16 14,04	2 1,75	114
ɸm	32 28,07	28 24,56	13 11,40	0 0	12 10,53	26 22,81	3 2,63	114
ɸp	86 75,44	9 7,89	4 3,51	7 6,14	6 5,26	2 1,75	0 0	114
ɸt	94 82,46	6 5,26	0 0	6 5,26	5 4,39	0 0	3 2,63	114
sk	67 58,77	17 14,91	6 5,26	5 4,39	15 13,16	0 0	4 3,51	114
Sum	405	173	84	19	58	44	15	798

While similarities, especially in the high amount of deletion, can be found for the results of the clusters [kt], [ɸp], [ɸt], [sk], the results for the clusters [ɸl], [ɸm] and [lg] pattern differently, whereby especially the proportions for the cluster [lg] stand out. What unites the first three clusters, what unites the second two and what differentiates the last one from the others? The first four clusters are all made of obstruent material, whereas the others constitute one obstruent and one sonorant. While [ɸl] and [ɸm] have the sonorant in second position, [lg] has it in first position. While deletion, which is the most frequent strategy for clusters with obstruent only (from 59 to 86%), is only between 20-30% for clusters with a sonorant in second position, it does not occur at all for the cluster with a sonorant in first position. To the contrary, the proportions for epenthesis are higher for clusters with a sonorant in second position (21-25%) than for clusters with obstruents only (3-15%), and they are highest for clusters with a sonorant in first position (75%). In (44)a, we provide typical example for clusters with only obstruent material, in (44)b, examples with a sonorant in first or second position are shown.

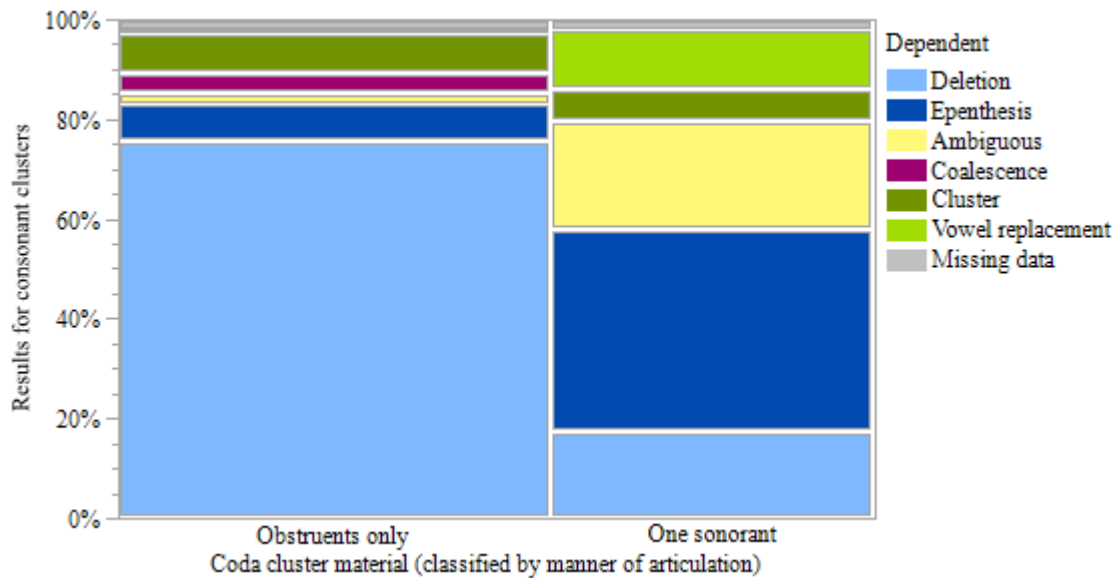
(44) Exaples for current repair patterns for different coda cluster material

	Stimulus	IPA Stimulus	IPA Result	Glosse	Result category
a)	<i>bisk</i>	[bɪsk]	[bɪt]	‘bisque’	Deletion
	<i>carpe</i>	[caɸp]	[cap]	‘carp’	Deletion
b)	<i>ferme</i>	[fɛɸm]	[fɛk mɤ]	‘farm’	Epenthesis
	<i>algue</i>	[alg]	[aj ɣiw]	‘algua’	Epenthesis

To be able to run Pearson χ^2 tests of independence with sufficient data, we collapse the data into two categories: custers with obstruents only vs. clusters with one sonorant and run the test

for the two most differing and frequent independent variables, deletion and epenthesis. The p-value below 0,0001 shows that the distribution is not random. In chart and table 54, we provide chart and table for these two categories and independent variables.

Chart and table 54: consonant clusters: coda cluster material, classified by manner of articulation, as an independent variable; the dependent variables are the result categories

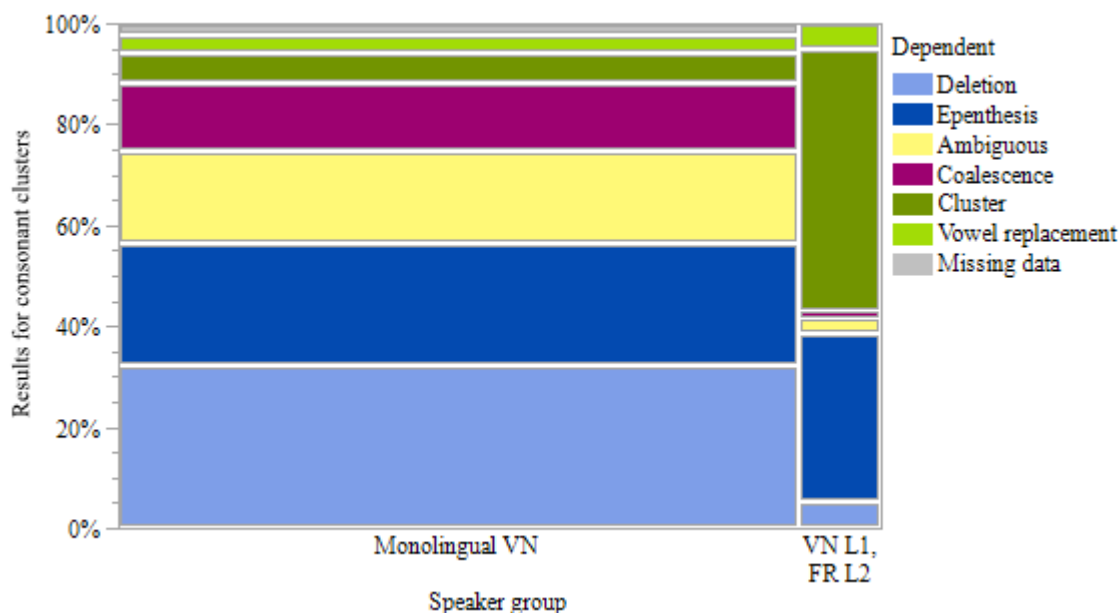


Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
Obstruents only	345	35	10	18	37	2	9	456
One sonorant	60	138	74	1	21	42	6	342
Sum	405	173	84	19	58	44	15	798

After a detailed analysis for the independent variable cluster material we can summarize that for the selected onset clusters we based our data collection on, the first cluster consonant seems to determine the proportions of the dependent variables. For the selection of the coda consonants, we can see that the group of two obstruents in the stimuli show different results patterns than consonant clusters in which one consonant is a sonorant. A weakness of this selection is that results of onsets and codas cannot be grouped together as the selected onset clusters are different from the selected coda clusters. This is since French syllable structure predicts other cluster material in the onset than in the coda. Still, later on, we will consider the independent variable onset vs. coda cluster to have a broad picture about structural differences between these two groups. We have to keep in mind that these differences could also be due to

the fact that coda clusters are made of different material. But before turning to onset vs. coda clusters, we consider the independent variable speaker group, see chart and table 55.

Chart and table 55: consonant clusters: speaker group as an independent variable with the values monolingual speakers of Vietnamese on the one hand and speakers of Vietnamese as L1 and French as L2 on the other; the dependent variables are the result categories

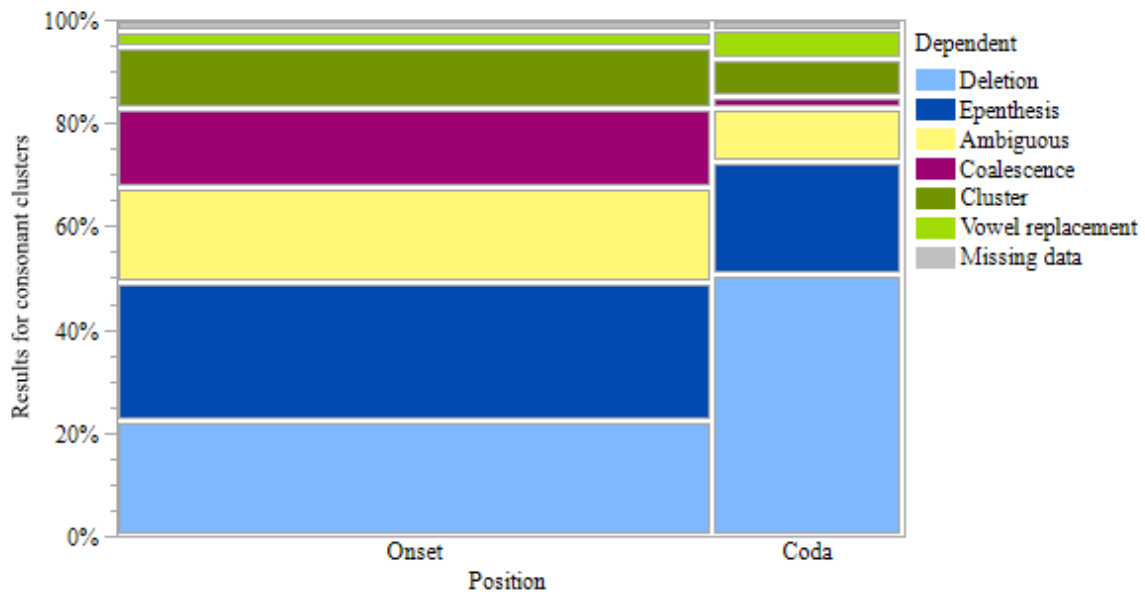


Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
L1 VN,	19	115	11	5	181	17	0	348
L2 FR	5,46	33,05	3,16	1,44	52,01	4,89	0	
Monolingual	952	722	537	400	180	97	70	2958
VN	32,18	24,41	18,15	13,52	6,09	3,28	2,37	
Sum	971	837	548	405	361	114	70	3306

First, the dataset for this variable is not balanced, but also for clusters, the patterns are quite stable for the group with L2 French knowledge and the amount of data is also big enough to run Pearson's χ^2 tests of independence. While the distributions for vowel replacement and epenthesis are most similar, but still differing between the two groups (5 vs. 3% and 24 vs. 33%), the highest difference between the groups can be attested for deletion, cluster preservation and coalescence: with 32%, deletion is the most common result for the monolingual group whereas it is at only 6% for the group with L2 knowledge of French. Also, coalescence is drastically lower in the French speaking group: 1 compared to 14% in the monolingual group. On the other hand, the frequency of cluster preservation is much higher in the French speaking group than in the monolingual group: 52 vs. only 6%. If we consider the

subset of the latter three dependent variable values, the outcome of the χ^2 test is that the distribution is not random, with a p-value below 0,0001. Still, for the subset of the more similar values epenthesis and vowel replacement, the p-value is 0,7340 and the null hypothesis cannot be rejected. We continue with the independent variable position, the second last variable, see chart and table (56).

Chart and table 56: consonant clusters: position as an independent variable with the values onset and coda, the dependent variable values are the result categories



Number	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
Percent								
Onset	566 22,57	664 26,48	464 18,50	386 15,39	303 12,08	70 2,79	55 2,19	2508
Coda	405 50,75	173 21,68	84 10,53	19 2,38	58 7,27	44 5,51	15 1,88	798
Sum	971	837	548	405	361	114	70	3306

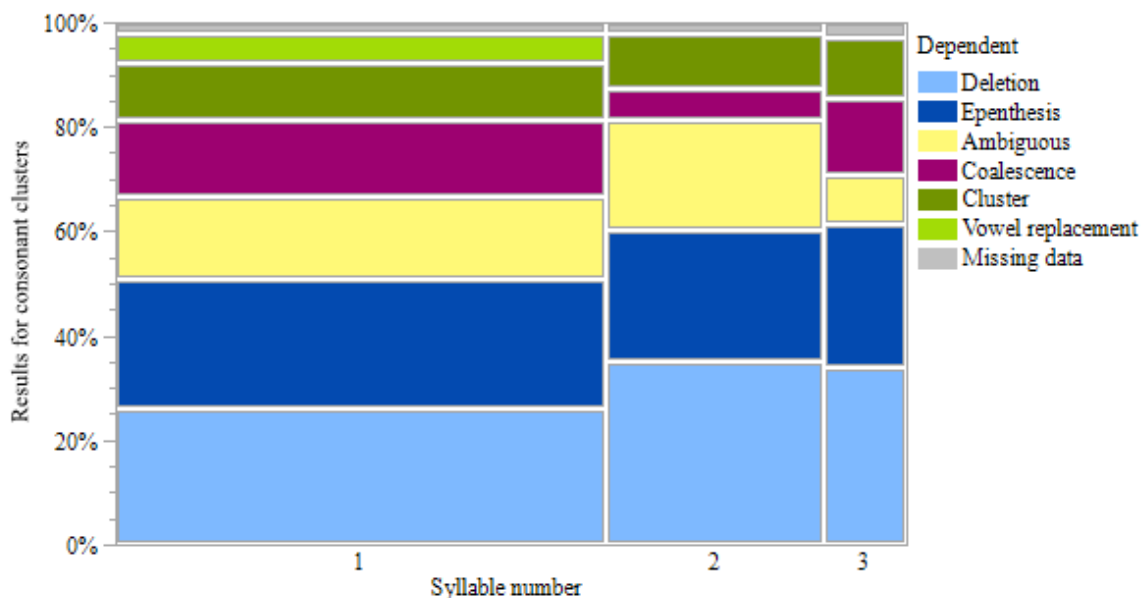
The most striking difference between onsets and codas lies in the proportion of deletion: it is at 23% for onsets whereas it is at 51 % for codas. Examples for this pattern are given in (45). The dependent variable value for which we can observe the second highest difference is coalescence with 15% for onsets and only 2% for codas. Therefore, we run a Pearson's χ^2 test of independence for the subset of these two values. The p-value is below 0,0001. For the subset of the rather similar values instead, namely epenthesis, cluster, and vowel replacement, we get a p-value below 0,0001 as well. The distribution is therefore not random for either the two subsets of dependent variable values, and position probably is a strong factor of influence.

(45) Examples for frequent repair patterns in stimulus onset and coda clusters: preference of deletion vs. Epenthesis

<i>Stimulus</i>	IPA stimulus	IPA result	Glosse	Position	Result category
a) <i>bisk</i>	[bisk]	[bit]	‘bisque’	Coda	Deletion
<i>carpe</i>	[caɾp]	[cap]	‘carp’	Coda	Deletion
b) <i>glas</i>	[glas]	[kɾ lat]	‘ice-cream’	Onset	Epenthesis
<i>blé</i>	[ble]	[bɾ le]	‘wheat’	Onset	Epenthesis

Finally, we present syllable number as the ultimate independent variable we want to test. In chart and table 57, this is shown for the whole dataset. Overall, the monosyllabic lexemes make the largest group, the smallest amount of data is collected for trisyllabic lexemes. Although there are differences between the three groups, they do not pattern as expected. Our expectation was that epenthesis occurs more often in monosyllabic lexemes than in bi- or trisyllabic lexemes. To the contrary, proportions for epenthesis remain stable. For the Pearson’s χ^2 test of independence, we consider the subset of this independent variable value, namely epenthesis, together with the other most stable value cluster preservation. The p-value is 0,9735 and the null hypothesis cannot be rejected. This changes when we consider the subset of epenthesis together with deletion: here, the p-value is 0,0141, but this is due to the instability of proportions for deletion.

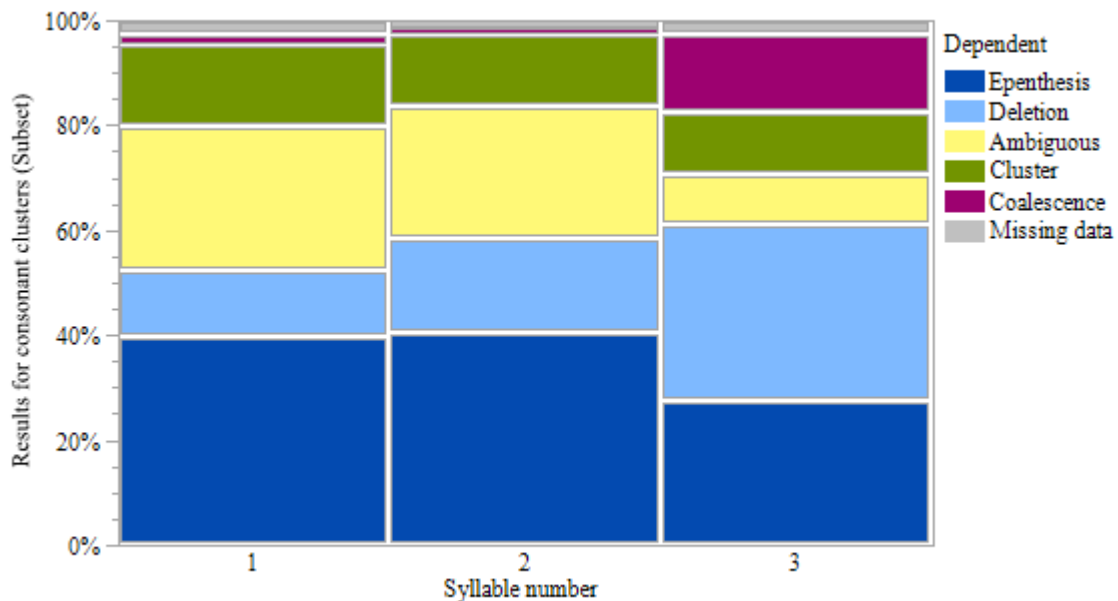
Chart and table 57: consonant clusters: syllable number as an independent variable with the values 1, 2 and 3, the dependent variables are the result categories



Number Percent	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Vowel replacement	Missing data	Sum
Monosyllabic	534 26,02	515 25,10	322 15,69	300 14,62	224 10,92	114 5,56	43 2,10	2052
Bisyllabic	321 35,20	228 25	194 21,27	55 6,03	96 10,53	0 0	18 1,97	912
Trisyllabic	116 33,92	94 27,49	32 9,36	50 14,62	41 11,99	0 0	9 2,63	342
Sum	971	837	548	405	361	114	70	3306

Due to this fact, we want to have a closer look at a smaller, more balanced, and homogenous subset of the data: lexemes with similar segmental material (the same onset cluster [bʁ]) but with different number of syllables such as *brique*, *briquet*, *bric-à-brac* ‘brick, lighter, bric-a-brac’. We have three of such triplets in total, the others are for the clusters [kʁ] *crabe*, *crapaud*, *crepuscule* ‘crab, toad, crepuscule’ and [bl] *blé*, *blazon*, *bloc-cuisine* ‘wheat, blazon, kitchen block’. Chart and table for this data subset is given in 58.

Chart and table 58: consonant clusters: subset for the independent variable syllable number with three lexeme triplets: each triplet contains a monosyllabic, a bisyllabic and a trisyllabic lexeme, but has the same cluster material



Number Percent	Deletion	Epenthesis	Ambiguous	Coalescence	Cluster	Missing data	Sum
Monosyllabic	44 12,87	136 39,77	94 27,49	7 2,05	53 15,50	8 2,34	342
Bisyllabic	61 17,84	139 40,64	86 25,15	3 0,88	48 14,04	5 1,46	342

Trisyllabic	116 33,92	94 27,49	32 9,36	50 14,62	41 11,99	9 2,63	342
Sum	221	369	212	60	142	22	1026

For this subset, the expected tendency is partly visible in the proportions of the data: while there is rather no difference for epenthesis between mono- and bisyllabic lexemes, the expected difference accounts for the data with three syllables compared to the others (40 and 41% vs. 28%). On the other hand, the proportions of deletion increase from step to step: from 13 over 18 to 34%. For the subset of dependent variable values, the p-value of a Pearson's χ^2 test of independence is below 0,0001 but considering again epenthesis and the more stable value cluster preservation, the p-value is at 0,6462 and the null hypothesis cannot be rejected. Still, absolute numbers show us that there is a difference between mono- and bisyllabic lexemes on the one hand and trisyllabic lexemes on the other. We could deepen this issue statistically in the future by considering epenthesis on the one hand and the rest of the dependent variable values grouped together on the other, or by applying mixed effect models, but in the framework of this work continue by providing exemplary results for the tendencies so far described in (46). They are all chosen from the monolingual data, the patterns observable in (46)a-b are those that reflect most frequent patterns. In (46)c, there are two peculiarities: only for this specific monosyllabic stimulus, coalescence is the most frequent strategy chosen and for this specific bisyllabic stimulus, it is deletion. Therefore, we point out to the fact that not only syllable number might be an independent variable of influence herein, but also the stimulus material, as we have already shown in detail on p.168.

(46) Examples for patterns for the independent variable syllable number in our subset of three lexeme triplets

<i>Stimulus</i>	IPA stimulus	IPA result	Glosse	Syll. No	Result Cat.
a) <i>brique</i>	[bʁik]	[bʁ rik]	'brick'	1	Epenthesis
<i>briquet</i>	[bʁike]	[bʁ rik ke]	'lighter'	2	Epenthesis
<i>bric-à-brac</i>	[bʁikabʁak]	[bik ka bɛ]	'bric-a-brac'	3	Deletion

b)	<i>blé</i>	[ble]	[bɣ le]	‘wheat’	1	Epenthesis
	<i>blason</i>	[blasõ]	[bɣ la zuŋ]	‘coat of arms’	2	Epenthesis
	<i>bloc-cuisine</i>	[blokkɥisin]	[lāk kwi sin]	‘kitchen unit’	3	Deletion
c)	<i>crabe</i>	[kɣab]	[xan]	‘crab’	1	Coalescence
	<i>crapaud</i>	[kɣapo]	[ka fu]	‘toad’	2	Deletion
	<i>crépuscule</i>	[kɣepɥskyl]	[ka pi tɛuj]	‘dusk/dawn’	3	Deletion

Until now, we have considered five different independent variables concerning the proportions between the three main repair strategies for onset clusters: we have discussed stimulus item speaker variability (Experiment 1 vs.2), three conditions (imitation, embedding in a carrier sentence and writing), different cluster material, speaker group (monolingual Vietnamese vs. L2 French knowledge), position (onset vs. coda), and syllable number (mono- bi- trisyllabic lexemes). At this point, we come to a detailed analysis regarding the category of two chosen repair strategies: epenthesis and deletion. For epenthesis, we want to see which epenthetic vowels are inserted in which surroundings. For deletion we investigate which cluster consonant is deleted. In the respective data, we will include again also ambiguous data when both strategies apply, epenthesis and deletion.

In the following, we present our hypotheses which we derived from the loan data:

1. Epenthesis: according to our loan data, we expect the vowels [ɣ], [a] or [i] to be inserted, with [ɣ] being the most frequent epenthetic vowel (Dependent variable). The place of articulation of the consonant which precedes the epenthetic vowel (independent variable) seems to be an influential factor to determine which vowel is inserted in our loan data, but the loan dataset is too small to make strong predictions.
2. Deletion: we generally expect the second consonant to be deleted most frequently, and the first consonant to be maintained, or, if illicit in Vietnamese coda position, replaced by a similar licit consonant.
 - a. Onsets: consonantal material (independent variable) is supposed to be influential for which of the two consonants is deleted (dependent variable). In line with our loan data, we focus on two groups: C+[ɣ] and C+[l]. If the

second consonant is a [ɹ], we expect this second consonant to be deleted. The other way round, if it is a [l], we expect the first consonant to be deleted.

- b. Codas: consonantal material of the clusters is supposed to be influential. According to our loan data, we investigate two groups: clusters without vs. with a nasal as a second consonant. If the second consonant is no nasal, we expect its deletion whereas if it is a nasal, we expect the first consonant to be deleted due to saliency of the nasal feature.

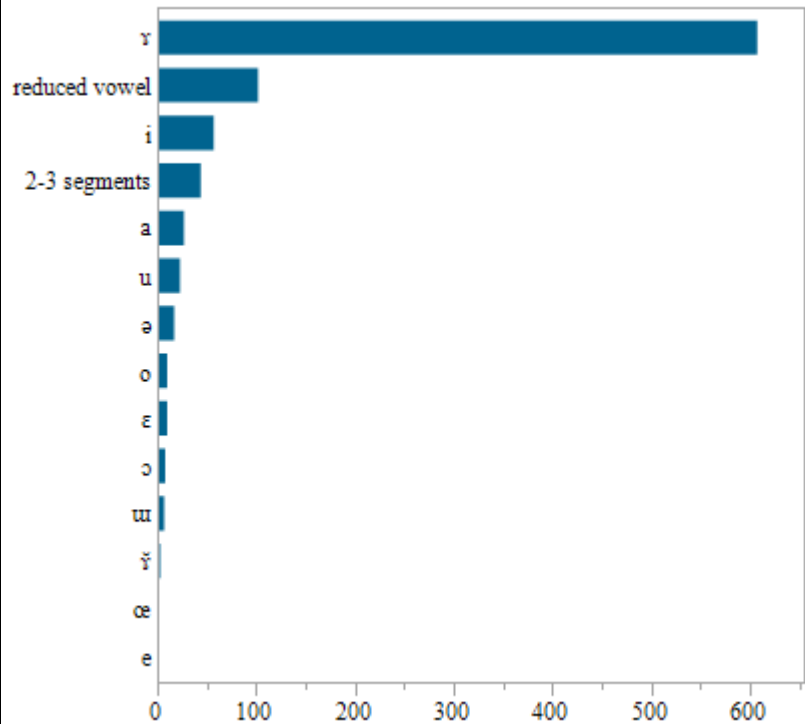
For the hypotheses 2a and 2b, we can now derive a more concise hypothesis if we enlarge 2b also to laterals as a second consonant. This was not possible in our loan investigation as we have no such data available. To the contrary, for our experimental data, we include coda cluster data with a lateral as the second consonant. We still test hypothesis 2a and 2b separately, but if they were both confirmed for nasals/laterals as the second consonant, we could argue with saliency for those consonants and that manner features may therefore be more powerful than place features for nasals and laterals. As we will see, hypotheses 2a and 2b are not confirmed in our experimental study which is why we can skip this discussion in our further investigation. More fruitful is the investigation on epenthesis, as hypothesis 1 can generally be confirmed. The subset of our data on which the following presentation of the results is based contains all 917 tokens for instances of epenthesis.

Epenthesis

After having provided the hypotheses, we look at both strategies in detail, starting with epenthesis, and present the overall results for epenthesis in table and chart 59.

Table and chart 59: overview proportions of the results for epenthetic vowel quality in repairs of stimulus clusters

Class	Number	Percent
ɤ	607	66
reduced vowel	102	11
i	57	6
2-3 segments	44	5
a	27	3
u	23	3
ə	17	2
o	10	1
ɛ	10	1
ɔ	8	1
ʊ	7	1
ɿ	3	>1
œ	1	>1
e	1	>1
Sum	917	100



Our first hypothesis is confirmed: the epenthetic vowel with far the highest frequency of 66% is [ɤ]. All other vowels make only a little percentage, from below 1% up to 6%. The category with 11% is called *reduced vowel* and groups the following three vowels [ɤ], [ɛ] and [a]. As the vowel quality of these reduced vowels is hardly audible, we do not count them within the other vowel categories but put them in only in this extra group of reduced vowels. This category can be seen as transitory between the realization of a cluster and epenthetic vowel. As the vowel is still audible (which is double-checked against a native speaker's perception), it is classified among the larger category epenthesis. Still, if a reduced vowel is chosen in the first step, there is the chance to have a cluster in the following conditions, especially in the writing condition, but also the contrary is possibly, that the reduced vowel results in a full vowel in the following condition. Examples for the stimulus *ble* [ble] 'wheat' illustrate this issue: one speaker realizes a reduced epenthetic vowel in the isolation condition [b(ɤ) li] but a cluster in the embedding and the writing condition [bli]. In contrast, another speaker realizes the reduced vowel in the isolation condition as [b(ɤ) lit], which becomes stabilized as a full vowel in the embedding condition [bɤ lit] and the writing condition <pòr lít>, converted into IPA as [pɤ^{A2} lit^{D1}]. The

second category which groups different results, is the category which is intitled *two or three segments*. This mainly occurs for the stimulus *algue* [alg], but herein quite often and in different forms: sometimes in form of two vowels as in [ai kiə] or [a lɿu], and sometimes in form of a vowel and a glide as in [a kiw]. We have no explanation for this interesting pattern. Examples for other results which are not grouped into categories and have a percentage higher than 1%, are provided in (47). These are the vowels [ɤ] with 66%, [a] with 3%, [i] with 6%, [u] with 3% and finally the Schwa-vowel with 2%, which only occurs for the data of speakers with French as a second language knowledge in the oral steps and mostly in coda clusters. The other epenthetic vowels can also occur in codas but do so with a higher proportion in onsets.

(47) Examples for epenthetic vowels in repair results of stimulus consonant clusters

Stimulus	IPA stimulus	IPA result	Glosse	Epenthetic vowel
<i>blé</i>	[ble]	[bɤ le]	‘wheat’	ɤ
<i>blason</i>	[blazɔ̃]	[bɑ la zuŋ]	‘coat of arms’	a
<i>brique</i>	[bʁik]	[bi rit]	‘kitchen unit’	i
<i>plume</i>	[plym]	[cu ri]	‘feather’	u
<i>algue</i>	[alg]	[an gə]	‘algue’	ə

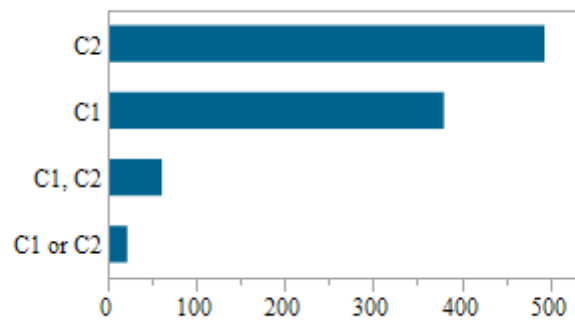
Although the experimental data in total is much higher than the loan data, the percentage of epenthetic vowels other than [ɤ] is still so low that we cannot provide statistically significant analyses for which independent variables might influence the occurrence of an [i], for instance. It seems that vowel harmony, although not a feature which is known to be active in Vietnamese phonological processes, has a role to play. As in the just listed examples, if the vowel which follows the cluster is an [a], the same vowel is oftentimes also chosen as the epenthetic vowel between the preceding cluster consonants. The same can be observed for the vowel [i]. If the stimulus vowel which follows the cluster is the closed vowel [y], the epenthetic vowel can be an [u], which is also closed, and the [y] is replaced, in this example, by its unrounded counterpart [i]. After having provided some insights into the issue of the quality of epenthetic vowels, we now move on to deletion patterns for consonant clusters.

Deletion

In the following, we look at which of the two cluster consonants is deleted when deletion applies. We do not have a detailed look at the other consonant, whether it is preserved or replaced. As already stated before, replacement patterns are not considered in the chapter of consonant clusters. Also, when we consider deletion, the differentiation between preservation and replacement for the other consonant is simply not in the focus of interest. If the consonant which is not deleted, keeps all the stimulus consonant features or not is not important when we want to know which of the consonants gets deleted. For the following analysis, we consider a subset of the whole data, namely the lexemes where deletion of a cluster consonant is observed. In total, we have 960 tokens for this subset. We start with an overview, see table and chart 60.

Table and chart 60: overview proportions of the results for stimulus cluster deletion patterns

Class	Number	Percent
C2	495	52
C1	382	40
C1, C2	61	6
C1 or C2	22	2
Sum	960	100



Comparing the overall proportions, the second consonant is deleted with a higher proportion than the first consonant, which is an expected result, referring to results from the loan data. Still, the proportions are not very different: 52 vs. 40%. The two remaining groups make up the deletion of both consonants with 6% and ambiguous cases for which we cannot be sure which of the two consonants has been deleted with 2%. In what follows, we do not focus on these two groups of minor importance and as we have different hypotheses for which independent variables affect deletion patterns in onsets and codas, we continue by providing an overview for onsets and coda clusters separately and then go on with a more detailed analysis of onset clusters first and subsequently of coda clusters. For onsets, the proportions for the expected tendency are even stronger with 36% deletion of the first consonant and 60% of the second, see table and chart 61. In contrast for codas, the proportions are balanced, see table and chart 62.

Table and chart 61: overview proportions of the results for stimulus cluster deletion patterns (Onsets)

Class	Number	Percent
C2	293	60
C1	173	36
C1, C2	21	4
C1 or C2	1	>1
Sum	488	100

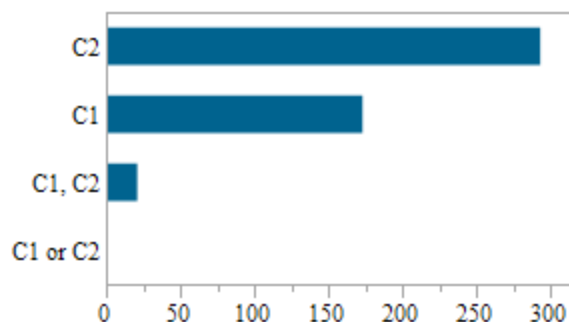
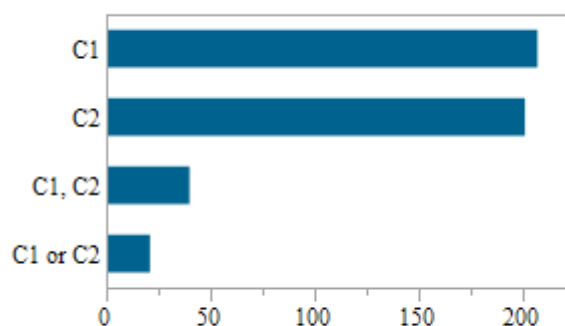


Table and chart 62: overview proportions of the results for stimulus cluster deletion patterns (Codas)

Class	Number	Percent
C1	209	44
C2	202	43
C1, C2	40	8,5
C1 or C2	21	4,5
Sum	472	100



Examples for stimulus onset clusters are given in (48)a, and for coda clusters in (48)b. For both, we first give one example for the deletion of C1 and then for the deletion of C2.

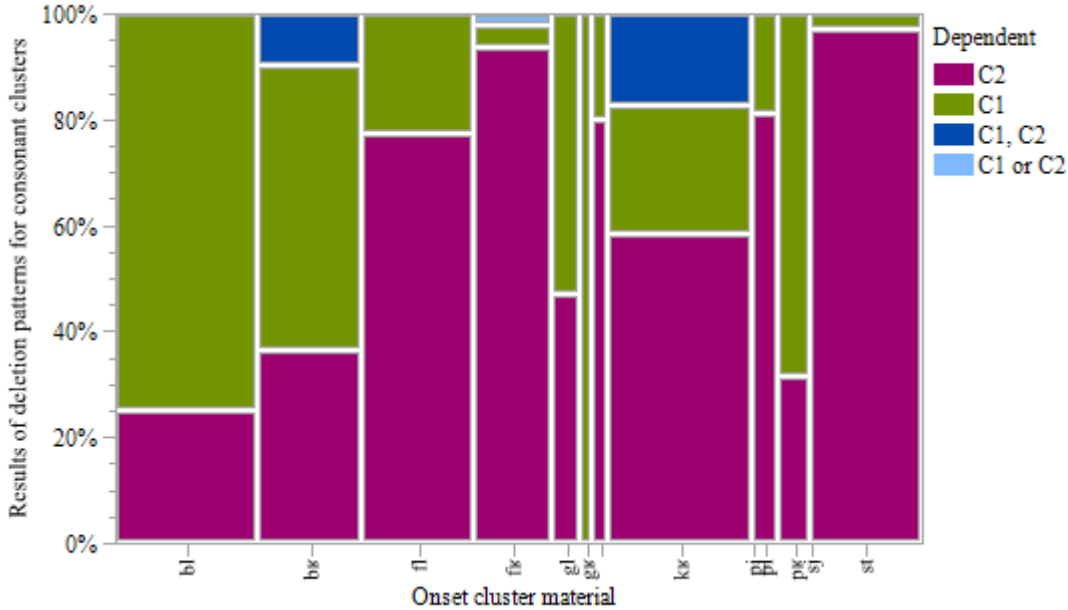
(48) Examples for deletion of first vs. second consonant in onset and coda clusters

	Stimulus	IPA stimulus	IPA result	Glosse	Position	Deletion of
a)	<i>ble</i>	[ble]	[le]	‘wheat’	Onset	C1
	<i>ble</i>	[ble]	[bi]	‘wheat’	Onset	C2
b)	<i>perle</i>	[peɹl]	[peɹn]	‘wheat’	Coda	C1
	<i>perle</i>	[peɹl]	[peɹw]	‘coat of arms’	Coda	C2

While the deletion pattern is obvious in (48)a, it is a bit more complicated to understand in (48)b. This is because in (48)a, replacement of one of the two consonants does not occur, but in (48)b, it does: in the first result, [l] is replaced by [n], and in the second, [ɹ] is replaced by the glide [w].

In the following, we present an analysis of onset deletion patterns, see chart 63. A table is not shown for reasons of space. Deletion is never chosen for the clusters with [j] as a second consonant. Considering [b] and [f] as a first consonant, the proportions for the deletion of this first consonant are higher for [l] as a second consonant than [ɾ] as a second consonant. Still, for the clusters with [g], [k] and [p], the proportions are reversed. The dependent variable is the deletion of the first vs. the second cluster consonant.

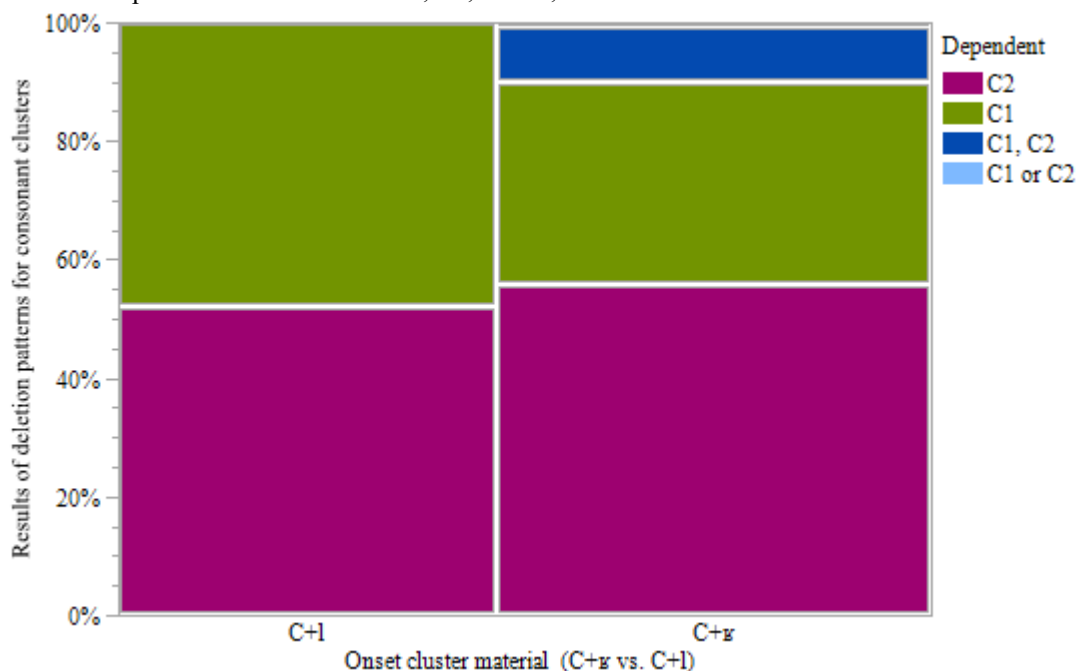
Chart 63: consonant clusters: onset cluster material as an independent variable, and deletion result patterns as the dependent variable with the values C1, C2, C1/C2, C1 or C2



We must consider two things: first, the data is unbalanced and second, the dataset is also relatively small. It is also problematic that the datasets for the consonant clusters in which the proportions are reversed are smaller, namely [g], [k] and [p] as a first consonant. This is because on the one hand, there are more stimuli for some clusters such as [bl] and [bɾ] but also since for some stimulus clusters, the preferred cluster repair made by speakers is not deletion.

In the following, we test one independent variable for which values we expect different result patterns: C+[ɾ] vs. C+[l]. In the loan data, if the second consonant is a [ɾ], it is deleted, but if it is a [l], the first consonant is deleted. We have argued with saliency of the lateral as a possible reason for this result (see p.80). But as the experimental data patterns differently from the loan data, it is possible that the results herein do not stabilize patterns observed for the loan data. Also, the result categories are larger if we consider the large parts of the data categorized in two groups C+[ɾ] vs. C+[l], and proportions can be seen in chart and table 64. Still, also for these larger categories, statistic Pearson’s χ^2 tests of independence cannot deliver meaningful results as the data is still too small: 20% of the cells have an expected frequency smaller than 5.

Chart and table 64: consonant clusters: subset for onset cluster material as an independent variable and with deletion result patterns with the values C1, C2, C1/C2, C1 or C2



Number	C2	C1	C1, C2	C1 or C2	Sum
C+[l]	103	94	0	0	197
	52,28	47,72	0	0	
C+[ʁ]	125	77	21	1	224
	55,80	34,38	9,38	0,45	
Sum	228	171	21	1	421

The clear patterns from the loan data can finally be observed in the experimental data as slight tendencies but keeping the above-mentioned reservations in mind: for the stimulus cluster group C+[l], there are higher proportions of deletion of the first consonant than for the group C+[ʁ]: 48% vs. 34%. Still, the deletion of the second consonant is only very slightly higher for the group C+[ʁ] than for the group C+[l]: 56 vs. 52%. Examples are provided in (49)a-b. Another difference makes up the category for the deletion of both consonants: it only occurs for the group C+[ʁ] with a percentage of 9, not in monosyllabic lexemes and mostly in trisyllabic ones, see (49)c.

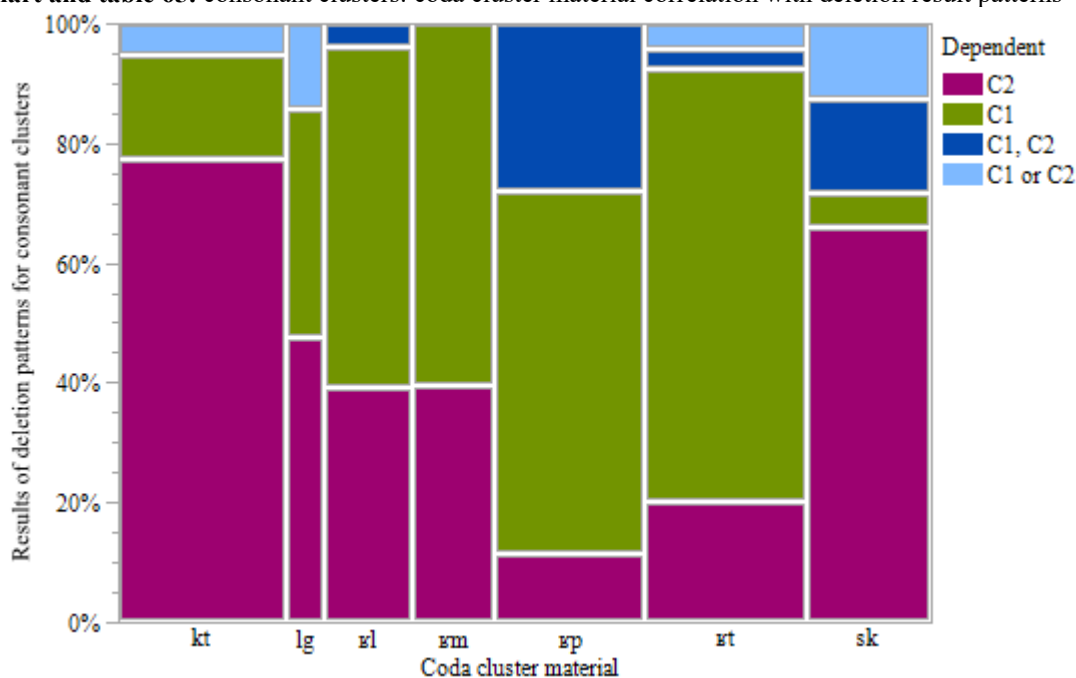
(49) Examples for deletion of first vs. second consonant in onset clusters as the values of dependent variable, the independent variable values are the cluster groups C+[ɸ] vs. C+[l]

<i>Stimulus</i>	IPA stimulus	IPA result	Glosse	Cluster group	Deletion
a) <i>ble</i>	[ble]	[le]	‘wheat’	C+[l]	C1
		[ɸi]			C2
b) <i>brique</i>	[bɸik]	[rik]	‘brick’	C+[ɸ]	C1
		[ɸik]			C2
c) <i>bric-à-brac</i> <i>crépuscule</i>	[bɸikabɸak] [kɸepuskyl]	[ik t̃ɛɣ hwɛk]	‘bric-a-brac’ ‘dusk/dawn’	C+[ɸ]	C1, C2
		[ik kiw su lɣ]			C1, C2

We still conclude for this investigation that it is overall not fruitful in confirming our hypotheses: first, results only provide tendencies and second, the tendencies might be due to an unbalanced dataset. Finally, the dataset should be larger to draw meaningful conclusions. After having described patterns for deletion in onsets, we now move on to codas.

Although the dataset is also small for coda clusters, it is more balanced. Differences in the data amount for different clusters are only since deletion is not the chosen repair strategy to an equal frequency for all the clusters. For instance, for the stimulus cluster [lg] in *algue*, deletion is chosen by the speakers only very seldom. If we want to check whether clusters with a nasal or a lateral as the second consonant pattern differently from the other clusters, we first need to check if they pattern similarly, comparing them to each other. In a second step, we need to check if the rest of the data patterns similarly in their difference to this pattern. This can be done by considering chart and table 65.

Chart and table 65: consonant clusters: coda cluster material correlation with deletion result patterns



Number	C1	C1, C2	C1 or C2	C2	Sum
kt	17	0	5	76	98
	17,35	0	5,10	77,55	
lg	8	0	3	10	21
	38,10	0	14,29	47,62	
ʁl	29	2	0	20	51
	56,86	3,92	0	39,22	
ʁm	29	0	0	19	48
	60,42	0	0	39,58	
ʁp	52	24	0	10	86
	60,47	27,91	0	11,63	
ʁt	68	3	4	19	94
	72,34	3,19	4,26	20,21	
sk	4	11	9	47	71
	5,63	15,49	12,68	66,20	
Sum	207	40	21	201	469

Our first check has a positive result: the cluster [ʁl] in *perle* is adapted similarly to the cluster [ʁm] in *ferme*. But if we look at the other data, it seems that it is also the first rhotic consonant [ʁ] which has a role to play: the values for *ferme*, *perle* and *carpe* are very similar, for instance in that the rhotic first consonant is oftentimes deleted: with a percentage of 57 to 61. For the cluster [ʁt], the frequency is even higher with 72%. Therefore, our second check has a negative

result and for coda clusters, our hypothesis cannot be confirmed. To sum up our detailed look at epenthesis and deletion patterns, it was partly fruitful: the hypothesis for epenthesis has been confirmed and additional interesting insights have been disposed. To the contrary, for deletion we do not find evidence for assuming that the expected decisive independent variables could correlate with the dependent ones: although the second consonant gets deleted with a higher frequency, it is not much higher than the frequency of the first consonant. Overall, the proportions between the deletion of the first vs. the second cluster consonant are quite balanced in codas as well between 44 and 43%. Systematic patterns cannot be found. This has been the last insight on consonant clusters and before analysing the results on syllabification, we provide a short summary of this most extensive and detailed part in the results of our dissertation.

Interim conclusion consonant clusters

The part on consonant clusters for this experimental setting we presented so far is the most extensive part of our work, which is why we provide at this point a short interim summary to recapitulate results in a concise fashion. There are three peculiarities in the experimental data. First, epenthesis is a very frequent strategy, and more frequent compared to results on loan data. To the contrary, according to typology in loan data it is epenthesis which occurs more often than deletion (see p.83). The experimental data is situated between the general typological tendencies in loan data in the world and the results derived from our specific loan dataset.

The second peculiarity mainly surfaces for onset clusters: herein, we do not only find deletion and epenthesis, but also two other strategies: coalescence and vowel replacement. Whereas vowel replacement is not frequently attested, coalescence is a frequent strategy. In coalescence, the cluster is replaced by a single consonant which is neither the first consonant nor the second consonant of a cluster but shares features of both consonants. For instance, the French stimulus cluster [st] is frequently replaced by the Vietnamese sound [t̪e̯]. This affricate groups the features of French [t] and the coronal fricative features of [s]. For the stimulus *stuc* [styk] ‘stucco’, we therefore get for instance [t̪ewik^{D1}].

The third peculiarity for the monolingual group concerns coda clusters. While in the loan data as well as in the experimental data for onsets, we always identify only one repair strategy for each cluster, the picture for coda clusters is somewhat more complex, as it seems that two strategies often apply simultaneously for one cluster, for instance epenthesis *and* deletion. An example can be given by two oral responses to the stimulus *algue* [alg], namely [a.ɫ̪] and [a.ɣ̪]. In both examples, the epenthetic vowel [ɣ̪] is inserted. But additionally, one of the two

consonants is deleted: in the first example, this concerns [g] and in the second it concerns [l]. One might therefore assume that the vowel [ɤ] is not an epenthetic vowel but a vowel replacement of the respective missing cluster consonant. Still, epenthesis also applies in cases where no deletion applies, for instance [al.yi]. As presented in the preceding subchapter concerning single consonants, epenthesis also occurs as an adaptation pattern of illicit single consonants, for instance in some imitations of *ciel* [sjɛl] ‘sky’ by monolingual speaker of Vietnamese, just as in [siə.li]. Therefore, the before mentioned cases stay ambiguous: we cannot define which is the decisive cluster repair strategy and which of the repairs is due to other reasons, for instance the release of the stimulus coda.

As to the French as a second language speaker group, there is much less such ambiguity. In parallel to single consonants, speakers are more faithful to the stimulus than the monolinguals and as has been shown for loan data. In the oral data, they oftentimes realise clusters as such, whereas in their transcription according to Vietnamese orthography, they oftentimes decide for epenthesis, just as observed for the adaptation patterns of illicit single consonants. Therefore, there is a larger difference between oral and written data for this group than for the monolinguals, who cannot make use of any foreign language proficiency in their speech. After having presented the results for consonant cluster repair in the experimental data, we now turn to another topic, namely syllabification.

5.3.3. Special syllabification patterns

Syllabification is a topic which is independent from clusters but partly linked to clusters, as syllabification caught our attention when we were examining consonant clusters in loanwords. One example from our loan data is *xích lô* [sik^{D1} lo^{A1}] from French *cyclopousse* [si.klo.pus] ‘pedicab’, in which the first onset cluster consonant of the French lexeme is a coda consonant of the preceding glide in the Vietnamese lexeme. In this manner, there is no syllable internal illicit cluster in the Vietnamese loan. In several structures like this, we first identified syllabification processes as another strategy for consonant cluster repair but then found out that this strategy may have other motivations than cluster repair. This is so because these specific syllabification patterns also occurring in several other instances where no cluster is part of the source lexeme: one example is *phốt-tăng* [fot^{D1} tǎŋ^{A1}] from *potence* [po.tãs] ‘stem’ (bicycle). In this case, the onset consonant of the second syllable is geminated, and the double becomes the coda of the first syllable.

The amount of data for the special syllabification processes in loanwords is enough to catch the interest of the researcher, but due to the limited amount of total data still not very high. With

our experimental approach, we have more evidence for these processes to take place, as not only the dataset is larger but also the percentage of the occurrences are higher than in the loan data. Referring to the loan data, we have made several hypotheses. In our experimental data, these are not only confirmed and strengthened, but there are even instances of such syllabification processes where we did not expect them to happen. Therefore, our results not only strengthen but also go beyond our hypotheses. In the following, we start by recapitulating shortly the hypotheses deduced from our loan study we have presented during the method chapter of this experimental study. Subsequently, we give some broad information about the main results and explain them with the help of examples, delivering qualitative insights into the data. We then continue by providing a quantitative view by explaining proportions with the help of charts and tables as in the chapters before.

The hypotheses in table 66 below are not intended as strong constraints: in the loan data, the hypotheses are confirmed to a certain amount of the respective source lexemes, but not to all of them. Therefore, we do not expect them to apply robustly but just to a certain frequency in the experimental data as well.

Table 66: hypotheses for syllabification

French lexeme	IPA	English glosses	Expected syllabification process
boyau	bwa.jo	tubeless tyre	Onset glide could become coda glide, empty onset filled by glottis stop
écran	e.kʁã	screen	First onset cluster consonant could become a coda consonant of the preceding syllable
câbleuse	ka.bløz	wiring specialist (fem.)	
étang	e.tã	pond	Onset consonant of second syllable could be doubled and become coda consonant of preceding syllable
crapaud	kʁa.po	toad	
épice	e.pis	spice	
briquet	bʁi.ke	lighter	
bric-à-brac	bʁi.ka.bʁak	bric-à-brac	
menotte	mə.not	handcuffs	
hamac	a.mak	hammock	
chameau	ʃa.mo	camel	

efface	e.fas	rubber	Onset consonant slot of second syllable could be doubled and become coda consonant of preceding syllable (but some consonantal features are changed in the double)
gigot	ʒi.go	leg (of an animal, gastr.)	
coussin	ku.sẽ	cushion	
radeau	ʁa.do	raft	
poulet	pu.le	chicken	
stylo	sti.lo	pen	
blason	bla.zõ	coat of arms	
guignol	gi.ɲol	joker	

As to a general overview of the results, the expected processes occur to a higher frequency than for loans (39% vs. 12%, relative to all structures where we expect that syllabification processes can potentially take place). Considering the results for the experimental data in contrary to the loans, there is not a systematic difference within the four different categories for the results. This does not weaken the results themselves but rather shows that the driving process is the same for all of them: the first syllable, which is open in the stimulus, is closed in the result. Possible reasons for the observation that open stimulus syllables often result in closed syllables could be phonetic cues such as the shortness of French vowels. Also, distributions of syllable structures in the Vietnamese lexicon may have a role to play. At this point, we explain the patterns with the help of some examples, from our experimental data, see (50).

(50) Examples for syllabification processes: the first syllable in bisyllabic lexemes gets closed, which means that the hypotheses in table 66 are at least partly confirmed

<i>Stimulus</i>	IPA stimulus	IPA result	Glosse	Hypothesis
a) <i>boyau</i>	[bwa.jo]	[bwoj.ʔo]	‘tubeless tyre’	Confirmed
		[bwaj.zu]		Partly confirmed
b) <i>écran</i>	[e.kʁã]	[ik.xan]	‘screen’	Confirmed
		[ik.kan]		Partly confirmed
c) <i>briquet</i>	[bʁi.kɛ]	[bik.kɛt]	‘lighter’	Confirmed
		[vwik.tɛɛ]		Partly confirmed

d) <i>coussin</i>	[ku.sɛ̃]	[kut.sǎŋ]	‘cushion’	Confirmed
		[kus.sʁ]		Partly confirmed

For the stimuli *boyau*, *écran*, *briquet* and *coussin* in (50)a-d, the first of each result pair is the expected result. The second is also kind of expected in that the open first stimulus syllable is closed in the results, but in an unexpected manner. We explain this by going through each example, starting with (50)a. Here, the first result is exactly as expected: the onset consonant of the second stimulus syllable is in the coda of the first response syllable and the empty onset slot in the second syllable gets filled by the glottal stop. In the second example under (50)a, the parallel to the first example is the glide [j] in coda position of the first syllable, but the onset consonant [j] in the second syllable gets replaced by [z], a common replacement pattern of [j] as we have described on p.150.

In (50)b, the expected pattern is a movement of the syllable boundary, which takes place in the first example: the plosive [k] becomes the coda consonant of the preceding syllable while the uvular fricative [χ] keeps its position as an onset but gets replaced by the velar fricative [x], which is also a common single consonant replacement pattern (see p.150). Therefore, deletion as a cluster repair strategy takes place first. Then, the onset consonant of the second syllable which survived the cluster repair gets geminated and its double becomes the coda of the preceding syllable. The just described, partly unexpected pattern is the repair we expected for the following stimulus *briquet* in (50)c: the onset of the second syllable, a single consonant also in the stimulus for this case, gets geminated and its double becomes the coda of the first syllable. But we also have cases like the second example, in which the base of the geminating process gets replaced by another consonant, here the affricate [tʃ].

Finally, for (50)d, the pattern is again as expected in the first example: as the fricative [s] is illicit in coda position, the gemination process is partly blocked: the double of the onset consonant [s] in the second syllable does not become the coda consonant of the first syllable, but some of its features survive in the added coda consonant [t] in the first syllable. As shown on p.155, replacing the alveolar fricative [s] by the alveolar plosive [t] in codas is a common pattern found for single consonants. As we have explained now in detail with the help of examples, the expected syllabification patterns can be observed in the experimental data. All the examples have in common that the first syllable in bisyllabic lexemes is open in the stimulus but closed in the response. This happens by a movement of syllable boundaries, gemination and processes which could be intitled as *consonant slot doubling* or even *featural gemination* (cf.

Rachid Ridouane, personal communication). Still, there is no systematic difference in the results between the different stimulus groups as listed in table 22 on p.112, as expected from our loan results. Therefore, we merge our hypotheses into one single more general hypothesis:

In bi- (or tri-) syllabic lexemes with an open first syllable in the stimulus, we expect this syllable oftentimes to get closed, be it by gemination of the preceding onset consonant or by other processes.

In the experimental data and differently to the loan data, this process can additionally be observed for stimulus lexemes in which epenthesis applies. Examples are provided in (51). For each stimulus, we display two results: the first is the result with the unexpected syllabification process, the second one the expected result without the syllabification process, which occurs in other cases. In our data, we have 59 unexpected syllabification cases, which is a small number compared to the number of syllabification processes in expected structures, which is at 791.

(51) Examples for syllabification processes: first syllable gets closed also in other structures than the expected ones.

	Stimulus	IPA Stimulus	IPA result	Glosse	Lexeme structure
a)	<i>crabe</i>	[kʁab]	[xap. bʁ] [xa. bʁ]	‘crab’	monosyllabic
b)	<i>saule</i>	[sol]	[son. lʁ] [so. lʁ]	‘willow’	monosyllabic
c)	<i>guignol</i>	[gi.ɲɔl]	[ɣi.ɲon. lʁ] [ɣi.ɲʁ. lʁ]	‘joker’	Bisyllabic, last syllable affected
d)	<i>épice</i>	[e.pis]	[e.pit. sʁ] [i.bi. sʁ]	‘spice’	Bisyllabic, last syllable affected

While only epenthesis applies in the second example of (51) a-d, featural gemination/ consonant slot doubling surfaces in the first example. The replacement patterns follow expected patterns: [b] gets devoiced in coda position, [l] changes the manner from lateral to nasal and [s] changes the manner from fricative to plosive. The place feature is still preserved.

Finally, there is a certain number of lexemes in which the only syllable (monosyllabic lexemes) or the last syllable (bisyllabic lexemes), which is open in the stimulus, gets closed in the result.

This process is no syllabification issue, as there is no exchange between material of first and second syllables of one lexeme, but the result and the underlying constraint could be the same, namely, to get open syllables closed. Mono- and bisyllabic examples are shown in (52)a and b.

(52) Examples for other processes which result in getting a syllable closed which is open in the stimulus

Stimulus	IPA stimulus	IPA result	Glosse
a) <i>pas</i>	[pa]	[bak]	‘step’
<i>blé</i>	[ble]	[lit]	‘wheat’
<i>frai</i>	[fʁε]	[fɛt]	‘frog eggs’
b) <i>bambou</i>	[bã.bu]	[bãŋ.zum]	‘bamboo’
<i>boyau</i>	[bwa.jo]	[bʁ.rut]	‘tubeless tyre’
<i>crapaud</i>	[kʁa.po]	[xap.fuk]	‘toad’

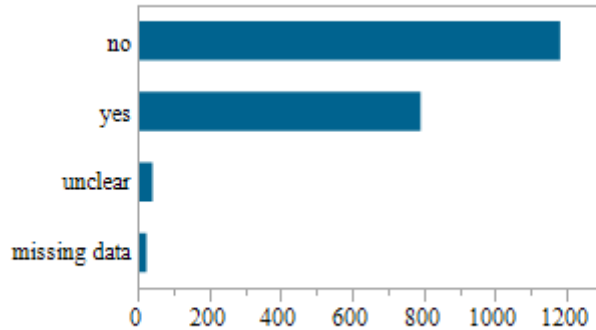
The example with the strongest evidence for the possible motor behind all the just described processes is the last one: the stimulus *crapaud* consists of two open syllables in the stimulus, [kʁa] and [po]. Both are closed in the result: the first by a syllabification process and the second one by the plosive [k].

So far, we have explained the issue of syllabification and its possible motivation in our experimental data, adapted and simplified our hypothesis and provided exemplary qualitative insights. Now it is time to test our adapted hypothesis on quantitative grounds. Generally, we focus on the lexemes where we expected syllabification. As these are mainly bisyllabic, we disregard syllable number as a possible independent variable. We also do not have a look at stimulus speaker variability as this has been carried out in detail for consonants and consonant clusters and does not deliver surprising or new information. Independent variables to be considered for syllabification are the two speaker groups, the three steps and the different segmental material. But first, we provide an overview of the proportions in general, see table and chart 67. The category *yes* means that the hypothesis is confirmed, and the expected structure or process is observed. The category *no* means that the expected structure or process is not observed. The expected structure is that we have a closed first syllable in the result and

the expected process is that the open syllable in the stimulus lexeme gets closed by a consonant which shares features of the onset of the following syllable.

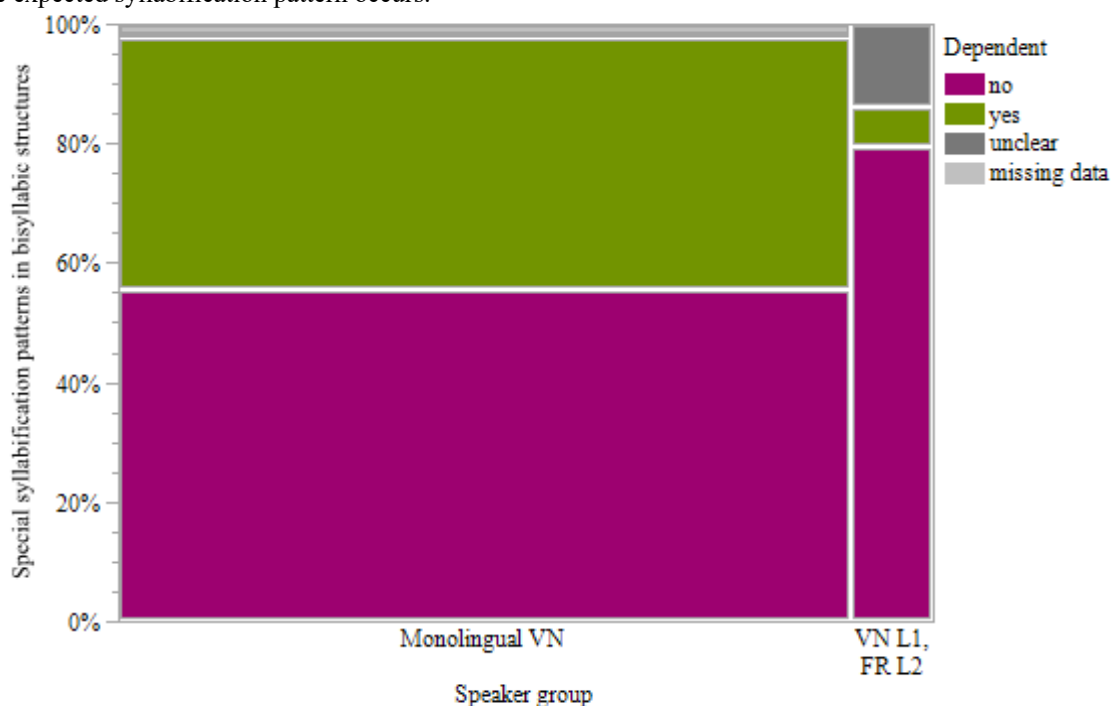
Table and chart 67: overview proportions of the results for special syllabification processes

Class	Number	Percent
no	1181	58
yes	791	39
unclear	41	2
missing data	25	1
Sum	2038	100



The percentage of instances in which the expected syllabification process does *not* occur is at 58, but the percentage of 39 for the expected structures is still very high. This is considerable especially since our hypothesis is not that the frequency of non-occurrences is lower than the frequency of occurrences of the expected structures. It is just that these structures can occur at all, which is the case to a much higher degree than expected. Therefore, this overview strengthens the hypothesis. In the following, we want to go through the three different independent variables. We start with the speaker group, continue with the three conditions and finally the material of the onset slot(s) of the second syllable which is supposed to be doubled and/or (partly) moved to the empty coda of the preceding syllable. The first chart and table 68 show the proportions of the results for speakers of Vietnamese with second language knowledge of French contrasting with monolingual speakers of Vietnamese.

Chart and table 68: special syllabification patterns: speaker group as an independent variable with the values monolinguals vs. L1 speakers of Vietnamese with L2 knowledge of French; in the dependent variable we test if the expected syllabification pattern occurs.



Number	no	yes	unclear	missing data	Sum
L1 VN, L2 FR	162	14	28	0	204
Percent	79,41	6,86	13,73	0	
Monoling. VN	1019	777	13	25	1834
Percent	55,56	42,37	0,71	1,36	
Sum	1181	791	41	25	2038

The category *missing data* is just listed for the sake of completeness, but as in the previous subchapters on consonants and consonant clusters, data is only missing because the writing of two speakers is hardly decipherable. The category *unclear* accounts generally for cases where we are not able to perceive whether these are gemination cases or not. For the monolingual speaker data, we double checked our perception against the perception of a native speaker of Vietnamese, and to him as well, most of the cases we classified as unclear are unclear. This category is higher for the group of the speakers with second language knowledge of French with 28% (vs 14% which is only the half). For this speaker group, we double checked the relevant recordings against the perception of a native speaker of Vietnamese and additionally of a native speaker of French. Both speakers, who have knowledge of phonetic transcription, was given the phonetic transcription, and when they listened to the results, they were asked to enter a dot where they perceived a syllable boundary. In most of the cases which are unclear to

us, it is no gemination according to the speaker of French's perception but rather gemination according to the speaker of Vietnamese's perception. Still, we want to point out that well-designed perception experiments with more speakers of Vietnamese and French would be necessary to be more explicit about this issue. Also, we want to point out to our methodological weakness in this respect under the light that there is little clarity about how syllable boundaries can and should be measured: "it is curiously difficult to state an objective phonetic procedure for locating the number of syllables and especially the boundaries between syllables in a word or a phrase in any language" (Ladefoged & Johnson, 2001, p. 244). This difficulty even increases in the context of language contact. For this reason, we have limited ourselves in this work to the perception of syllable boundaries by three listeners, well knowing that there is room for methodological improvement, which is why our study can only provide preliminary evidence and directions for future studies. When there was disagreement between us three listeners or when we were not sure where to put the dot, these results are grouped into the category unclear and do not enter our statistical analysis.

The two remaining categories are *yes* vs. *no*, which stand, as we have just explained, for *the expected syllabification process occurs* vs. *does not occur*. For the monolinguals, the percentage of *yes* is much higher: 42% vs. only 7%. According to a Pearson's χ^2 test of independence, this distribution is not random, as the p-value is below 0,0001. After having looked at the independent variable speaker group, we continue by showing another chart and table 69 for the independent variable of the three conditions: the first two are oral, and the third one is written. In the first condition, speakers repeat the lexeme in isolation. In the second condition, they embed it in a carrier sentence and in the third condition, they write it down. As we have just seen, there are strong differences in the proportions of the results for the independent variable of the speaker group: the expected structure can be observed quite often for the monolinguals but only seldom for speakers with second knowledge of French. To the contrary to the variable of the speaker groups, there are not such strong differences for the independent variable of the three conditions.

Chart and table 69: special syllabification patterns: three conditions as an independent variable with the values isolation, embedding, and writing; in the dependent variable we test if the expected syllabification pattern occurs



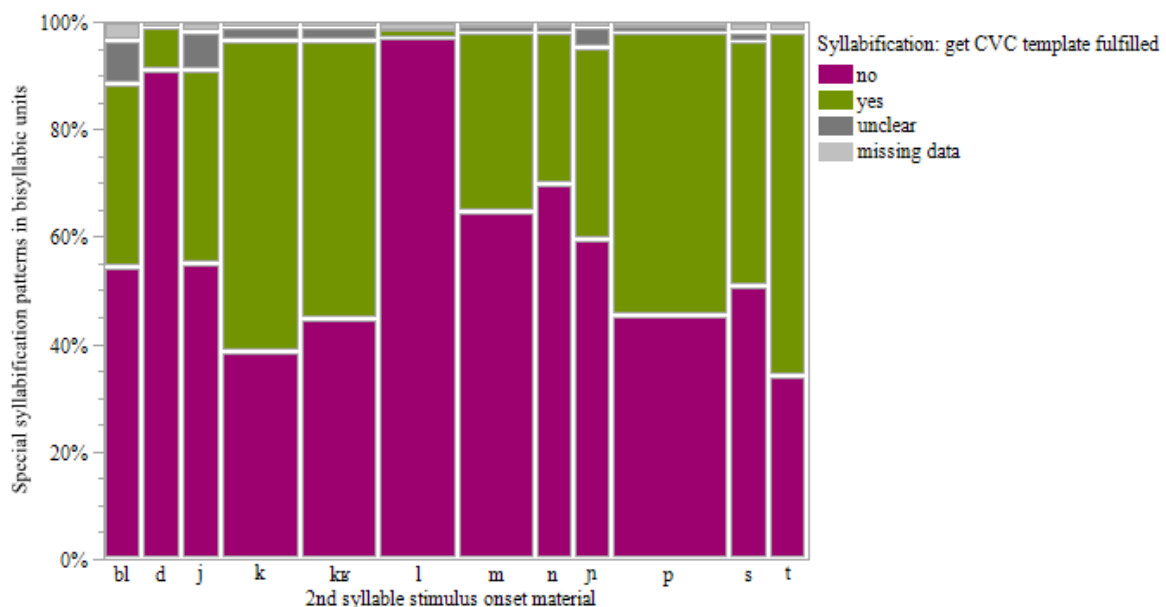
Number	missing data	no	unclear	yes	Sum
1	1	419	18	245	683
	0,15	61,35	2,64	35,87	
2	2	408	21	252	683
	0,29	59,74	3,07	36,90	
3	22	354	2	294	672
	3,27	52,68	0,30	43,75	
Sum	25	1181	41	791	2038

The two oral conditions are very consistent with 36 vs. 37% of cases with the expected effect and 61 vs. 60% of cases without. Also, the proportions of unclear cases are balanced with 3% in both oral conditions. The only difference is between the oral conditions on the one hand and the writing condition on the other. The reason why missing data only occurs in the writing condition is again that this is due to the undecipherable writing of two participants, therefore we do not consider this in our further analysis. The proportions of the expected structures are a bit higher than in the oral steps with 44%, but the general tendencies stay the same. The amount of unclear data decreases to only 2 cases (from 19 and 21 cases which make 3% in the oral steps). This is because in writing, we can clearly see if a speaker doubles a consonant or not whereas in the oral data, it was not always clearly audible, even by a native speaker of Vietnamese. According to a χ^2 test, the differences in the distribution between the categories

yes and no is not random for the two oral conditions on the one and the writing condition on the other, although they are not huge neither. Apparently, there is the tendency that the expected effect gets stronger and stabilizes in the writing condition. If we run a Pearson's χ^2 test of probability for the whole set of independent variable values and the two result categories yes and no as dependent variable, the p-value is 0,0035, and the null hypothesis can be rejected. But if we consider the subset of the two oral conditions, this is not the case as the p-value is at 0,6294. Considering the two pairs of the first oral condition (isolation) and the writing condition as well as the second oral condition (embedding) and the writing condition, this is again different: the p-value is 0,0018 and 0,0084. We can conclude that the distribution is not random for the oral conditions on the one hand and the writing condition on the other.

After having considered the independent variable of the three conditions, we now move on to the last independent variable we test for the aspect of syllabification, which is the different onset material of the second syllable of each relevant stimulus lexeme. For reasons of space, we do not show a contingency table for this variable, but a chart is shown in 70.

Chart 70: special patterns of syllabification: stimulus onset material of the second syllable as an independent variable and the dependent variable syllabification



For this last variable, we do not have enough data to run Pearson χ^2 tests of independence with a reliable outcome: 20% of the cells have an expected frequency smaller than 5. Possibly, the material is an influencing variable, but there are no clear patterns which would allow us to group the material into larger categories like singleton consonants vs. cluster or similar/same place and manner of articulation. For instance, there are considerably less occurrences of the expected effect for the cluster [bl] than for the cluster [kɹ], and there are more similarities

between the cluster [bl] and the singleton [j] than between the two clusters. To the contrary, the proportions of the cluster [kɾ] are most similar to the proportions for the singleton [p]. While we would expect similar patterns for the two alveolar plosives [t] and [d], strong differences can be expected in that for the voiced consonant [d], the cases without the expected effect are strongly predominant but for the voiceless consonant [t], cases with the expected effect are clearly dominating. There are more similarities between [b] and [l] than between [b] and [d]. The only pattern is that for the voiceless plosives [p], [t] and [k], occurrences of the expected structures have the highest frequency.

To conclude the considerations on the dependent variable of special syllabification types, experimental data strengthens our hypothesis in that there must be a process which results in a closed syllable although the stimulus syllable is open. The added coda consonant is a geminate or takes on features of the following onset consonant, if licit according to Vietnamese phonotactics. Still, our initial differentiation between the different stimulus categories derived from the loan data does not seem to hold for the experimental data: the results whether gemination, featural gemination, syllable boundary movement or some more complex process is chosen, are not systematically different for the different stimulus classes. Another unexpected result is that even for other data, the expected effect can be observed: epenthesis is sometimes accompanied by the just mentioned specific syllabification patterns. Even open syllables which are not followed by a second syllable are sometimes closed by a consonant. We will come back to these results and provide explanations for them during the discussion section but for now continue with the last results aspect we focus on, which is tone.

5.3.4. Tonal aspects

So far, we have considered first segmental, then syllabic aspects and now move to a last syllabic aspect, which is tone, as the tonal domain in Vietnamese is the syllable. While our phonetic core study on tonal aspects focusses on a small subset of the data we collected for this dissertation, we only provide a broad overview picture for the rest of the data. With the help of these results, we can start tackling our broad questions on the topic and have first detailed insights. Our general hypothesis is the following:

F0-movements of French stimuli may have an impact on the assignment of tones, when these stimuli are heard once by speakers of Vietnamese, imitated, and written down.

We start with a broad picture of the experimental data, leaving different independent variables aside. For this picture, we consider the data from the writing condition, as these allow us to

have insights into underlying tonal representations because in Vietnamese orthography, tonal categories are obligatorily marked. Also, we mention parallels and discuss differences to the loan data. In loans, we have mainly considered mono- and bisyllabic lexemes, which is why we concentrate on these lexemes here as well, also as they constitute the highest amount of data in our corpus. For polysyllabic words we did not notice any peculiarities, and patterns seem to behave similarly to monosyllabic and disyllabic lexemes. This is the reason why they will only be discussed peripherally in this experimental overview of distributions and patterns.

Subsequently, we deliver a phonetic small case study on the two lexemes *bambou* ‘bamboo’ and *boyau* ‘tubeless tyre’, taking the independent variables speaker group (Monolingual speakers of Vietnamese vs. speakers with knowledge of French) and stimulus intra-speaker variability (Experiment 1 vs. 2) into deeper account. This way, we can check if there are differences in tone assignment between the two speaker groups and if there is any stability between the two lexemes and the two realizations of each lexeme.

Distributional overview

In what follows, we present the broad distributions on tone assignment, limiting ourselves to the writing condition for monosyllabic and bisyllabic lexemes and start by recapitulating results for loans. To recapitulate the main differences between Vietnamese and French from chapter 2.2.2. concerning tonal aspects: Vietnamese is a tonal language with a lexical tone specification on each syllable while French is not a tonal language. It is therefore not surprising that in borrowings from French into Vietnamese, a tone is assigned to each syllable. Our results show that 55% of monosyllabic words are assigned tone A1 (see 53a) and in bisyllabic words, both syllables are assigned tone A1 for 53, 4% of the loans (see 53b). Moreover, most syllables are assigned tone A1 (see 53c) for lexemes with more syllables. 36% of monosyllabic loans receive tone D1 (see 53d), and for lexemes with more than one syllable, tone D1 is assigned second most (see 53e). Only 6% of monosyllabic lexemes receive tone A2 and 3% tone D2. The other tones are not assigned to monosyllabic loans and are hardly not (C1) or not at all (B1, B2, C2) assigned to syllables in bi- or multisyllabic loans. Also, those findings on monosyllabic lexemes are mirrored in the results for multisyllabic lexemes. One interesting finding is that the first syllable in bisyllabic loans sometimes receives tone A2 (see 53f).

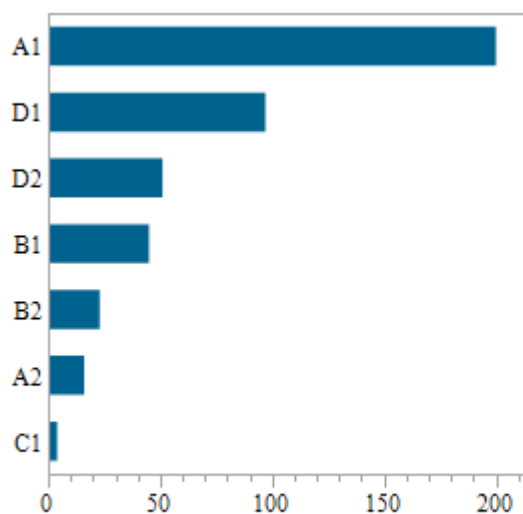
(53) Examples for most current patterns of tonal distributions in loans

- a) *gare* [gaʁ] *ga* [ɣa^{A1}] ‘station’
 b) *jaourt* [jauʁt] *da ua* [za^{A1} ʔuə^{A1}] ‘yoghurt’
 c) *caramel* [kaʁamɛl] *caramen* [ka^{A1} ra^{A1} mɛn^{A1}] ‘(crème) caramel’
 d) *bus* [bys] *buýt* [bwi^{D1}] ‘bus’
 e) *atlas* [atlas] *át lát* [at^{D1} lat^{D1}] ‘atlas’
 f) *blouse* [bluz] *bò lu* [bɔ^{A2} lu^{A2}] ‘blouse’

To compute the tonal distributions in our experimental data, we start with tonal pattern frequencies in monosyllabic and bisyllabic lexemes and continue by giving the total number of each tone for both lexeme categories. The syllable number does not refer to the stimulus but to the number of syllables in the response. At a first glance, we do not find any peculiarities for lexemes with more than two syllables and will not have a detailed look at those for reasons of space. Let us start with distributions in monosyllabic lexemes, see table and chart 71.

(71) Proportions of tonal distributions in monosyllabic lexemes, step 3

Tone	Number	Percent
A1	200	46
D1	97	22
D2	51	12
B1	45	10
B2	23	5
A2	16	4
C1	4	1
Sum	436	100



We have 436 monosyllabic response tokens. As expected, the number of tone A1 is highest and is assigned nearly to a half of all syllables in monosyllabic lexemes (see 54a). The percentage of tone D1 is 22 (see 54b) and, followed by tone D2 with 10% (see 54c). These distributions are similar to the distributions in loans in that tone A1 and D1 are the two tones with the highest frequency. Still, the distribution of tone D2 is higher than in the loans. The distributions of tone B1 with 10% and B2 with 5% in contrast are higher in the experimental data (see 54d-e). The

percentage of tone A2 with 4 (see 54f) is again similar to the distribution in loans, and also the low percentage of occurrences of tone C1 (see 54g).

(54) Examples for most current patterns of tonal distributions in experimental data, monosyllabic lexemes

Stimulus	IPA stimulus	Writing condition	Converted into IPA	Glosse
a) <i>pas</i>	[pa]	<ba>	[ʔa ^{A1}]	‘step’
b) <i>bisque</i>	[bisk]	<bít>	[ʔit ^{D1}]	‘bisque’
c) <i>flaque</i>	[flak]	<lạch>	[lɛk ^{D2}]	‘puddle’
d) <i>ferme</i>	[fɛm]	<séo>	[sɛw ^{B1}]	‘farm’
e) <i>ble</i>	[ble]	<lụy>	[lwi ^{B2}]	‘wheat’
f) <i>ciel</i>	[sjɛl]	<sèn>	[sɛn ^{A2}]	‘sky’
g) <i>plume</i>	[plym]	<piu>	[piw ^{C1}]	‘feather’

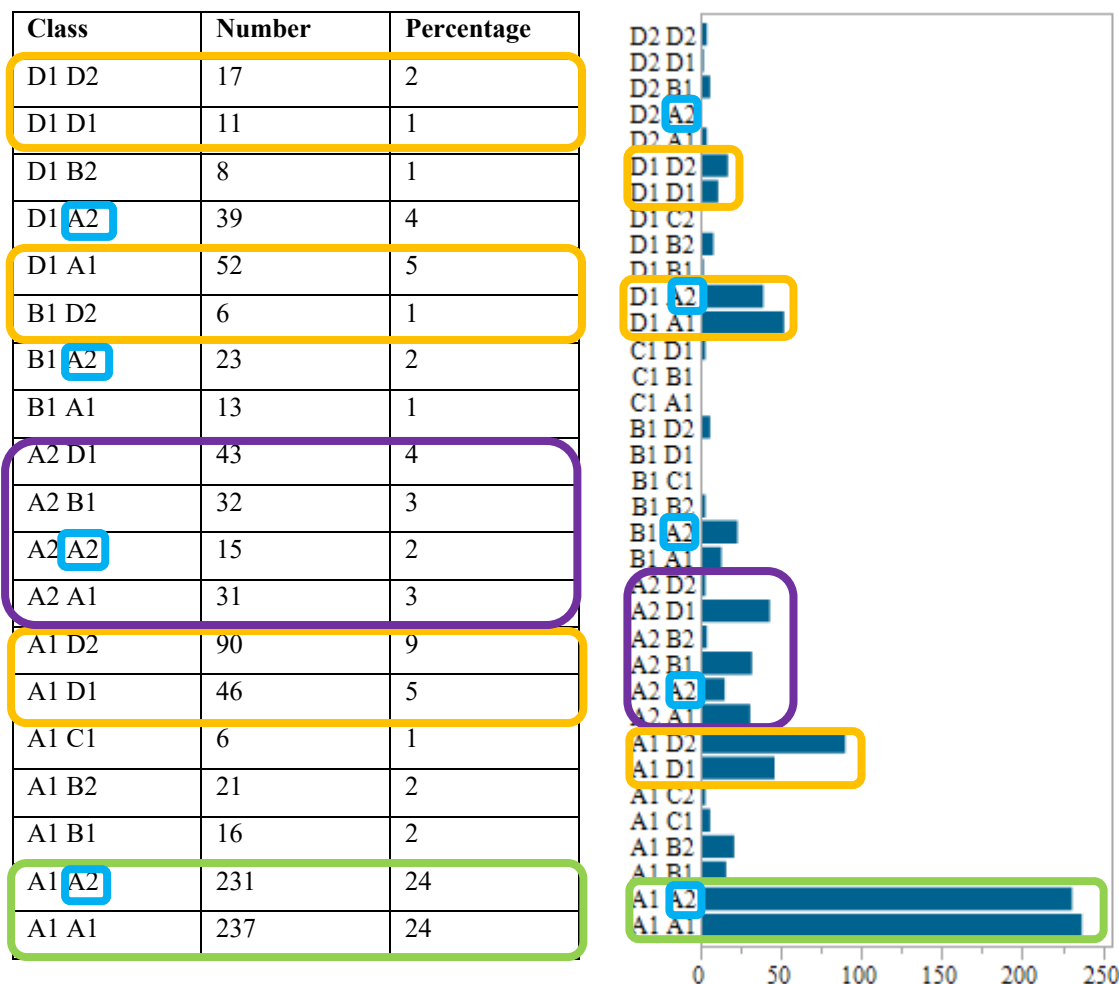
The fact that tone C2 never surfaces in the experimental data is another parallel to the loan data. Therefore, most patterns in loans are similar to the experimental data. The fact that tones B1, B2 and D2 surface more often in the experimental data can be explained with our experimental design: speakers of Vietnamese hear each stimulus lexeme only once: we assume the degree of abstraction which speakers make when reproducing a lexeme heard only once is much lower than the degree of abstraction in borrowing situations. This relatively low degree of abstraction possibly affects tone assignment, and we will come back to it in a moment. In what follows, we present examples of monosyllabic responses of monolingual speakers, where the shortness of the stimulus vowel may have influenced the tonal choice, and consequently the addition of a coda consonant, see (55).

(55) Examples for instances of tone D1 and D2 with an additional coda consonant

Stimulus	IPA stimulus	Writing condition	Converted into IPA	Glosse
a) <i>blé</i>	[ble]	<nét>	[net ^{D1}]	‘wheat’
b) <i>frai</i>	[fɛɛ]	<phách>	[phɛk ^{D1}]	‘frogg eggs’
c) <i>frai</i>	[fɛɛ]	<phạch>	[phɛk ^{D2}]	‘frogg eggs’
d) <i>pas</i>	[pa]	<bạp>	[ʔap ^{D2}]	‘farm’

After some general considerations on monosyllabic lexemes, we move on to tonal distribution patterns in bisyllabic lexemes, see table and chart 72. We have in total 977 tokens, and 35 of $8 \times 8 = 80$ tonal patterns surface. As most of the patterns are very rare though, we only give in the table the numbers of patterns which surface more often than 0,5 %. In contrast, in the bar chart, all pattern categories, also those with a frequency of less than 0,5%, are shown. In both, table and chart, we decide for this issue to not present the data in the table from the highest to the lowest frequency as pattern are not discernible, but to show it listed according to the tone in the first syllable, because it there where clear patterns arise. As to the tone in the second syllable, there are no discernible patterns which go beyond patterns found for monosyllabic items: the frequency of tone A1 is highest in any position and of D1 and D2 is also quite high. Noteworthy and of specific interest is the high proportion of tone A2 herein.

Table and chart 72: proportions of tonal distributions in bisyllabic lexemes, step 3, table and bar chart



The most current patterns are the tonal patterns of A1 A1 and A1 A2 with 24% each (see green frame in table and chart, and examples 56a-b) and the first two values in the table 72 marked in bold). As to the orange frames in chart and table, they show that combinations containing tone

D1 and D2 have a relatively high probability as well. Let us finally come to what we mark in violet: to recapitulate the results from our loans, tone A2 occurs often in the first syllable if this syllable is open, and we want to check herein if the distribution gives a hint to a similar pattern in the experimental data. In fact, we can observe a clustering, even though not very strong, of structures with the tone A2 in first syllable position. Therefore, the possibility that the same pattern surfaces in our experimental data is given: in total, data with tone A2 in first syllable position is at 13%²⁴ (see examples 56c-d). Still, we must consider that tone A2 surfaces even more often in the second syllable position of a bisyllabic lexeme, as indicated by the light blue framing, and come back to possible explanations for this result later.

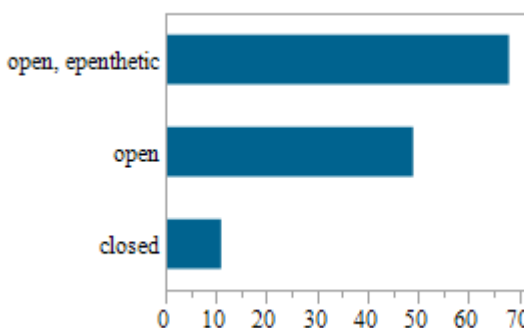
(56) Examples for current patterns of tonal distributions in experimental bisyllabic lexemes

Stimulus	IPA stimulus	Writing condition	Converted into IPA	Glosse
a) <i>chameau</i>	[ʃamo]	<xa mô>	[sa ^{A1} mo ^{A1}]	‘camel’
b) <i>poulet</i>	[pulɛ]	<phu lèo>	[fu ^{A1} lɛw ^{A2}]	‘chicken’
c) <i>blason</i>	[blazɔ̃]	<bà dung>	[ba ^{A2} zuŋ ^{A1}]	‘coat of arms’
d) <i>hamac</i>	[amak]	<ò mách>	[ɣ ^{A2} mɛk ^{D1}]	‘hammock’

In order to know if there is a pattern for open syllables, we must first check if these syllables are open or closed. In table and chart 73, we show proportions of closed and open syllables with tone A2 as the first syllable in bisyllabic lexemes. The category of open syllables is divided into open syllables with an epenthetic vowel as the nucleus and open syllables with another, non-epenthetic vowel. We explain the reason for this subcategorization in a moment.

Table and chart 73: proportions of bisyllabic experimental results with tone A2 in the first syllable

Class	Number	Percent
open, epenthetic	68	53
open	49	38
closed	11	9
Sum	128	100



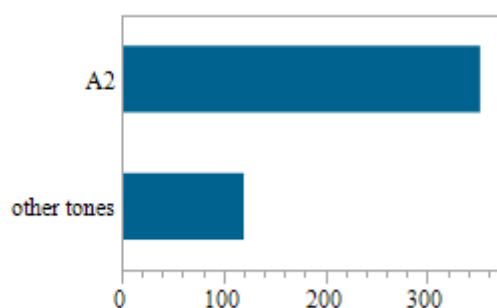
In fact, only 9% of these syllables are closed, but most of the syllables in first position which receive tone A2 are open: 91% in total, the examples we have just given in (56)c-d belong to

²⁴ In this calculation, the 7 tokens of categories with rare frequency (A2 B2, A2 D2) are added to the 121 tokens shown in table and chart 72, where only patterns with a frequency of at least 0,5% are listed.

them. Of this data, tone A2 is assigned especially often to open syllables in which the nucleus is epenthetic: to 53% (vs. 38% non-epenthetic syllables). With these results in mind, we want to check if epenthetic vowels in general, also in other syllabic contexts, receive high frequently tone A2. Therefore, we add to the epenthetic vowels we have just examined, namely those in the first syllable in bisyllabic lexemes, all other epenthetic vowels in other position such as word final and with other syllable numbers such as three to five syllabic lexemes. The distribution of whether tone A2 is assigned to the syllable with the epenthetic vowel or not is shown in table and chart 74. If tone A2 is assigned to the syllable, this falls into the category *A2* and if another tone is assigned, it belongs to the category *other*.

Table and chart 74: proportions of epenthetic syllables with and without the assignment of tone A2

Class	Number	Percent
A2	352	75
Other tone	120	25
Sum	472	100



From this picture we can see clearly that most epenthetic syllables receive tone A2. Examples for epenthetic vowels in different positions in lexemes with different syllable numbers are given in (57). In (57) a-c, we show bisyllabic lexemes: the first syllable is epenthetic in (57)a-b while in (57)c, it is the second and last. In (57)d-f we show trisyllabic syllables with the epenthetic syllable in first, second and third position. And finally, we show one lexeme with four syllables and another with five (see 57g and h). In (57)g, it is the first syllable which is epenthetic and in (57)h, epenthetic syllables are the first and the last. All of them get assigned tone A2.

(57) Examples for lexemes of different structures in which epenthetic syllables in different positions to which tone A2 is assigned

Stimulus	IPA stimulus	Writing conditon	Converted into IPA	Glosse
a) <i>frai</i>	[fɾɛ]	<phò khe>	[fɾ ^{A2} xɛ ^{A1}]	‘frog eggs’
b) <i>blason</i>	[blazɔ̃]	<bà dung>	[ba ^{A2} zuŋ ^{A1}]	‘coat of arms’
c) <i>algue</i>	[alg]	<an gò>	[an ^{A1} ɣɾ ^{A2}]	‘algua’
d) <i>briquet</i>	[bɾikɛ]	<phò rít chét>	[fɾ ^{A1} rit ^{D1} tɛt ^{D1}]	‘lighter’

e)	<i>câbleuse</i>	[kabløz]	<kem bò lút>	[kɛm ^{D1} bɤ ^{A2} lut ^{A1}]	‘wiring specialist’
f)	<i>épice</i>	[epis]	<ít bi si>	[it ^{D1} bi ^{A1} si ^{A2}]	‘spice’
g)	<i>bloc-</i>	[blɔk]	<pò nắ>	[pɤ ^{A2} nắk ^{D1}]	‘kitchen unit’
	<i>cuisine</i>	kɯisin]	<chị rùng>	[tɛi ^{A1} zɤŋ ^{A2}]	
h)	<i>cré-</i>	[kɤe]	<pò khê>	[pɤ ^{A2} xɛ ^{A1}]	‘dusk/dawn’
	<i>puscule</i>	pɯscyl]	<puýt uyn nò>	[pɯit ^{D1} ʔwin ^{A1} nɤ ^{A2}]	

To sum up, distributions are partly similar to the distributions in loans in that the majority of syllables overall gets assigned tone A1. Other tones which do not occur most frequently, but sometimes, are A2, B1, B2, D1 and D2. Tone C1 occurs very seldom and tone C2 not at all in the whole dataset. Tone A2 is very frequently assigned to epenthetic syllables – no matter in which position of the lexeme epenthesis occurs. In this respect, the generalization for loanwords made in Vương (1992) comes closer to the results of our experimental study than the generalizations made in Barker (1969). While Barker (1969) relates the position of open syllables to the assignment of tone A2, Vương (1992) argues for a relation between epenthetic vowels and the assignment of tone A2 (see p.61). While in the loan data, there is a great overlap between the two and epenthetic syllables never occur in lexeme-final position, both interpretations are plausible. Our experimental data, where epenthetic vowels surface at any syllabic position within a lexeme, delivers evidence for Vương (1992)’s claim.

Phonetic small-case study

After having given a picture of the broad distributions in the experimental dataset, we now move on by considering the independent variable of the two experiments and make use of another methodology than previously. As has been pointed out in the method section, one lexeme has been produced by the French stimulus lexeme speaker two times, and the f0 pattern differs between the two realizations. Then, two experiments have been designed. In each experiment, listeners hear each lexeme only once, but in experiment 1, they hear one realization and in experiment 2 the other. F0 movements for the two stimuli per lexeme differ, and stimuli were assigned to experiment 1 and 2 so that each experiment contains an equal number of stimuli with rising, falling or flat contours. We provide an example of monosyllabic lexemes in (58) to illustrate possible results for this procedure. The results, as before, refer to step 3. The lexeme is *port* [pɔɤ] ‘harbour’: it has been realized by the speaker of French once with a falling contour (see 58a) and another time with a rising contour (see 58b). The lexeme with the falling

contour is the stimulus for experiment 1 and the one with the rising contour is the stimulus for experiment 2.

(58) Exemplary results for two different stimuli for the lexeme *port* [pɔʁ] ‘harbour’ with rising (Experiment 2) vs. falling (Experiment 1) contour in the stimulus

	Experiment	Stimulus contour	Writing condition	Converted into IPA
a)	1	falling	<pò>	[pɔ ^{A2}]
			<po>	[pɔ ^{A1}]
b)	2	rising	<pó>	[pɔ ^{B1}]
			<póc>	[pɔk ^{D1}]

If the stimulus is falling, then tone A2 or A1 is often assigned to the result lexeme, and if the stimulus is rising, then tone B1 or D1 is rather assigned. The total number of occurrences for each single lexeme is low: as we consider the data of 34 monolingual speakers and 21 speakers with L2 knowledge of French, and each speaker produces each lexeme once, this are also the total numbers of data per group for each lexeme. In our phonetic small case study, we concentrate on bisyllabic lexemes. Until now, we have only considered the writing condition. In this study, we consider the oral realizations in the isolation and embedding condition and take f0-measurements of stimuli and results into account.

We continue by taking the independent variable of speaker groups into account, with a reduced subset: we only consider the two lexemes *bamboo* ‘bamboo’ and *boyau* ‘tubeless tyre’. In total, we have data of these lexemes for 34 monolingual speakers of Vietnamese. The results for these lexemes will be compared to the results of two other speaker groups we have not considered until now. On the one hand, there is a dataset of 21 native speakers of Vietnamese who study French as a foreign language at the university of Hà Nội²⁵. On the other hand, there is a control group dataset of 10 native speakers of French living in Paris. This is a control group in the sense that we have insights how L1-speakers of French perform in doing the same task with lexemes

²⁵ To recapitulate the reason for this choice from our method section, we use this data for the small case study and not the data of the four French as a second language speakers we used for the studies before. As the data of these four speakers is not enough for the two lexemes, we prefer to use the data of 21 speakers with French as a foreign language knowledge. The other way round, we decided to not use the data of the 21 speakers for the larger main study on segmental and other syllabic aspects we have done so far, as this data is of lower quality than the data of the four French as a second language speakers and as for the whole dataset with all the stimulus lexemes, the data of the four speakers is enough to draw conclusions about systematic patterns. More details and an explication for why we cannot fusion the two datasets of French as a foreign and French as a second language speakers can be found in the method section on p.122.

from their native language. The 21 students of French speak French only during their French lessons and have a level from A2 to B1. Generally, they are less fluent in French than the four speakers with second language knowledge of French whose result we have compared to the monolinguals so far. It is especially interesting to consider the speakers with foreign knowledge residing in Vietnam and to compare their results to the monolingual speakers of Vietnamese, as the foreign language knowledge is less elaborated than the second language knowledge of the four speakers residing in France and speaking French in their daily live. If there are substantial differences to the results of the monolinguals already for speakers with a smaller knowledge of French, then even a relatively little knowledge of a foreign language makes strong a difference for this issue compared to no foreign or second language knowledge. Our three general hypotheses are the following:

1. We assume that monolingual speakers of Vietnamese associate f₀ movements of the French stimulus lexeme with tonal categories of Vietnamese that are closest to f₀ movements on the respective syllables.
2. We assume that speakers of Vietnamese with foreign language knowledge of French differ from the monolingual group in that they abstract away from f₀ movements
3. Their results are closer both to the results of the French control group and to the loanwords than the results of monolingual speakers of Vietnamese.

Comparing the loan data to this specific experimental approach has its limits, and we chose this approach to examine things we were not able to examine considering loans: for the loan data we have no knowledge about the phonetic characteristics of the stimuli, thus it is very likely that speakers of Vietnamese heard a lexeme several times in different phonetic realisations from speakers of French before they borrowed it into Vietnamese. To the contrary, our experiment is designed in a way that each speaker of Vietnamese hears each stimulus only once.

Evidence for our main hypotheses can be taken from our phonetic core study on the two stimulus lexemes *bambou* ‘bamboo’ and *boyau* ‘tube’. Parts of this study have been published in Michaud et al. (2021) We recapitulate the procedure with the three conditions: at first, speakers repeat the perceived stimulus in isolation. In a second condition, they embed it into the Vietnamese carrier sentence *Cái này tên ... bằng tiếng Pháp* ‘This is called ... in French’. And finally, in a third condition, they write down the lexeme according to Vietnamese orthography. Detailed hypotheses related to the three conditions are the following:

1. Isolation condition: we expect the f0 movements to be relatively similar to the stimulus, for both Vietnamese speaker groups. Probably, the French speaker control group performs less accurately in this respect, as they may be less attentive to imitate the f0 pattern since they have no knowledge of any tonal language.
2. Embedding condition: for the repetition of the lexeme in a carrier sentence, we expect the monolingual Vietnamese speaker group to preserve the f0 patterns from the isolation condition, whereas we expect speakers of Vietnamese with French as a foreign language knowledge and native speakers of French to not preserve them. If speakers preserve the f0 patterns, this could be a first indication that they may treat the French stimuli as if French was a tone language as well.
3. Writing condition: the orthographic transcripts of the monolingual speakers of Vietnamese are expected to confirm the expected assumption from the embedding condition that speakers of Vietnamese treat the French stimuli as if French was a tonal language: if this is so, they assign the respective tone diacritics to each syllable which comes closest to the f0 movements of stimuli and repetitions.

These assumptions can be tested in a detailed way based on our experimental design of two experiments, 1 and 2. If the lexeme *bambou* stimulus has a falling f0 contour in experiment 1, the contour is rising in experiment 2. Conversely for *boyau*: the contour of this stimulus lexeme is rising in experiment 1 and falling in experiment 2. Therefore, for our study on these two lexemes, we have both lexemes *bambou* and *boyau* in both experiments, one falling and one rising lexeme in each experiment. Which of the two lexemes is the falling and which the rising one makes the difference between the two lexemes. The reason for choosing such a complex experiment design is that we want to keep the potential influence of independent variables such as participant inter speaker variability and the different lexemes low.

In what follows, we present a detailed analysis for the results of the two stimuli for *bambou* and start by presenting the stimuli themselves, see figure 4 and 5. In figure 4, we see *bamboo* with a falling and in figure 5 with a rising contour. The points in the middle reflect the f0 movement. Below, we display a phonetic and phonological segmentation.

Figure 4: stimulus ‘bambou’ with a falling f0 movement

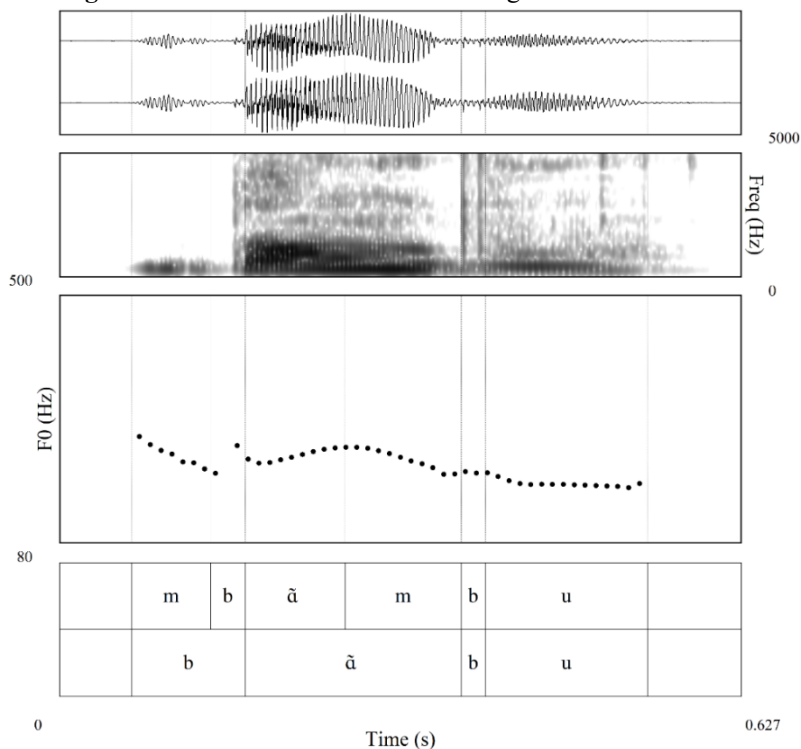
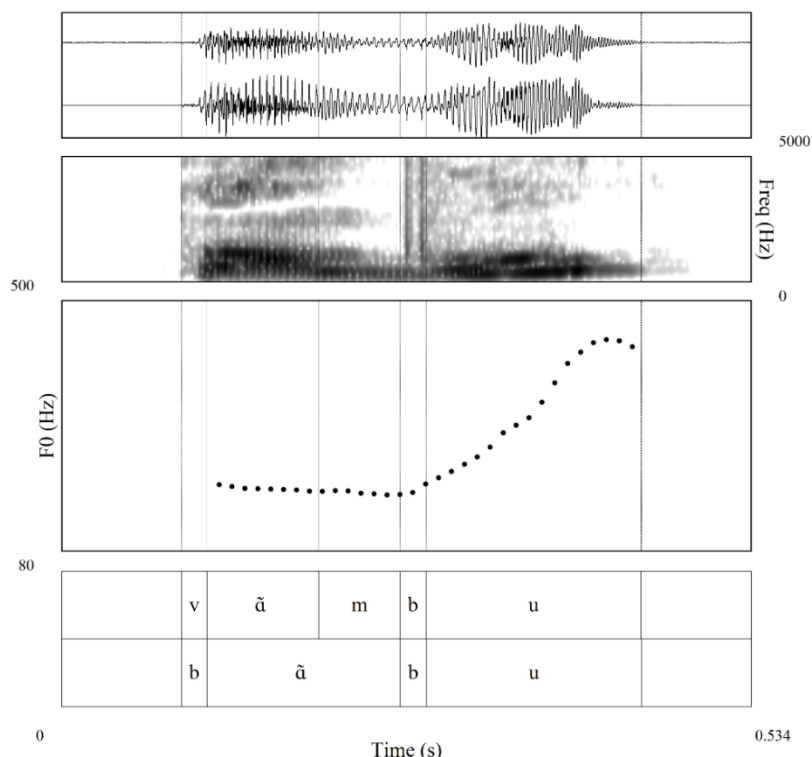


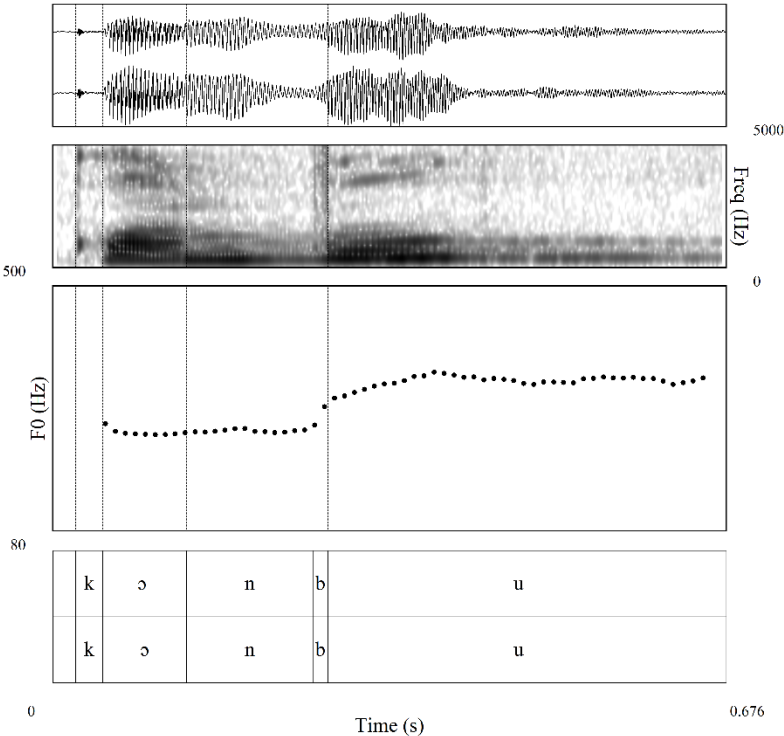
Figure 5: stimulus ‘bambou’ with a rising f0 movement



After having displayed figures of the four stimuli, we continue by presenting the results, exemplarily and in detail for the stimulus bambou with a rising movement on the second syllable: for the monolingual group, 93% of the results also have a rising movement on the second syllable, in both oral conditions: in the isolation condition and in the embedding

condition. We first categorise movements as rising with our ear and check our categorization against the categorization of a native speaker of Vietnamese. For 100% of the data, we have made the same choice. Sometimes, the rising movement is very steep just as the French stimulus. Such a steep movement would not be necessary for the Vietnamese tone B1 which come closest to F0 movement of the French stimulus and which we expect to be assigned to the second syllable in the results of monolingual speakers. In fact, more often than preserving the steepnes of the rising stimulus movement, speakers abstract more from this phonetic steepnes and realize a rising movement which is more flat and sounds more similar to a typical vietnamese tone B1. An example is provided in figure 6.

Figure 6: a response to stimulus *bambou* with rising movement, see figure 5, by a monolingual speaker of Vietnamese

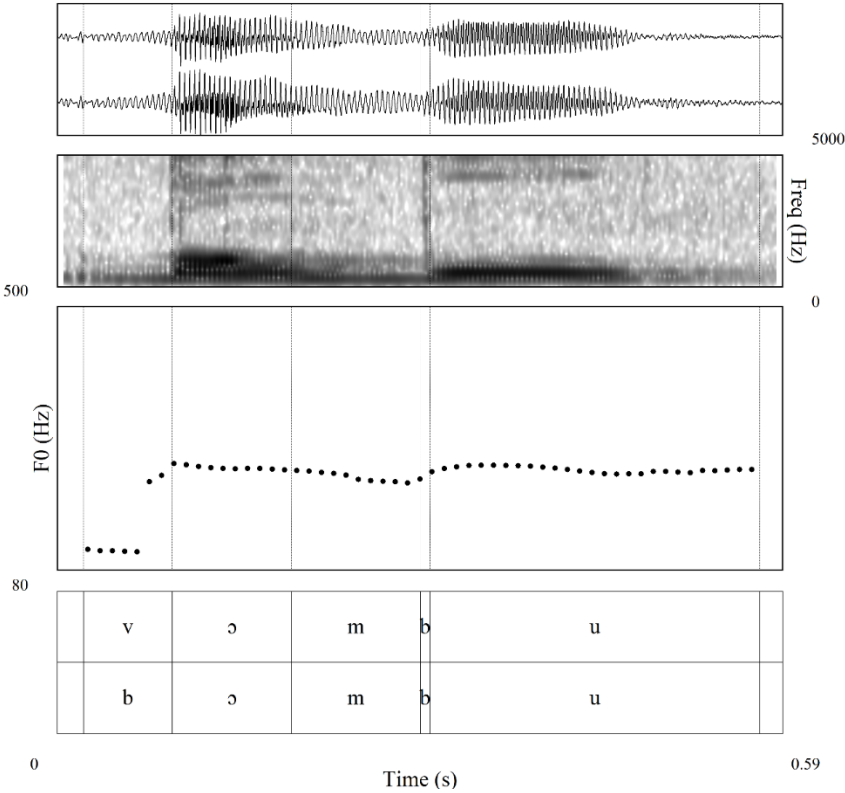


We continue presenting the results for the writing condition. Again, 93% of the monolingual speakers preserve the rising feature by choosing the tone diacritic for Vietnamese tone B1: there is a degree of consistency between the three steps of 100%. In the oral conditions, an euqally high number of speakers chose rising f0 movements as the number of speakers who chose to map tone B1 ton the second syllable of *bambou*.

These results contrast with the results for the students of French which French as a foreign language knowledge. The consistency is lost between the first and the second oral condition: in the isolation condition, 60% of the result lexemes have a rising movement on the second

syllable. This rising movement is totally lost in the embedding condition: 0% of the speakers chose to preserve it. Also, the frequency for responses with a rising movement in the isolation condition is lower for this speaker group than for the monolinguals: 60% vs 93%. These 60% apparently preserve the rising movement not because they consider it as phonemic. Otherwise, they would preserve it also in the embedding condition. This is evidence for our assumption that the speakers with knowledge of French abstract away from the rising contour of the stimulus as they know that French is not a tonal language, and as they know how non-tonal languages work and that non-tonal languages exist. An example is given in figure 7.

Figure 7: a response to stimulus *bambou* with rising movement, see figure 5, by a speaker of Vietnamese with foreign knowledge of French



So far, we have considered the lexeme *bambou* in detail. But the principle is the same for the stimulus *boyau*. As the results are very similar, we fusion them: the results for the stimulus lexeme *bambou* with the rising f0 contour with the results for the stimulus *boyau* with the rising contour on the second syllable; and also the results for both lexemes with falling contours. We provide tables with distributions or these fusioned results. At first, we present the results for the monolingual speakers of Vietnamese. In figure 8a we can see the results for the isolation condition and in figure 8b, we provide the results for the embedding condition. The black line is the mean and the grey line the standard deviation. The values of f0 are not normalized. With a small set of four stimuli, we can observe a clear difference between figure 8a and b: while the

contour in the second syllable is rising in figure 8a, we can see a level contour in figure 8b. All the following figures have been built in R. We have extracted 20 equidistant points of each syllable rhyme and therefore normalized the time. The black line is a visualization of the mean, the grey lines show the standard deviation.

Figure 8a: first and second syllable of the fused results of monolingual speakers of Vietnamese related to the stimuli *bambou* and *boyau* with a rising f0 mouvement on the second syllable, isolation condition

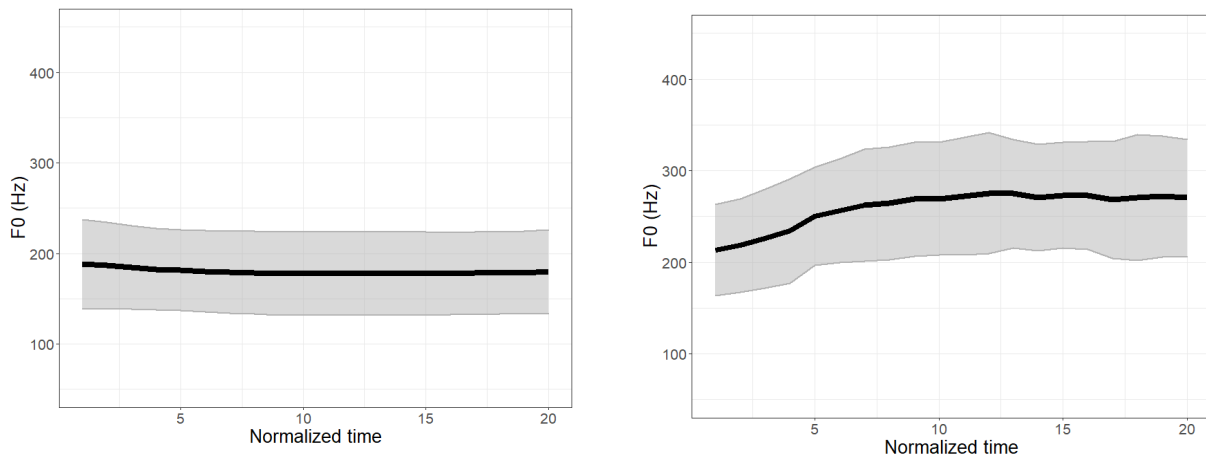
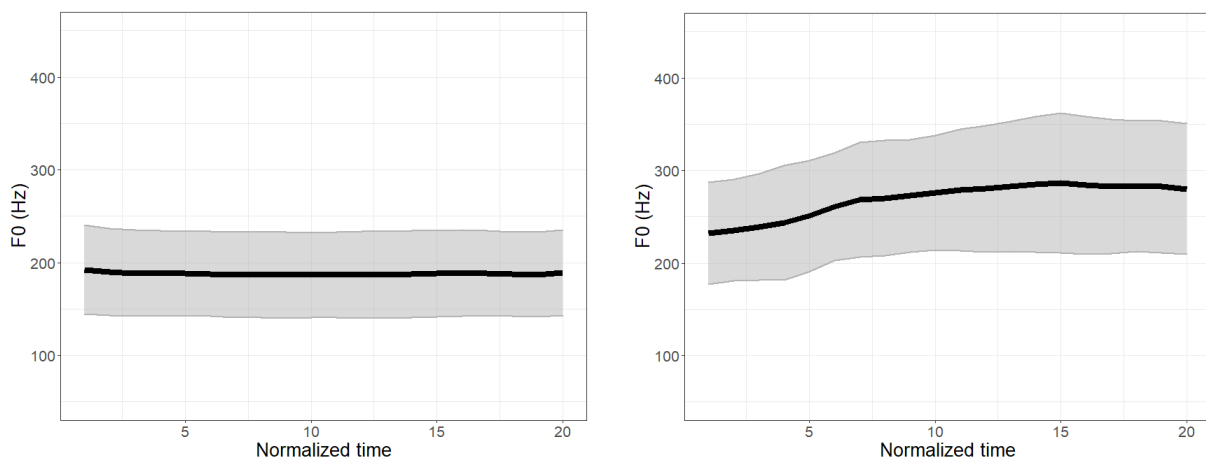


Figure 8b: first and second syllable of the fused results of monolingual speakers of Vietnamese related to the stimuli *bambou* and *boyau* with a rising f0 mouvement on the second syllable, embedding condition



We can see that for both oral conditions, the repetition of the lexeme in isolation and the embedding of the lexeme in a Vietnamese carrier sentence, the pattern is the same: the contour of the first syllable is flat at a vaule slightly below 200 Hz, and the contour of the second syllable is rising from about 210-30 Hz to about 260-280 Hz. In the following graphs, we display the results for the goup of native Vietnamese speakers with foreign language knowledge of French: results for the first and second syllable for the isolation condition are shown in figure 8c and for the embedding condition in 8d.

Figure 8c: first and second syllable of the fused results of speakers of Vietnamese with French knowledge related to the stimuli *bambou* and *boyau* with a rising f0 movement on the second syllable, repeated in isolation

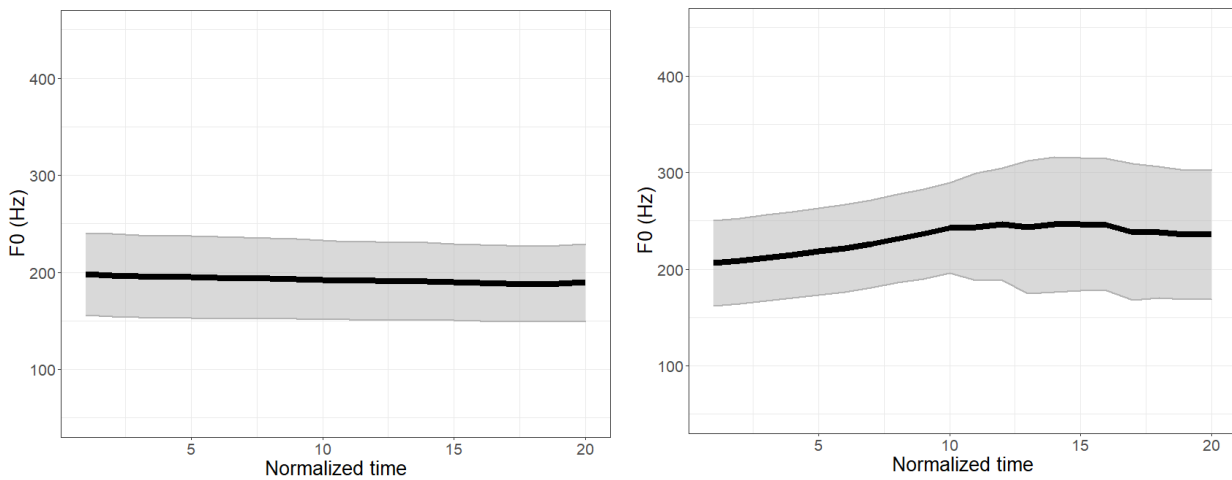
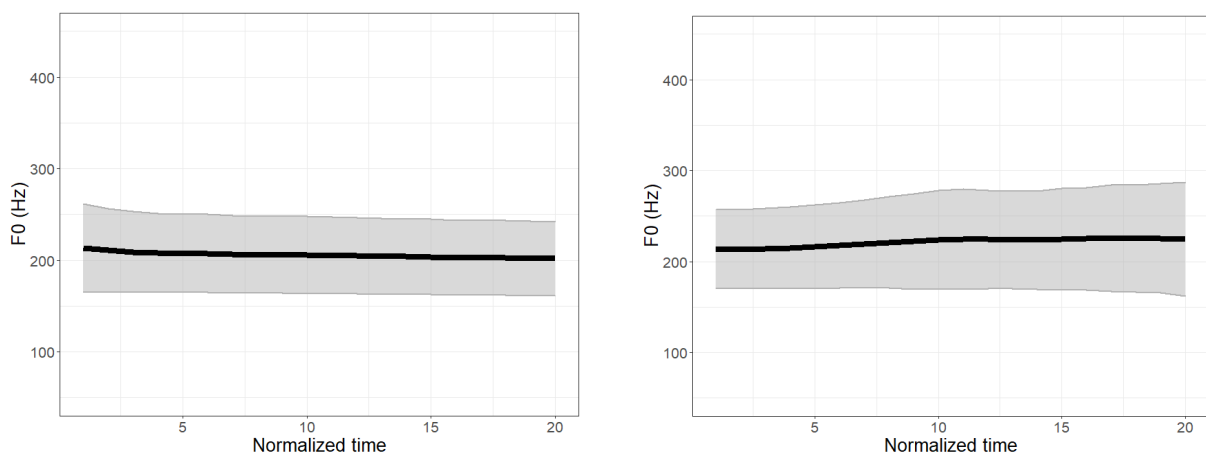


Figure 8d: first and second syllable of the fused results of speakers of Vietnamese with French knowledge, related to the stimuli *bambou* and *boyau* with a rising f0 movement on the second syllable, embedding condition



While the pattern, despite a stronger standard deviation, is relatively similar to the pattern of the monolingual group in figure 8c, it is totally different in figure 8d: Both syllables have flat contours at about 210 Hz. To contrast these examples with the results for the stimuli with falling contours, we provide below the fused results for the stimuli *bambou* and *boyau* with falling contours: in figure 9a-b, we display results for the isolation condition and the embedding condition for monolinguals and in figure 9c-d, results for the isolation and embedding condition for native speakers of Vietnamese with foreign language knowledge of French.

Figure 9a: first and second syllable of the fused results of monolingual speakers of Vietnamese, related to the stimuli *bambou* and *boyau* with a falling f0 movement on the second syllable, isolation condition

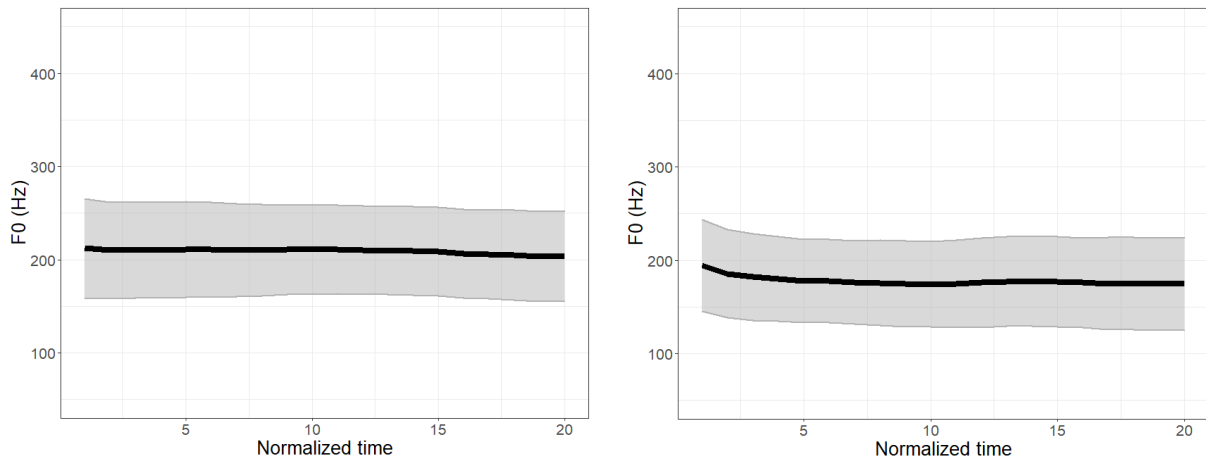
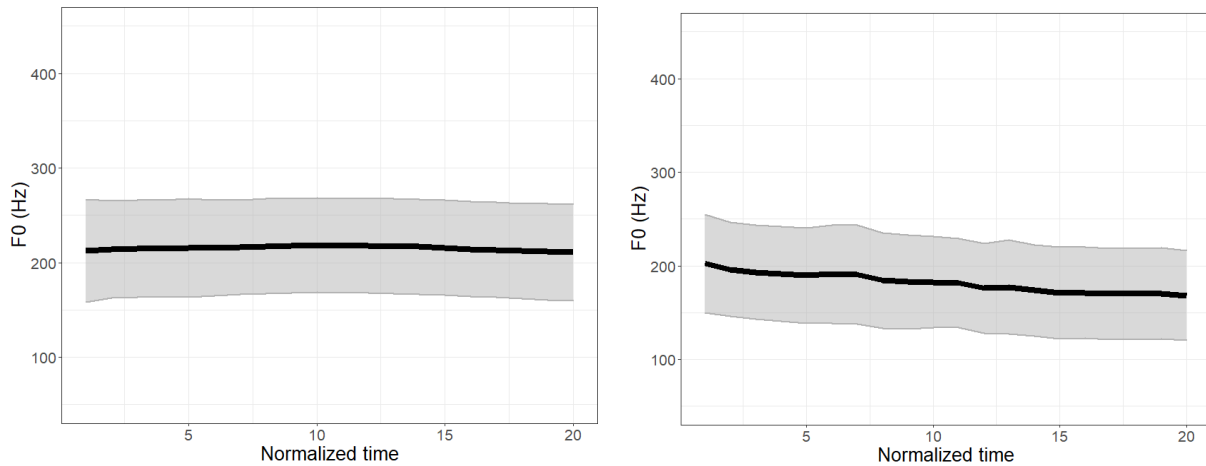


Figure 9b: first and second syllable of the fused results of monolingual speakers of Vietnamese, related to the stimuli *bambou* and *boyau* with a falling f0 movement on the second syllable, embedding condition



Again, as for the rising movement, there is a high consistency between the two conditions. Also, a falling movement, even if not very steep, can be observed for the second syllable, and the hertz values for the second syllable are also lower than for the first: while the first syllable in both conditions is at about 210 Hz, it starts at about 200 Hz and falls to about 270 Hz in the second syllable. Again, we want to contrast these results with the results of the Vietnamese French learner group, see figure 9c-d.

Figure 9c: first and second syllable of the results of monolingual speakers of Vietnamese for the stimuli *bambou* and *boyau* with a falling f0 movement on the second syllable, isolation condition

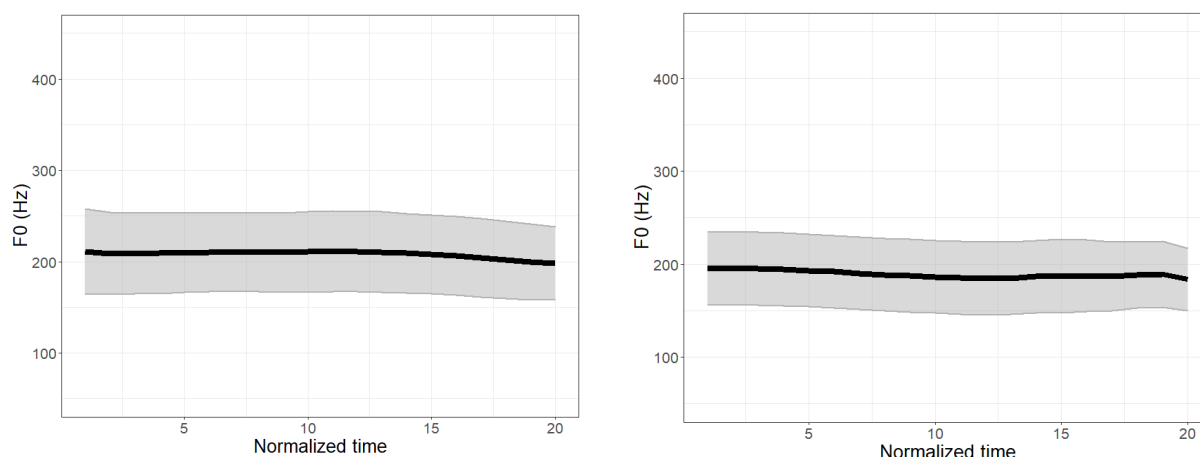
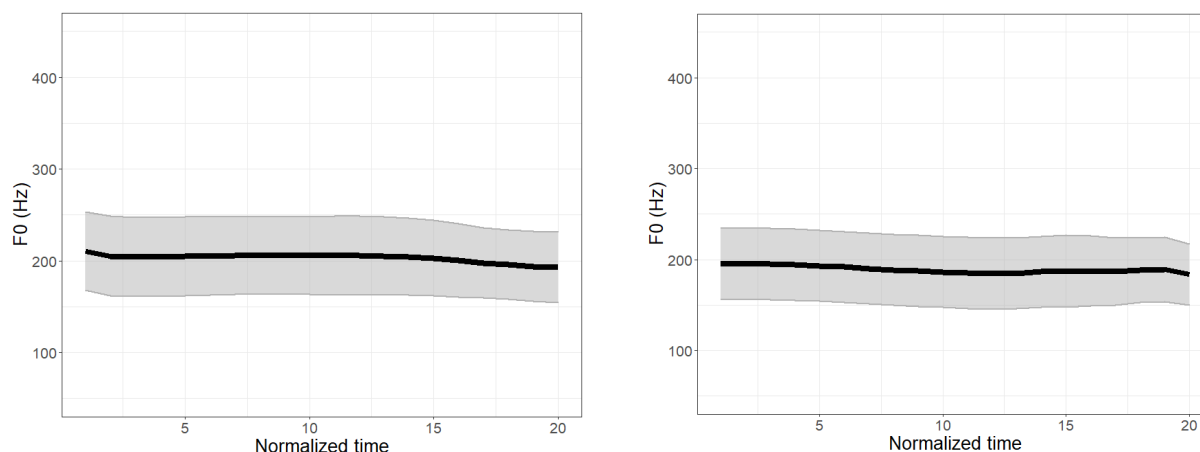


Figure 9d: first and second syllable of the results of monolingual speakers of Vietnamese, related to the stimuli *bambou* and *boyau* with a falling f0 movement on the second syllable, embedding condition



For the falling stimuli contours, the difference between the results of the two Vietnamese speaker groups are less strong. In figure 9c and d, there are falling contours in the second syllable (but also in the first). Still, they are only falling very slightly below 200 Hz and still contrast with the results for the monolingual group. Probably, the salience of a rising movement is more salient and therefore has a better chance to be unambiguously preserved in the monolingual data and therefore contrasts much stronger with the speaker group of Vietnamese French learners. Overall, there are differences between the two speaker groups for the embedding condition. The strongest difference for the rising stimuli is between the consistency of the monolingual results on the one hand and the difference between the isolation and the embedding condition and for the French learners on the other – the rising movement is lost in in the embedding condition, while it can be observed in the isolation condition and in both conditions for the monolinguals.

The French learner group has apparently understood that French is not a tone language. To the contrary, Vietnamese speakers without any knowledge of non-tonal languages possibly map f₀-movements to their tonal categories and suppose tone to play a role in these languages as well. But does the French learner with a L1 background of Vietnamese group differ from native speakers of French? To test this, we have to take the control group into account: the group of native French speakers. This speaker group is smaller than the other speaker groups (see methodology of data acquisition in 6.1.), and we summarize their results in a less detailed view.

Native speakers of French preserve the rising feature in the isolation condition for 70% of the results. This means that most speakers of French are able to perceive the f₀ movement as rising and also to imitate it, despite their knowledge that these features are intonational features and do not need to be preserved to keep the meaning of the lexeme. As a comparison, the percentage is at 93 for the monolingual vietnamese speaker group, and for the vietnamese speaker group with foreign knowledge of French, it is at 60%. Therefore, the native and foreign language speakers of French perform more similarly in the isolation condition, compared to the group of monolingual Vietnamese speakers. Speakers of French are proportionally even a bit more faithful to the rising feature. The result that speakers of Vietnamese with foreign language knowledge of French are even less faithful to the rising movement in the stimulus than native French speakers, could be explained by the fact that they have learned that f₀ movements do not matter for French as they do in Vietnamese and therefore have a higher motivation to not keep them than native speakers of French who have no consciousness about differences between tonal and non-tonal languages.

Still, there is a systematic difference also between the native and the foreign language speakers of French considering the embedding condition: while Vietnamese learners of French are in 100% of the cases not faithful to the rising stimulus movement in the second syllable, the native French speakers result is striking at first sight: native speakers of French seem to be more similar to the monolingual speakers of Vietnamese in that 80% of the result items are realized with a rising movement, although less steep. Therefore, the percentage of the items with a rising movement in the second syllable is even higher in the embedding condition than in the isolation condition. The remaining 20 % are characterized by a level contour on the second syllable.

The explanation can be given by also considering the results for the stimuli with the falling contour: for these stimuli, the falling movement is preserved in none of the results in the embedding condition. To the contrary, one half of the results has a rising movement instead, and the other half a flat movement. Why does it seem that the rising movement is preserved in

the second step but the falling is not ? It is an indicator that French intonational movements have a role to play here: we have to do with a condition of continuation in this phrasal context and this is marked by a rising intonation movement in French. Therefore, it is not astonishing that the falling movement is not preserved but the rising movement is. The results of the native French control group for the embedding condition can be seen below in figure 10a and b.²⁶

Figure 10a: first and second syllable of the results of the French control group for the stimulus *boyau* with a falling f0 movement on the second syllable, embedding condition

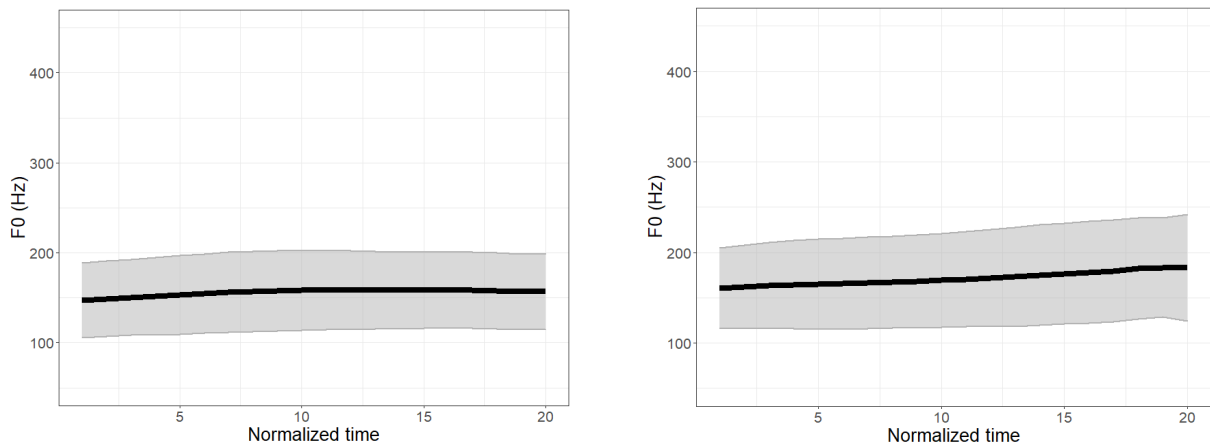
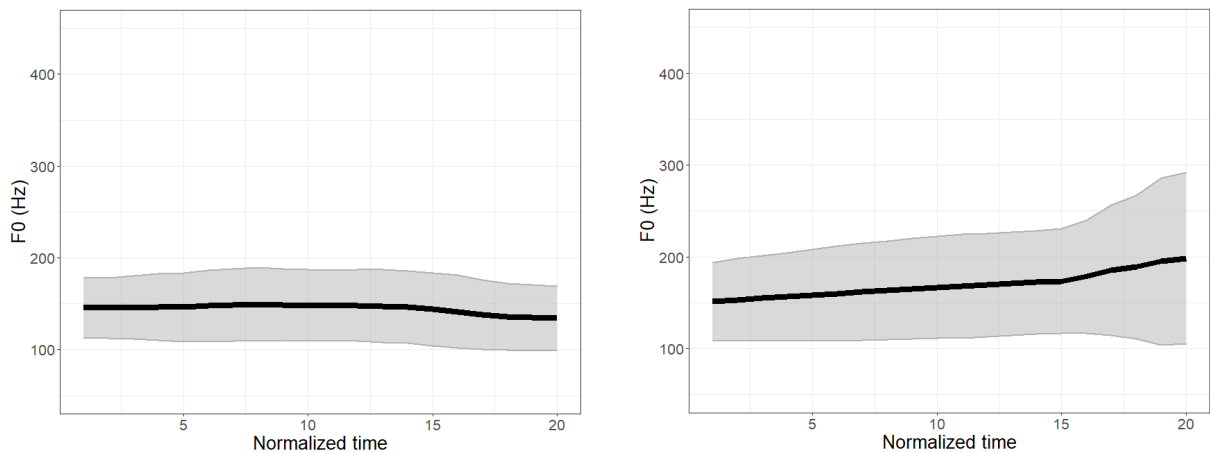


Figure 10b: first and second syllable of the results of the French control group for the stimulus *bambou* with a rising f0 movement on the second syllable, embedding condition



²⁶ For the French control group, we did not design two experiments as we did for speakers of Vietnamese. Hence, the rising stimulus is *bambou* for all of the participants and the falling stimulus *boyau* for all the participants. As will be explained in the method section 6.1., we did not design two experiments for the French control group as we had a different focus: we had already tested for the Vietnamese speaker group that results for the two different stimuli *bambou* and *boyau* are similar and we did not want to include another independent variable for this relatively small speaker group.

To sum up, results are different for all three groups: the native speakers of Vietnamese preserve faithfully the rising movement and seem to treat f₀ movements as if they were lexical. They tend to treat French as a tone language, not knowing that languages other than tonal exist. Interestingly, a rising movement is preserved for 93% of the results in the two oral conditions and to the same degree, the rising tone B1 is assigned to the writing condition. Therefore, the three conditions are 100% consistent to each other. For the falling movement, speakers either chose the falling tone A2 or the level tone A1 in the writing condition. It therefore seems that the rising movement is more salient than the falling movement and to a higher degree mapped to tone B1, while for the falling movement, more tones can be assigned, but never the rising.

Contrarily to the monolingual speakers of Vietnamese, speakers of Vietnamese with foreign language knowledge of French preserve the rising feature to a lower degree in the isolation condition and do not preserve it at all in the embedding condition: they rather chose a flat movement when they embed the lexeme in a Vietnamese carrier sentence. They know that f₀ values are not important on a lexical level in French and therefore do not preserve it. The flat movement chosen for both syllables in the vietnamese carrier sentence sounds like the vietnamese tone A1: the tone which is chosen for the majority of syllables in loanwords.

Finally, for the native French speakers, French intonation has a role to play in the embedding condition. While most of the speakers preserve f₀ contours for the repetition in isolation, they chose mostly a rising movement for the lexeme embedded into a French carrier sentence, no matter if the stimulus has a rising or falling movement. This can be interpreted as an emergence of the intonation contour of continuation, which is characterized by a rising f₀ movement. Therefore, if the stimulus has a rising contour and a rising contour surfaces not only for the two oral conditions, this does not mean that speakers of French deal with their native language as if it was tonal, but that per chance, the intonational movement in the carrier sentence is also rising. After having presented a phonetic small case study on the interaction of tone and intonation patterns, we want to finish considering the direction French → Vietnamese and consider the other direction as well.

6. Empirical small-case studies with Vietnamese stimuli and speakers of French

In this chapter, we reverse the direction of language contact. The study for which the experimental data collection was conducted in early 2020 in Paris, was intended to be larger, but abandoned due to the outbreak of the pandemic. First, the aim of this study is to find out what speakers of French find particularly difficult when they imitate Vietnamese lexemes: which segments, but also which syllable structures are repaired in which way and why? What happens to Vietnamese tones? Finally, based on some repair processes in the borrowing/imitation of French lexemes by speakers of Vietnamese, we want to investigate whether certain processes and repair strategies are reversed in the imitation of Vietnamese lexemes by speakers of French. This could support some of our previously proposed hypotheses about the specifics of both languages and language contact phenomena. In the following, after pointing out to the fact that there is no previous research on this direction of language contact, we present the methods of our study, broadly following the same principle as the methods of our beforehand presented study in section 3.1.1., just with a reversed order. We move on to an overview of the results.

6.1. State of the art: second language acquisition for the direction Vietnamese French

For segmental and prosodic interlanguage patterns observed in the other direction of second language acquisition, namely in the speech of L1 speakers of French acquiring Vietnamese, there exists no literature. We want to encourage L1 speakers of French to learn Vietnamese, hoping that they will participate in futures studies in this field.

6.2. Methods

In experiment 3, although generally similar in structure the experiment block 1+2, the order of language contact is reversed: speakers of French who never learned neither any tone language nor any East Asian language before are asked to repeat Vietnamese stimulus lexemes. Experiment 3 additionally provides control group data for our study on tone assignment with speakers of Vietnamese. The control group consists of French speakers who are confronted with French stimuli, and we have already used its material in our phonetic small case study in 5.2.4.

6.2.1. Stimuli

As described in the method section of the previous experimental studies, we first compile a word list of lexemes, but this time in Vietnamese, and a speaker of Vietnamese is asked to produce them. The whole list can be found in the appendix on p.321. Lexemes are recorded and again serve as stimuli for the production experiment. We decide for 16 Vietnamese nominal lexemes, as we want to concentrate on specific issues. A detailed justification of this choice is

provided in 3.3.1.2. below. Two of those lexemes are monosyllabic nouns accompanied by their classifier: *tàu thuyền* 'CL means of transportation + boat' and *cuộc gặp* 'CL event + meeting'²⁷. Others are bisyllabic compounds (like, for instance, *ngạt mũi* 'breathing difficulties + nose = cold, coryza (with stiffy nose)', or *cá mèò* 'fish + cat = catfish'). Also, we decide for three loanwords from French, namely *bờ lu* from French *blouse* 'blouse', *ắc quy* from French *accu (-mulateur)* 'rechargable battery' and *ốp la* from French *(oeuf) au plat* 'fried egg'. This choice is justified in detail when we talk about syllabification. The loan nouns, too, provide bisyllabic material. The same holds for the two short noun phrases which result in a bisyllabic pattern each: *các con* meaning 'each child/animal' or 'some children/animals' and *cá con* 'fish + child/little = little fish'²⁸. These two short noun phrases are chosen to have a minimal pair concerning consonantal lengths, which would otherwise have been difficult to find. This issue will also be dealt with in detail when we come to syllabification. We choose bisyllabic stimulus material because we want to disregard syllable number as a confounding variable in this study. This bisyllabic material contains the structures we need for our investigation, and to have all the structures present, we must choose different lexical and syntactical constructions. As the speakers of French have no knowledge about Vietnamese and its lexical and syntactic constructions, these structural differences cannot be an influencing factor to their mental processing of the perceived material anyway.

Finally, we add five of the French stimulus lexemes to compare the results of speakers of Vietnamese imitating French lexemes with speakers of French imitating the same French lexemes. Therefore, the French participants serve as a control group for our study on tone assignment, as the two lexemes *bamboo* and *boyau* are among those lexemes.

6.2.2. Design

The experiment design is very similar to the design for our experiments 1 and 2 described in 5.1.2. One difference is that the carrier sentence is in French: *Ça veut dire ... dans cette langue* 'That means ... in this language', or, if the stimulus is French, *Ça veut dire ... en Français* 'That means ... in French'. Another difference can be deduced from the first mentioned carrier sentence: speakers of French do not know to which language the stimulus lexemes belong and are asked to guess it afterwards. The reason is that we want to check whether they have some knowledge about how Vietnamese sounds. Also, some other questions for the gathering of metadata are different, as will be described in 6.1. 3. A last difference is that we only have the

²⁷ This is a shortened form of *cuộc gặp gỡ*, used in contexts when it is followed by a specification of the meeting.

²⁸ For this item, it is debatable if it is a compound noun or a noun phrase consisting of a noun and an adjective.

two oral conditions included in our design but not the writing condition. This is because French orthography is not syllabic and codes no information about f₀-movements either. Therefore, the writing step would not be very insightful in many aspects such as syllabification and tone to get insights on how sounds are represented at a phonological level in speakers of French's mind. The Vietnamese lexemes are selected according to two criteria: on the one hand, they contain segmental and suprasegmental properties which exist in Vietnamese but not in French, including consonants and tones. On the other hand, we focus on repair strategies used by speakers of Vietnamese for the adaptation of French lexemes to check whether these strategies are applied the other way round when French speakers adapt Vietnamese lexemes. This concerns, among other, the issue of syllabification: if a French stimulus with a certain syllable structure is realized with a different syllable structure by the speakers of Vietnamese, this design helps us to find answers to the question whether the same syllabification strategy can be applied in the opposite direction. This in turn can help us finding evidence for our hypothesis that prosodic language contact processes may be stable in both directions.

We decide to choose a smaller stimulus dataset for experiment 3 with native speakers of French as for the experiment block 1+2 with native speakers of Vietnamese and create only one experiment. This is because after examining the results of experiment one and two, we have more information about which specific structures may be worthy a deeper consideration for the other direction of language contact. In the following, we explain the choice of the stimulus dataset, paying attention first to segmental and syllabic structures and then to tonal aspects. We finally explain how we integrated into this study a control dataset for our study on tonal aspects for the other direction of language contact, namely from French to Vietnamese.

Starting with segmental and syllabic structures, we provide a list of French and Vietnamese stimulus lexemes for experiment 3 and justify this choice subsequently. We start with consonants in table 75 and continue with special syllabification patterns in table 76. As all Vietnamese coda consonants are possible in French, we mainly look at onset consonants but also some conceivable problems occurring with codas. We check if unreleased Vietnamese codas are deleted, possibly due to a lack in perception. As we do not have much loanword data for this direction, we do not have predictions about the repair patterns but only suggestions.

Table 75: Vietnamese stimuli for examining single consonants

Lexeme	IPA	English glosses	Stimulus consonant	Conceivable repair
khung cảnh	xuŋ ^{A1} keŋ ^{C1}	landscape	x	k, deletion
cuộc gặp	kuək ^{D2} ɣăp ^{D2}	meeting	ɣ	g, ʁ
học phí	hɔk ^{D2} fi ^{B1}	tuition fee	h	deletion
ngã tư	ŋa ^{C2} tu ^{A1}	intersection	ŋ	n
ngạt mũi	ŋat ^{D2} muj ^{C2}	cold (nose)		
thế cờ	tʰe ^{B1} kɣ ^{A2}	chess move	tʰ	No phonemic difference in French, therefore possibly no phonetic difference preserved
công ty	koŋm ^{A1} ti ^{A1}	company	t	
tàu thuyền	taw ^{A2} tʰwiən ^{A2}	boat	t, tʰ	
ốp la	op ^{D1} la ^{A1}	fried egg	Unreleased p	Deletion, because possibly not perceived by speakers of French
cuộc gặp	kuək ^{D2} ɣăp ^{D2}	meeting		
ắc quy	ăk ^{D1} kwɪ ^{A1}	battery	Unreleased k	
cuộc gặp	kuək ^{D2} ɣăp ^{D2}	meeting		
học phí	hɔk ^{D2} fi ^{B1}	tuotion fee		
ngạt mũi	ŋat ^{D2} muj ^{C2}	cold (nose)	Unreleased t	

Table 76: Vietnamese stimuli for examining special syllabification patterns

Lexeme	IPA	English glosses	Stimulus structure	Conceivable syllabification process
bờ lu	bɣ ^{A2} lu ^{A1}	blouse	bɣ.lu	blu, bɔ.lu, bə.lu, Is the insertion of epenthetic vowels in borrowing in the opposite direction reversed (probably not), and if not, becomes the epenthetic vowel a full vowel in French or a Schwa?
ắc quy	ăk ^{D1} kwɪ ^{A1}	battery	k.k	k (Is the consonant doubling process in the opposite direction reversed?)
thế cờ	tʰe ^{B1} kɣ ^{A2}	chess move	k	k, controll item for ắc quy (case above)
ốp la	op ^{D1} la ^{A1}	fried egg	p.l	.pl (Is the syllable boundary shift in the opposite direction reversed?)
cá con	ka ^{B1} kɔn ^{A1}	little fish	.k	Possibly these two minimal pairs are not perceived as such by speakers of French and the phonemic difference between c.c or m.m and .c or .m not reproduced
các con	kak ^{D1} kɔn ^{A1}	each fish	k.k	
cá mèo	ka ^{B1} mɛw ^{A2}	catfish	.m	
cám mèo	kam ^{B1} mɛw ^{A2}	dry cat food	m.m	

As already mentioned, there are three loanwords from French in this Vietnamese lexeme list, namely *bờ lu* from French *blouse* ‘blouse’, *ắc quy* [ăk^{D1} kwi^{A1}] from French *accu(-mulateur)* [a.ku] ‘rechargeable battery’ and ‘*ốp la* [op^{D1} la^{A1}] from French *(oeuf) au plat* [o.pla] ‘fried egg’. Especially for the two latter we want to check whether a repair made by speakers of Vietnamese in loanword adaptation is reversed in this case when the French loanword in Vietnamese is a stimulus for speakers of French. In the slides of the experiment, we add pictures which are not the significate of those significant: the Vietnamese stimulus *bờ lu* ‘blouse’ is mapped with pictures of ice-cream, *ắc quy* ‘battery’ with pictures of sparrows and *ốp la* ‘fried egg’ with pictures of claws. One example is given in figure 11 and 12. We want to check whether French speakers notice it and are therefore still able to recognize the French source without any hint and despite distractor. This is only to make sure participants do not adapt the stimulus to the French system in a certain way because they understand that this is a loan from French. This does *not* seem to be the case, even if, after the run of the experiment is done, we give some hints: “There are three words which originate from French, could you remember which words that may concern?”, and as no one remembers, we continue: “Which could be the French source of Vietnamese *bờ lu*, *ắc quy* and *ốp la*?” We even give the hint that pictures are wrongly assigned to lexemes. Still, no participant gives the correct answer.

Figure 11: Vietnamese stimulus *bờ lu* ‘blouse’ is accompanied by a picture of ice-cream, isolation condition



Figure 12: Vietnamese stimulus *bờ lu* ‘blouse’ is accompanied by a picture of ice-cream, embedding condition



After having listed the material, which is interesting for segments and syllabification, we now turn to tones. The tonal material is chosen to answer our research questions:

Are rising and falling contours preserved or, when embedded in a French carrier sentence, overridden by French intonation patterns?

Linked to this question are the two following subordinated questions:

1. Do speakers of French therefore understand that [+rising] and [+falling] are phonemic at a syllabic level in that language?
2. Do they notice a difference at all? If they faithfully reproduce rising and falling contours in the isolation condition, this is the case.

To find answers to these questions, we concentrate in this study on items with tone A2 vs. items with tone B1 on the other hand. Another larger question is whether speakers of French are better at preserving tonal material of complex tones and tones with conspicuous phonation type characteristics compared to simple rising/falling contours. Our hypothesis is that they are better at preserving those salient phonation features, as, differently to rising and falling movements, they do not encode intonational properties in French. Linked to this question is the question whether the former or the latter are rather preserved or not when embedded in a carrier sentence. In this study, we focus on tone C2 to compare it to tone A2 and B1. We chose tone C2 because the realisation of phonation types such as glottalization by the speaker of the Vietnamese stimulus lexemes seems most salient to us, more salient than, for instance, her realisation of tone C1. Still, our experiment design allows to extend this study also to other tones with probably less salient features, as for instance C1 but also A1 as a mid-level tone without special

phonation types. In this study, we finally consider briefly if the position of a tone, i.e., first vs. second syllable, may have an impact on how and how well the tonal features are reproduced. In table 77, we present five stimuli for tone A2 and B1 each and 2 stimuli for tone C2.

Table 77: tones

Lexeme	IPA	English glosses	Stimulus tone	Conceivable repair
bờ lu	ɸɯ^{A2} lu ^{A1}	blouse	A2 (huyền)	At least in carrier sentence, rising and falling tonal properties may be overridden by French intonational patterns
tàu thuyền	taw^{A2} t ^h wiəŋ ^{A2}	boat		
cá mèò	ka ^{B1} mɛw^{A2}	catfish		
cám mèò	kam ^{B1} mɛw^{A2}	dry cat food		
thế cờ	t ^h e ^{B1} kɯ^{A2}	chess move		
thế cờ	t^he^{B1} kɯ ^{A2}	chess move	B1(sắc)	
cá con	ka^{B1} kɔŋ ^{A1}	little fish		
cá mèò	ka^{B1} mɛw ^{A2}	catfish		
học phí	hɔk ^ɸ ^{D2} fɨ^{B1}	tuition fee		
chẩn đoán	tɛ̃n ^{C1} ɗwan^{B1}	diagnose		
ngã tư	ŋa^{C2} tuɯ ^{A1}	intersection	C2 (ngã)	Tonal features are so salient that they may be preserved also in the carrier sentence
ngạt mũi	ŋat ^{D2} muj^{C2}	cold (nose)		

After having explained the methodology for tonal aspects, we finally show how we integrate control group data for the study on tonal aspects for the direction French → Vietnamese into this study. In the experiment design, the French stimuli belong to the training session. We train speakers of French for the experiment procedure with French stimuli not only to make the experiment easier to understand. Additionally, we collect control group data for the study on tonal aspects for the direction French → Vietnamese.

As we choose in this study to limit ourselves on a quantitative statistical evaluation of the two lexemes *bamboo* and *boyau* (both with two realizations, one falling and one rising), *bamboo* and *boyau* are used as stimuli here as well. Still, we only use the rising variant of *bamboo* and the falling variant of *boyau* in this study. Remember that the Vietnamese experiment block 1+2 was designed much larger and for a larger speaker group. For this experiment with speakers of French, we decide for a simplified experiment design and therefore have only one stimulus variant for each lexeme. We also add four other French stimulus lexemes. They only serve as fillers and more training material for the French participants and are not relevant for our study, but in the future, they could be used as control group material if we want to extend our study on tonal aspects to other items. The filler lexemes are *cableuse* ‘female electrician’ (with an

overall rising movement but less high as in *bamboo*), *blason* ‘coat of arms’ (falling movement followed by a plateau on the second syllable) *crapaud* ‘toad’ (falling movement) and finally *briquet* ‘lighter’ (falling movement with final glottalization). In this manner, we provide a certain range of different stimulus f₀-movements to the French participants.

6.2.3. Procedure

The experiment for this study with speakers of French was performed in early 2020 in Paris. We did 13 experiment runs with one speaker per experiment and were therefore able to collect data of 13 persons but only use data of 10 persons for reasons we mention later. Participants were either staying at the same household as we did (a shared flat in Bellville) or working at the same working place as we did (Sorbonne Nouvelle, Paris III, the institutes LACITO and Llacas at the same building in Villejuif). Those who stayed at the same household were interviewed in the most silent room of the flat. In Villejuif, we had a soundproof chamber to our disposition. The procedure was quite similar to the performance described in 5.1.3., with three differences: in the training session, French speakers were exposed to French material and not to Vietnamese lexemes. French material, as already mentioned, was used to gather data for the control group for the study on tone assignment with speakers of Vietnamese.

Before their participation, speakers read the instruction as can be found in the appendix on p. 322. The participants of this experiment were not paid as it was only very short (10-15 minutes), they did not need to change their habitual location to participate and to investigate much time and effort. As to the questions for the metadata, they are similar to those already described for Vietnamese participants and can be found together with the declaration of consent in appendix on p. 323, and a link to a table with translations of the answers on p.324. The differences to Vietnamese metadata questions are the following: French speakers are not told to which Language the lexemes belong, and they are asked which language they think the lexemes belong to and why they think so after the experiment run has finished. They are also asked what they knew about this language before, what they notice during the experiment and what the aim of the experiment might be. This is to check whether they know something about tonal languages, Vietnamese as a tonal language and whether they noticed something which might have to do with tones, but also with other differences concerning segments and syllable structure.

As it was difficult to find participants who are monolingual French, we asked for participants who never learned any other language before the age of about 10. If that language was English, German, Spanish, Italian, Portuguese, Russian, Czech, or Polish, there was no problem to participate, if that language was another language, we asked them to tell us which language.

We wanted to make sure no participant had ever learned any tonal or east Asian language before without dropping the terms *tone language* or *East Asia*.

Although he did not meet all requirements, we allowed one Romanian participant who learned French in Belgium to participate because he absolutely wanted to and because we did not want to discriminate him because he is not French. Interestingly, his results do not differ from the French participant's results, but we still do not include them into our study. Furthermore, we exclude the results of two other participants because they knew too much about linguistics and tonal languages. One speaker of French who participated has a Russian mother and therefore speaks Russian since she was little. Because we decided to cancel further runs due to the pandemic situation, we were not able to continue to search for other participants and therefore include her results as they did not differ from the other speaker's results. After having described how we conducted experiment 3 for our small-case study on the direction Vietnamese → French in France, we briefly describe the data editing and finally move on to the presentation of the results of this study.

6.2.4. Data editing

As described in detail for the studies on the other direction of language contact, we work with excel files. A link to the annotated raw data as well as the recordings can be found in the appendix on p.324. French lexemes *boyau* and *bamboo*, for which this groups of native speakers of French is the control group, are analysed phonetically as have been analysed for the two native Vietnamese speaker groups. As our small-case study on the reversed direction of language contact is less extensive and with less participants, we do not run statistical tests.

6.3. Results

In the experimental study with speakers of French, we keep the general idea of the previous experimental study but reverse the direction of language contact: speakers of French without knowledge of any tonal or (South) East Asian language listen to Vietnamese lexemes and are asked to reproduce them. Our dataset for this direction of language contact covers only the data of 10 participants. Still, we can observe the emergence of stable patterns with this amount of data. This chapter is less extensive but structured similarly to the results in chapter 5.2. We first look at single consonants which exist in Vietnamese but not in French. There is no investigation on consonant clusters because they do not exist in Vietnamese, despite the cluster C+ [w], which also exists in French. Therefore, we continue by presenting results for syllabification and conclude with observations on what happens to Vietnamese tone. General hypotheses are:

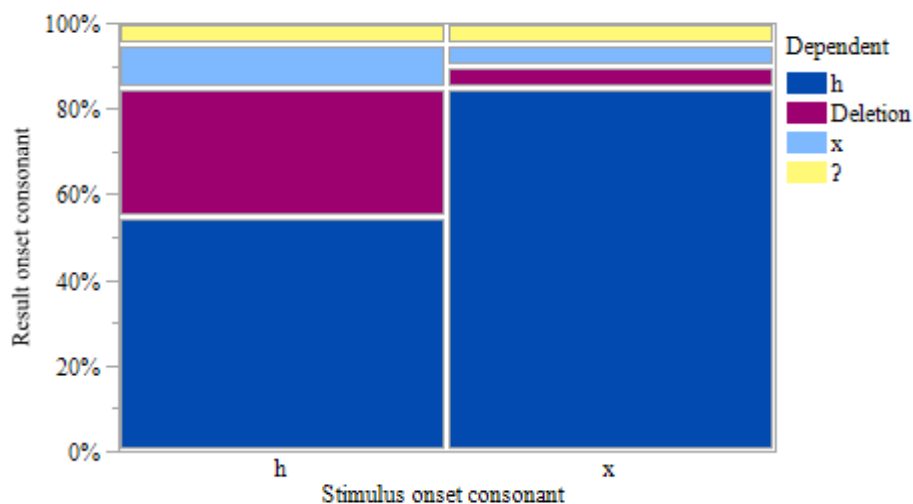
1. Single consonants: we differentiate again between onsets and codas. The Vietnamese onset consonant inventory has five consonants which do not exist in French. Vietnamese codas exist in French, but some Vietnamese codas are unreleased, while the French counterpart is released.
 - a. Onsets: we expect Vietnamese onsets without a direct French counterpart to be mapped to similar consonants that exist in French
 - b. Codas: we expect unreleased Vietnamese consonants to be frequently deleted, probably, because they are hard to be perceived by speakers of French.
2. Syllabification: the syllabification patterns which have been observed for the other direction of language contact French → Vietnamese are expected to be reversed in the reversed direction of language contact Vietnamese → French.
3. As French is not a tonal language, tone is expected to be lost or overridden by intonational patterns, especially in the embedding condition.

After having presented the structure of this chapter and the general hypotheses, we continue with the results for single consonants.

6.3.1. Segmental aspects: single consonants

Results are presented for onsets and codas separately, as this distinction again makes sense: while deletion does not play an important role for onsets, it does play a role for codas. This general tendency, which has already been observed in the experimental data for the other direction on language contact, is strengthened here. Starting with onsets, we consider Vietnamese consonants without a direct counterpart in French. These are the fricatives [h], [x] and [ɣ], the nasal [ŋ], and the affricate [tʃ]. For the latter, we do not need to show detailed results as it is always reproduced quite faithfully by 100% of the speakers. This may be since a similar sound [tʃ] exists in English and participants have at least basic knowledge of English. If the affricate [tʃ] is not perfectly reproduced, it is mapped to its English direct counterpart [tʃ]. The other sounds seem to cause more problems to speakers of French, and results are shown in detail, starting with the fricatives [h] and [x]. While the glottal fricative exists in English as well and should therefore at least passively be known to participants, the velar fricative does neither exist in French nor in English. Therefore, we expect more repair to be made for the second one. The reason why we group both fricatives together in chart and table 78 is that repair strategies are identical, just the proportions are different.

Chart and table 78: single onset consonants: the unvoiced velar and glottal fricative as independent variable values, the results as values for the dependent variable



Number	Deletion	h	x	?	Sum
h	6	11	2	1	20
x	1	17	1	1	20
Sum	7	28	3	2	40

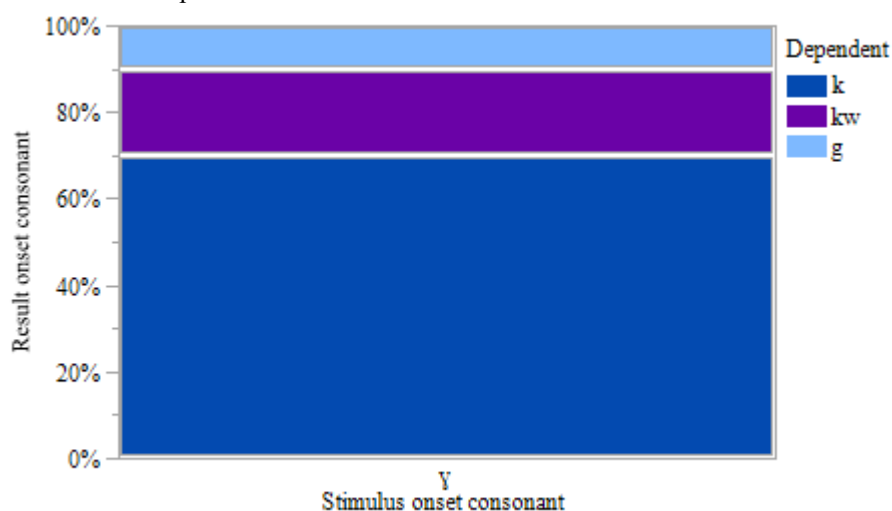
Our assumption can be confirmed: while there is no repair for [h] and this sound is preserved for 55 % of the data, the sound [x] is preserved only for 10%. Another interesting difference is that deletion occurs more frequently for the glottal stimulus fricative [h] than for the velar [x]: 30 vs. 5%. In contrast, the velar consonant [x] is very frequently replaced by [h]: in 85% of the cases. Why is [x] replaced so frequently by a sound with does not exist in French neither and which is preserved much less frequently, namely just in 55% of the data? Maybe the [h] gets oftentimes rather lost instead because it is not perceived, whereas the [x] is so salient that it is easier perceived and memorised as important phonemic information which should be kept. The sound [h] may pose less problems in production than the sound [x] because the first is known from English and the latter is not. It may be preserved or chosen as a replacement strategy more frequently than the sound [x], which is chosen only in 10 vs. 5% of the data. Finally, the glottal stop has been chosen one time each, which make 5% of the data. In (59)a-b, we provide examples for repair patterns of the glottal and the velar fricative. For each of the two stimulus lexemes, we provide two results, representing the most frequent patterns.

(59) Examples for repair patterns of [h] and [x]

Stimulus	IPA stimulus	IPA Result	Glosse	Cons. stimulus	Result
a) <i>học phí</i>	[hɔk ^{D2} fi ^{B1}]	[ɔɸ.fi] [xa.fi]	‘tuition fees’	[h]	Deletion [x]
b) <i>khung cảnh</i>	[xuŋ ^{A1} kɛŋ ^{C1}]	[hun.kɛŋ] [hum.kwaŋ]	‘scenery’	[x]	[h] [h]

If we imagined a situation of borrowing from Vietnamese to French, it is possible that the phenomenon of the *h aspiré* surfaced here as it is the case for some Germanic loans and blocs liaison. For instance, the Vietnamese lexeme *học phí* ‘tuition fees’ could be become *orfi*, pronounced in combination with a French plural article *les* ‘the PL’ as [le.ɔɸ.fi] and not [le.zɔɸ.fi]. But as we can only speculate on this issue, we continue now with the third fricative, namely the voiced counterpart of [x] which is [ɣ]. We provide an extra bar chart and contingency table for this fricative as repair patterns are totally different from its unvoiced counterpart and the unvoiced glottal fricative as well. These two are the only onsets in which deletion occurs at all, for all other stimulus onset consonants, deletion is never chosen as a repair. This can be seen at first in the bar chart and contingency table about the voiced velar fricative [ɣ], see chart and table 79.

Chart and table 79: single onset consonants: the voiced velar fricative as independent variable value, the results as values for the dependent variable

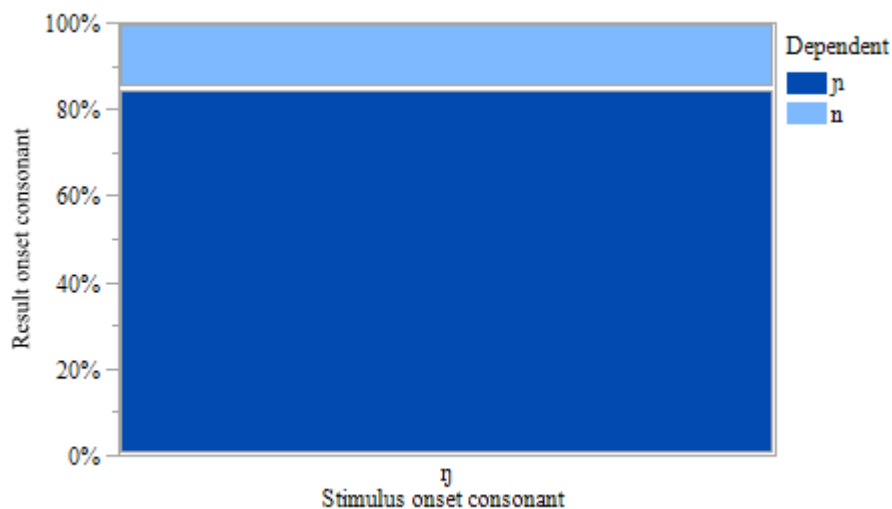


Number	g	k	kw	Sum
Percent				
ɣ	2	14	4	20
	10	70	20	

The unvoiced velar plosive [k] is chosen quite robustly with a percentage of 70% to replace the voiced velar fricative [ɣ]. In this case, two featural changes are made. To the contrary, the voiced velar plosive [g], which makes only one featural change, is chosen in 10% of the cases. More often, the features are split into two slots and the single consonant becomes the cluster [kw]. As speakers make a pause between the nucleus of the first syllable and the following [kw], the first segment of the cluster cannot be interpreted as the coda of the first syllable but non-ambiguously as the onset cluster of the second syllable. In the first cluster consonant [k], the velar feature is preserved and in the second, which is the approximant [w], the voiced fricative features are preserved. This way, all features can be preserved although the original sound does not exist in French. This is an instance of a strategy we call fission, and which also appears in the experimental data for the other direction of language contact (see p.134). As this strategy only emerges for this single consonant and in total even more marginally than deletion, we will not further dive into the topic. Illustrations for the repair patterns of the voiced velar fricative [ɣ] can be given with the stimulus *cuộc gặp (gặp)* [kuək^{D2} ɣăp^{D2}] ‘meeting’: one speaker realises [kuo.kwă] with the repair [kw], another [kuo.ka] with [k] and a third one [kuo.gă] with [g].

A last note on the three fricatives [h], [x] and [ɣ] we have just discussed is the comparison to the experimental data for the other direction of language contact. While speakers of Vietnamese repair the French uvular fricative [ʁ] with the highest frequency by these three velar and glottal ones (59% [x], 23% [h] and 17% [ɣ], see p.151), the French uvular fricative [ʁ] is never used as a repair of one of the three Vietnamese consonants. This result shows that repairs from one direction of language contact are not always identically reversed if the direction changes: speakers of Vietnamese seem to be sensitive to other phonetic details than speakers of French. We continue with the last consonant which does not exist in French onsets, the velar nasal [ŋ], see chart and table 80.

Chart and table 80: single onset consonants: the velar nasal [ŋ] as independent variable value, the results as values for the dependent variable

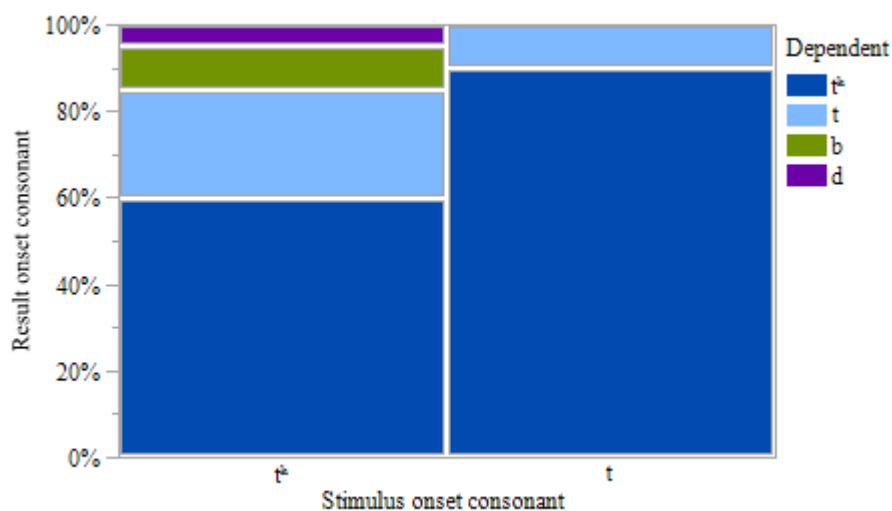


Number	n	ɲ	Sum
Percent			
ŋ	6	34	40
	15	85	
Sum	6	34	40

This consonant is in zero cases faithfully reproduced. Either it is replaced by the palatal nasal [ɲ] with a frequency of 85%, or by the alveolar nasal [n] with 15%. The nasal feature seems to be very salient and is robustly preserved. For the most frequent replacement strategy, there is only one featural change to the nearest place of articulation, and the place of articulation of the other repair is not far either. We provide two examples for replacement strategies of the nasal [ŋ] are given for the stimulus *ngã tu* [ŋa^{C2} tu^{A1}] ‘crossroads’: [ɲa.gə] in which the consonant is replaced by [ɲ] and [na.gə] in which it is replaced by [n].

Before we move to coda consonants, we consider two distinct Vietnamese onsets for which there is no phonemic distinction in French: the unaspirated [t] and the aspirated [tʰ]. Compared to other languages like German, in which there is likewise no phonemic distinction between the two, the French phoneme /t/ is rather unaspirated. But compared to the Vietnamese phoneme /t/, it is still rather aspirated, while it can be less aspirated than the Vietnamese phoneme /tʰ/. (see p.98). Our question is if speakers of French preserve a difference between the two Vietnamese sounds t/ vs. /tʰ/, and our hypothesis is that they rather do not. We compare the results for the stimulus [t] in *cong ty* [koŋm^{A1} ti^{A1}] ‘enterprise’ to the results for the stimulus [tʰ] in *thế cờ* [tʰe^{B1} kɔ^{A2}] ‘chess move’. Results are shown chart and table 81.

Chart and table 81: onset consonants: the phonemic distinction between phones [t] and [tʰ] as independent variable values, the results as values for the dependent variable



Number	b	d	t	tʰ	Sum
Percent					
tʰ (vs. t)	2	1	5	12	20
	10	5	25	60	
t (vs. tʰ)	0	0	2	18	20
	0	0	10	90	
Sum	2	1	7	30	40

The results show that most of both consonants result in a rather aspirated plosive [tʰ], no matter if the stimulus is [tʰ] or [t]. But it is striking that the stimulus [t] results in the aspirated [tʰ] with 90% even more frequently than the stimulus [tʰ] with 60%. We do not have any explanation for the fact that the stimulus [tʰ] is even sometimes mapped to [d] or [b] but the stimulus [t] never. Examples for results of the stimuli [tʰ] and [t] are given in (60)a and b.

(60) Examples for repair patterns of [tʰ] and [t]

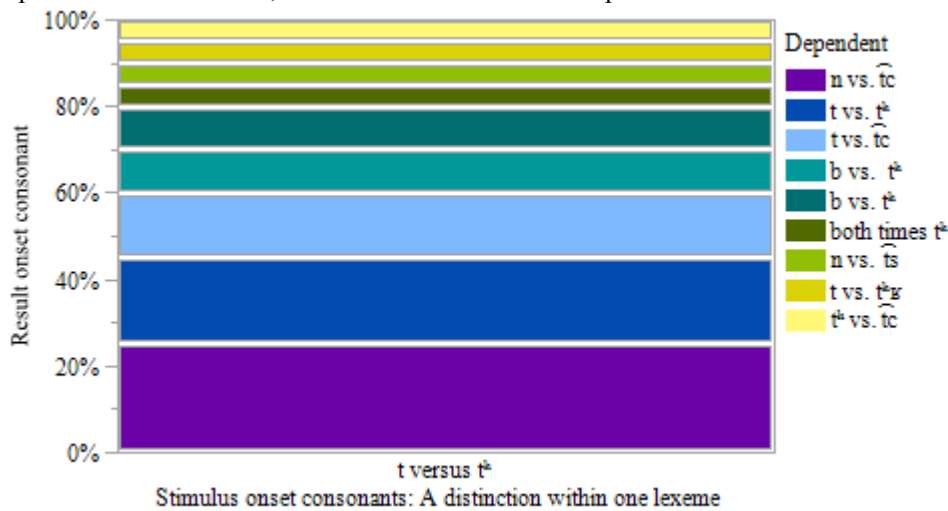
	Stimulus	IPA stimulus	IPA Result	Glosse	Consonant result
a)	<i>thế cờ</i>	[tʰe ^{B1} kɣ ^{A2}]	[tʰe.kɜ]	‘chess position’	[tʰ]
			[de.kɜ]		[d]
b)	<i>công ty</i>	[kɔŋ ^{A1} ti ^{A1}]	[kɔŋ.tʰi]	‘company’	[tʰ]

[kǒm.ti]

[t]

The results show that the phonetic details of the Vietnamese phonemes /t/ vs. /tʰ/ do not lead to decisions by speakers of French which would have shown that they got the phonemic distinction between the aspirated and unaspirated alveolar stop. This picture changes if both sounds, the aspirated and the unaspirated, are present in one stimulus lexeme. The lexeme *tàu thuyền* [taw^{A2} tʰwiən^{A2}] ‘boat’ has the unaspirated alveolar stop in the first syllable onset and the aspirated one in the second. Results are displayed in chart and table 82.

Chart and table 82 single onset consonants: phonemic distinction between phones [t] and [tʰ] in one lexeme as independent variable values, the results as values for the dependent variable



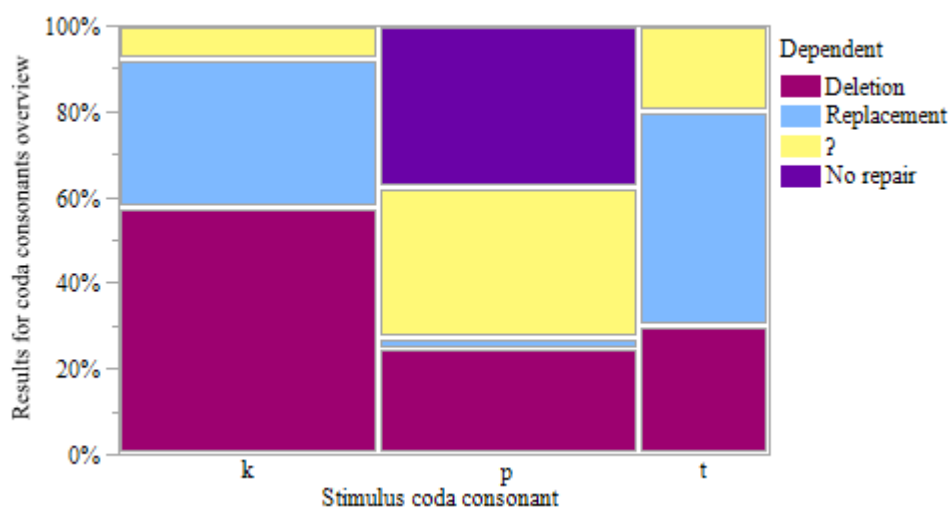
Number	b vs. tʰ	b vs. t̃c	2x tʰ	n vs. t̃s	n vs. t̃c	t vs. t̃c	t vs. tʰ	t vs. tʰg	tʰ vs. t̃c	Sum
Percent										
t vs. tʰ	2	2	1	1	5	3	4	1	1	20
	10	10	5	5	25	15	20	5	5	

Interestingly, if the two consonants are in one lexeme, speakers of French preserve the distinction, without always being faithful to all features of the consonants. Still, mostly the stimulus [t] results in an unaspirated sound, be it [t], [n] or [b]; and the [tʰ] results in an aspirated one, an affricate, or a cluster with a fricative in second position. The stimulus with [t] and [tʰ] within the same lexeme is *tàu thuyền* [taw^{A2} tʰwiən^{A2}] ‘ship’, and result examples are [taw.t̃cɛjən] for [t] vs [t̃c], [naw.t̃cyən] for [n] vs. [t̃c] and [baw.tʰirɛn] for [b] vs. [tʰ].

The affricate [t̃c], which is chosen as the onset of the second syllable three times in the relatively small dataset, resembles phonetic realizations of the French phoneme /t/ by some speakers, especially in the south. Therefore, if a speaker of French contrasts the sound [t] with [t̃c] like in [taw.t̃cɛjən], then he or she can perceive a difference phonetically, but it is not sure if this speaker would preserve the difference on a phonemic level. But for the speakers of French who chose

to contrast a [n] with a [ŋ] as can be seen in [naw.ŋcyɛn], speakers tend to rather preserve the phonetic details as important phonemic ones than to preserve other phonetic details which would result in the same sound in French on a phonemic level. Also, this process enhances the phonetic differences of two phonemes, which in Vietnamese only differ in aspiration vs. non-aspiration but in this French response results in a difference in manner of articulation. This holds for both examples where speakers chose a [n]. For the speakers who chose a [b] like in [baw.tʰirɛn], it is not the manner but the place of articulation which is changed instead. This way, the phonetic difference is enhanced in half of the cases so that a phonemic distinction can also be made according to the French system. The role of enhancement has interestingly also been studied for loanwords in three different language contact settings in Kenstowicz (2010). For the other half of the data, there is no distinction on a phonemic level according to the French phoneme inventory, but speakers are still sensitive to phonetic details and preserve them – to the contrary to what happens if they do not hear both Vietnamese sounds in the same word as we have shown before. In the present case, only one speaker does not make a phonetic difference and realizes both, the Vietnamese [t] and the Vietnamese [tʰ], as [tʰ]. After having discussed this issue in detail, we now move on to Vietnamese unreleased codas. All these codas exist in French as well, but due to the unreleased feature which is only present in Vietnamese but not in French, we expect the speakers of French to delete them because they do not perceive them, or because they replace them by other consonants, because of a lack in distinctive perception. Below we display chart and table 83 with an overview for the result categories.

Chart and table 83: single onset consonants: overview, unreleased plosive codas as independent variable value, results as values for the dependent variable



Number Percentage %	Deletion	No repair	Replacement	?	Sum
k	23 57,50	0 0	14 35	3 7,50	40
p	10 25	15 37,50	1 2,50	14 35	40
t	6 30	0 0	10 50	4 20	20
Sum	39	15	25	21	100

Besides instances with no repair which interestingly only occur for the consonant [p], we find deletion and replacement. We put the replacement by a glottal stop into an extra category, as it is a replacement on a phonetic level but, according to the French phoneme system, could rather be interpreted as an instance of deletion. We can see that deletion and replacement is most frequent for the consonants [k] with 58% and 35% and [t] with 30 and 50 %, but with reversed order of frequency ranking. This goes in line with our expectation, especially, as the respective consonant has never been preserved without repair. For the consonant [p], replacement occurs much less frequent than for the other consonants: it makes up only 1%, and the consonant is preserved faithfully for 37%. Example are displayed in (61).

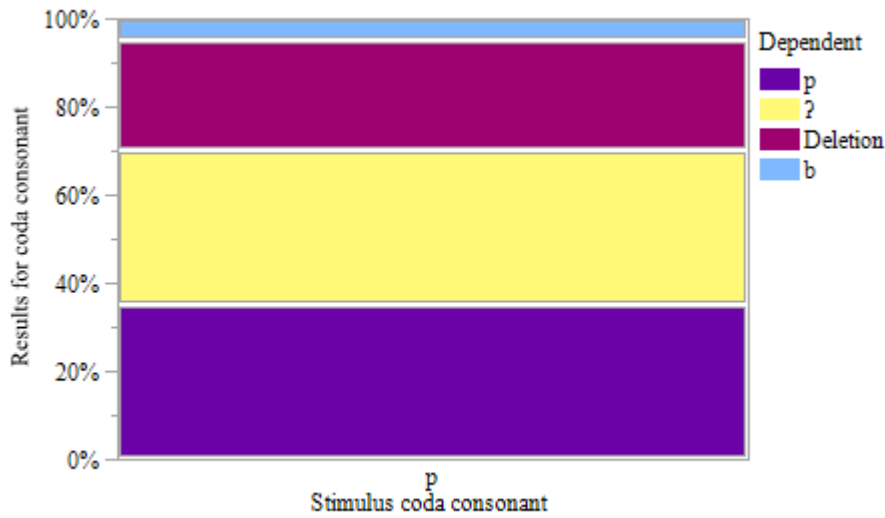
(61) Examples for results of the three Vietnamese unreleased plosive codas

Stimulus	IPA stimulus	IPA Result	Glosse	Plosive	Repair
<i>óp la</i>	[op ^{D1} la ^{A2}]	[o.pla] ²⁹	‘meeting’	[p]	No repair
<i>học phí</i>	[hɔk ^{D2} fi ^{B1}]	[xa.fi]	‘tuition fee’	[k]	Deletion
<i>ngạt mũi</i>	[ɲat ^{D2} muj ^{C2}]	[nak.mwi]	‘cold’	[t]	Replacement

We continue with a more detailed view of each of the three plosives, starting with the consonant [p], the frequency of the different replacements and deletion are shown in chart and table 84.

²⁹ For this example, it is unclear whether the syllable boundary is at this place. It could also be possible to assume the following transcription [op.la]. Phonetically, the syllable boundary is not marked but rather blurred.

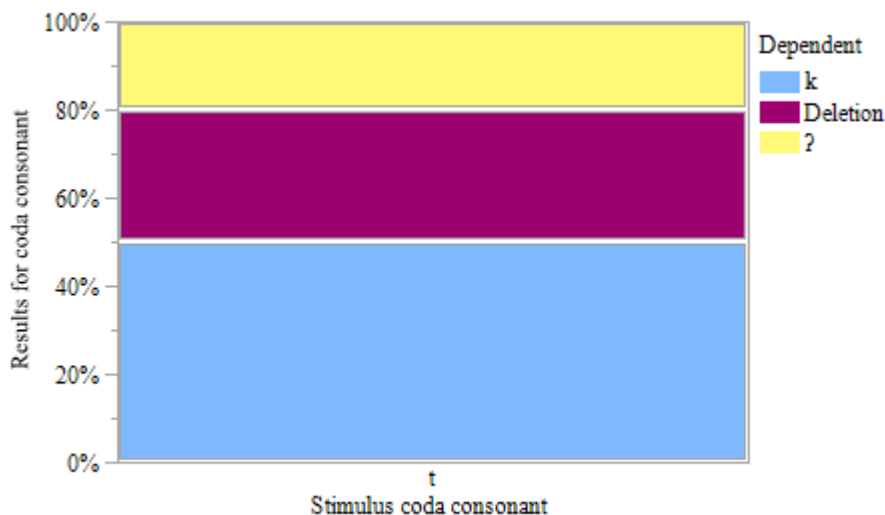
Chart and table 84: single onset consonants: unreleased plosive coda [p] as independent variable value, results as values for the dependent variable



Number	b	Deletion	p (no repair)	?	Sum
Percent					
p	2	10	14	14	40
	5	25	35	35	

The bilabial plosive [p] is the only one for which no repair or the replacement by its voiced counterpart [b] is observed (14 and 2 %). Probably, this sound is from a phonetic perception point of view more salient than the other remaining stops, for which we display the results in what follows. In chart and table 85 we show results for the stop [t].

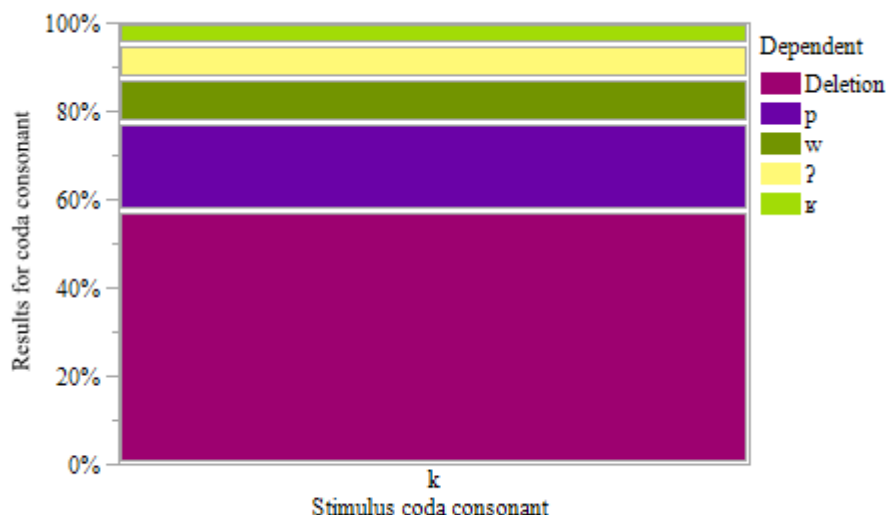
Chart and table 85: single onset consonants: unreleased plosive coda [t]



Number	Deletion	k	?	Sum
Percent				
t	6	10	4	20
	30	50	20	

The most frequent repair pattern for the alveolar stop [t] is the replacement by the velar stop [k] with 50%. Considering results in chart and table 86, we cannot observe this pattern the other way round: velar stop [k] is never replaced by the alveolar stop [t], but just by the bilabial one.

Chart and table 86: single onset consonants: unreleased plosive coda [k] as independent variable value, results as values for the dependent variable



Number	Deletion	p	ʔ	w	?	Summe
k	23	8	2	4	3	40
Percentage %	57,50	20	5	10	7,50	

After deletion, the replacement of the velar stop [k] by the bilabial stop [p] is the second most frequent strategy with 20%. But besides the glottal stop, there are also instances of replacement by the approximant [w] and the fricative [ʁ]. While the glottal stop and the approximant [w] could also be interpreted as instances of deletion with a trace of the deleted consonant left, the emergence of the fricative [ʁ] is an interesting replacement strategy, as the other way round, speakers of Vietnamese oftentimes proceed the same way by replacing the French [ʁ] by [k], see p.154. Therefore, we have instances of changes which pattern the same way in both language contact directions, just in the reversed order.

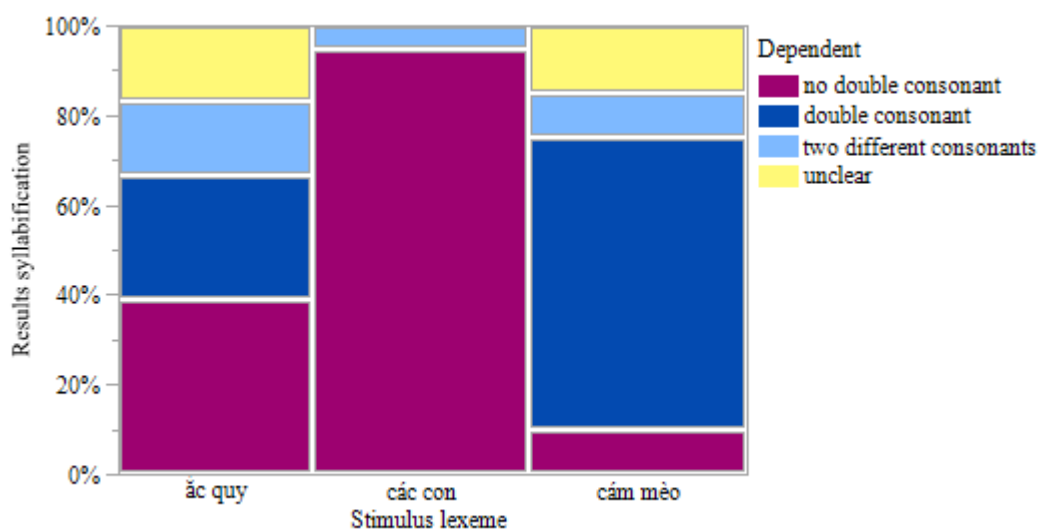
To summarize our results on single consonant repair, the difficulties of speakers of French in imitating Vietnamese segments they are not familiar with are very similar to the difficulties speakers of Vietnamese have in reproducing unfamiliar French segments. In some cases, patterns are even the same in the two directions of language: a French [ʁ] can be replaced by speakers of Vietnamese as a [k] and vice versa. Still, for other segments, they pattern differently

in the two directions, as speakers of French pay attention to other phonetic details of another language than speakers of Vietnamese. We now continue with syllabification.

6.3.2. Special syllabification patterns

For French stimuli, we have observed that native Vietnamese speakers tend to geminate consonants or double consonant slots in certain syllable structures. We have also observed other instances when syllable structures of the French stimulus differ from the responses of Vietnamese speakers. At this point, it would be interesting to test what happens the other way round. Our expectation is that for the reversed language contact direction also the process direction is reversed, while the same process can be observed. For instance, if there is a double consonant in the Vietnamese stimulus, it could result in a single consonant in French. We start by testing this issue with the help of the three Vietnamese stimuli *ấc quy* [ãk^{D1} kwí^{A1}], *các con* [kak^{D1} kɔn^{A1}] ‘each child’ and *cám mèò* [kam^{B1} mew^{A1}] ‘dry cat food’. The first of them is a loan from French which was not recognized as such by any of the French participants as we have described in detail in 6.1.1. on p.225. The other stimuli are chosen as we need minimal pairs where the only difference is that in one of them, the coda consonant of the first syllable is identical with the onset consonant in the second and the other without the coda consonant in the first syllable. The stimulus which forms a minimal pair with *các con* [kak^{D1} kɔn^{A1}] is *cá con* [ka^{B1} kɔn^{A1}] ‘little fish’, and the stimulus which forms a minimal pair with *cám mèò* [kam^{B1} mew^{A1}] is *cá mèò* [ka^{B1} mew^{A1}] ‘catfish’. The stimuli without a coda consonant in the first syllable are the control group: we expect them to never result in gemination or consonant slot doubling of the onset of the second syllable, and for 100% of the data, our expectations are confirmed. To the contrary, the results are different for the stimuli where the coda of the first syllable is identical to the onset of the second syllable, which can be seen in chart and table 87. For these results, we have four categories: a double consonant as in the stimulus, no double consonant, two different consonants and a fourth category for which it is unclear whether there is a double consonant or not. Our perception, on which these categories are based, is checked against the perception of a native speaker of French and a native speaker of Vietnamese, in parallel to what has been described for the other language contact direction on p.196. This time, we have asked speakers if they hear one consonant or two, or whether they cannot say.

Chart and table 87: specific syllabification patterns: stimuli *ắc quy*, *các con* and *cám mèò*



Number	double consonant	no double consonant	two different consonants	unclear	Sum
Percent					
ắc quy	5 27,78	7 38,89	3 16,67	3 16,67	18
các con	0 0	19 95	1 5	0 0	20
cám mèò	13 65	2 10	2 10	3 15	20
Sum	18	28	6	6	58

We can see that there are substantial differences between the results for the three stimuli. For the stimulus *các con*, the vast majority of the speakers does not realize a double consonant in the result: 95%. For the stimulus *cám mèò*, this is the opposite: in 65% of the results, speakers realize the coda [m] as well as the following onset [m]. And finally, for the stimulus *ắc quy*, the results are more balanced with 39% of the results with no double [k] and 28% with a double [k]. In 17% of the cases, one of the two consonants is replaced by another, which is a higher amount compared to the other lexemes with 5 and 10%. Examples are provided in (62).

(62) Examples for syllabification: stimuli *ắc quy*, *các con* and *cám mèò*

Stimulus	IPA stimulus	IPA result	Glosse	Struct. stim.	Struct. result
<i>các con</i>	[kək ^{D1} kɔn ^{A1}]	[ta.kɔn]	‘each child’	[k.k]	[k]
<i>cám mèò</i>	[kam ^{B1} mew ^{A2}]	[kam.mɛo]	‘dry cat food’	[m.m]	[m.m]
<i>ắc quy</i>	[ək ^{D1} kwi ^{A1}]	[ap.kwi]	‘battery’	[k.k]	[p.k]

Before going more into the details for the responses, we want to spend some time with phonetic details in the stimuli. First, in *ác quy*, the vowel of the first syllable is short, which is a perceptual cue for speakers of Vietnamese that there must be a coda consonant, because short vowels never occur in open syllables. But it may also enhance the chance to perceive a double consonant universally, even for speakers of French who do not distinguish between long and short vowels, which could explain the differences to *các con*. For this stimulus, the results are clearly in favor of our expectations: most speakers of French do not distinguish between *các con* and *cá con*, between a stimulus with a double [k] and a single [k] in its middle and the result is rather [ka.kən] than [kak.kən]. But why do speakers of French perform better in the case of *cám mèò*? Gemination may be easier for them to perceive if the doubled consonant is a nasal instead of a plosive: while for the plosive, the gemination is expressed by a lengthening of the closure before the burst, it is realized by a sequence of two audible consonants for [m], with a short break between the two. The phonetic realizations of the Vietnamese stimuli with what we have just described can be seen in figures 13, 14 and 15.

Figure 13: stimulus *ác quy* with the sequence [k.k], which is expressed by a long closure before the burst

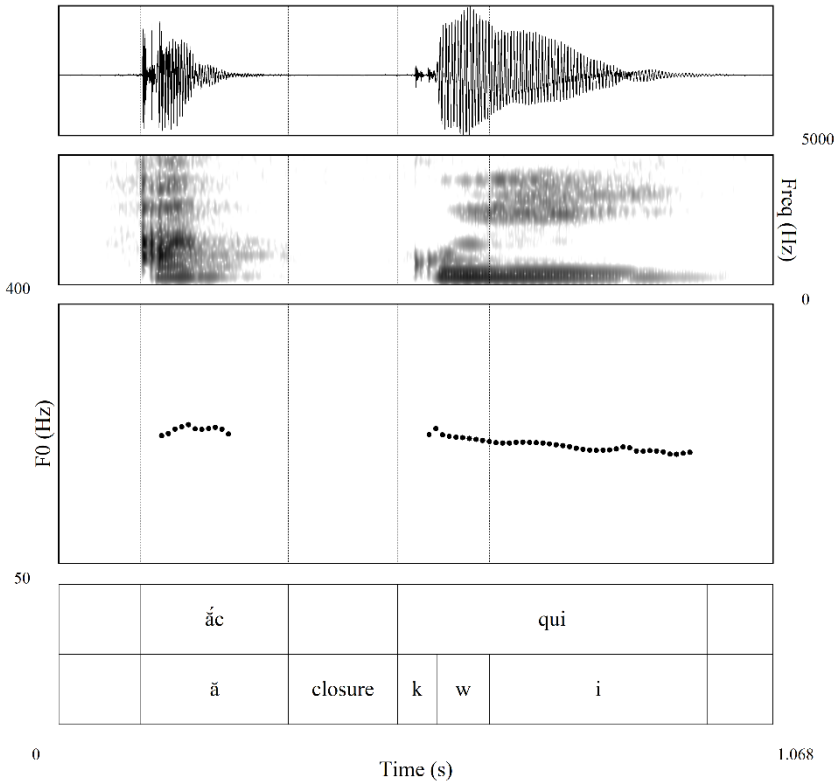


Figure 14: stimulus *các con* with the sequence [k.k], which is expressed by a long closure before the burst

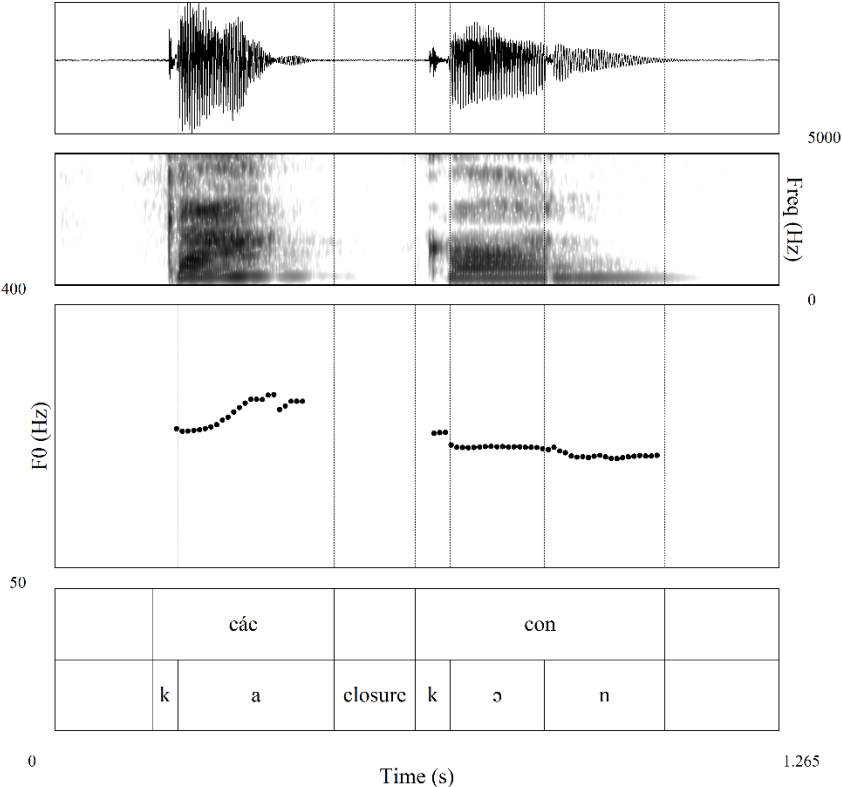
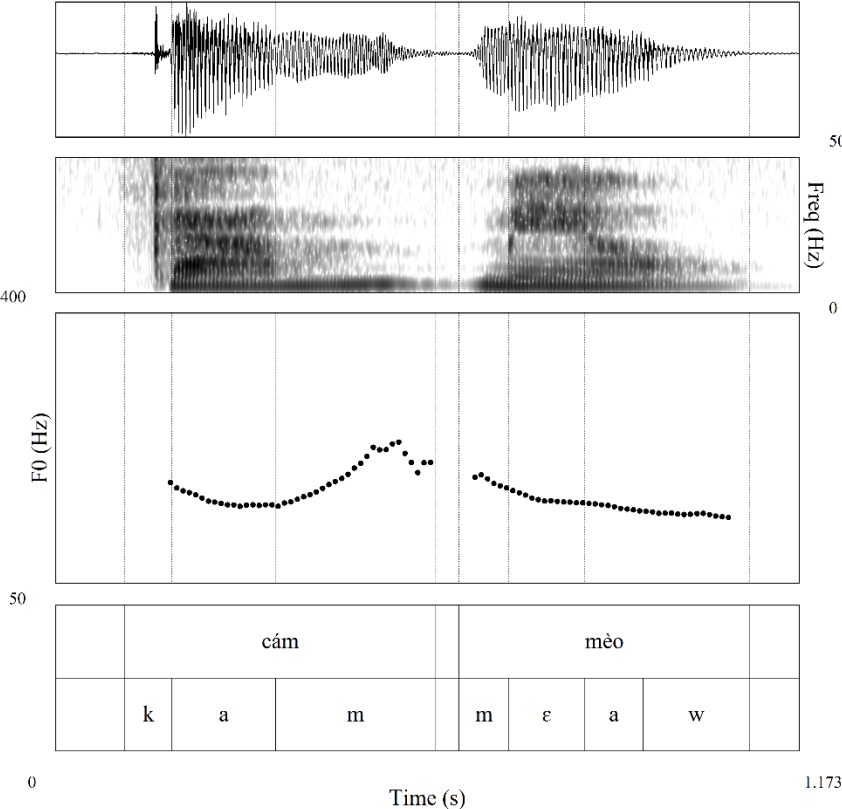
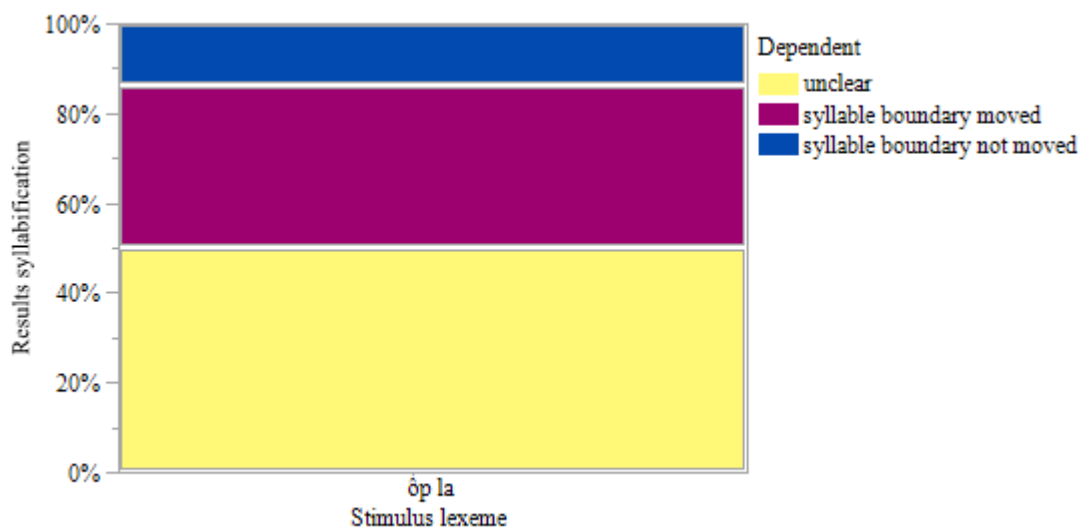


Figure 15: stimulus *cám mèò* with the sequence [m.m], expressed by two sequences of [m] with a pause between



We continue with the last stimulus for syllabification phenomena for this language contact direction and consider the Vietnamese lexeme *ốp la* [op^{D1} la^{A1}], derived from French (*œuf*) *au plat* ‘[o.pla] ‘scrambled egg’. In French, there can be but oftentimes is not a phonetic hint to where the boundary between the two syllables is. At least, if we didn’t know the language and didn’t have a conception about French syllables. As speakers of Vietnamese have their own conception of syllables depending on their native language, they have borrowed the French lexeme into Vietnamese with a different syllable structure, putting the boundary one segment further after the bilabial plosive. To the contrary to French, we believe that there are strong phonetic cues to perceive this boundary in Vietnamese. But what happens, if this loan from French into Vietnamese enters back into French? This is simulated with our experimental approach, when speakers of French, who do not know that this is a loan from their native language, imitate the Vietnamese lexeme. Do they move the syllable boundary back, applying French syllabification rules to the Vietnamese lexeme, or are they sensitive to the phonetic cues of Vietnamese syllabification and preserve the Vietnamese syllable boundary? And finally, if there are oftentimes no strong phonetic cues to syllable boundaries in French, are we able to perceive this at all? Chart and table 88 display the results in what follows.

Chart and table 88: specific syllabification patterns: stimulus *ốp la*



Number	syllable boundary moved	syllable boundary not moved	unclear	Sum
Percentage				
ốp la	8	3	11	22
	36,36	13,64	50	

For the dependent variable of the results, we have three value categories: *syllable boundary moved*, which means that we are able to perceive that the syllable boundary comes after the [o],

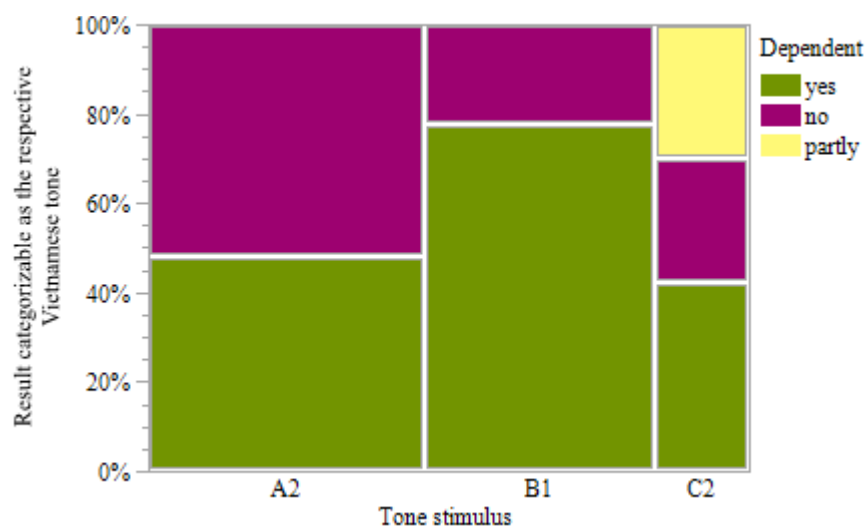
resulting in a perceivable syllable boundary which refers to underlying typical French syllable structure. To the contrary, the value *syllable boundary not moved* means that it remains as in the Vietnamese stimulus. And finally, the value *unclear* means that we are not able to perceive on phonetic grounds where the syllable boundary is.

Actually, it is unclear from perception where the syllable boundary is for exactly half of the data. For 36 % we are able to perceive that the boundary has changed according to French syllabification rules and only for 14 %, we can perceive that the Vietnamese syllable structure is preserved. As to the limitations of the indicative power of these results, we want to keep in mind that we rely only on the perception of three people: our own perception, which is a perception of a speaker who speaks fluently both languages, French and Vietnamese, but is not a native speaker of none of the other language, second the perception of a native speaker of Vietnamese and finally a native speaker of French. We also have to keep in mind that the amount of data is very limited and we would have to continue with more data, but also by running acoustic analyses and perception experiments to find more evidence for our assumption in the speech signal and in perception. This can be undertaken in future research. After having broached the issue of syllabification, we conclude our last study by examining tone.

6.3.3. Tone

Vietnamese is a lexical tone language but French is not. After having investigated how Vietnamese tones are assigned to French stimuli, we now investigate what happens to Vietnamese tone if Vietnamese stimuli are reproduced by speakers of French. Are they preserved or overridden by French intonational patterns? We focus on the three tones A2, B1 and C2. Tone A2 is a mid-falling tone, tone B1 a high-rising tone and tone C2 a falling-rising tone with glottalization after the fall. We expect tone A2 and B1 to be overridden by intonational patterns, at least when embedded in a French carrier sentence, but features of tone C1 to be better preserved because of their saliency and because they do not correspond to any French intonational pattern. The latter expectation corresponds to Flege (1995)'s *Speech Learning model* (see p.31), to which we come back in the discussion (see p.295). The 12 stimuli are listed in table 77 in our method section on p.227. We start by providing an overview picture, see chart and table 89. Subsequently, we consider the independent variables syllable position and experimental condition. We rely on our categorial tone perception and on the perception of a native speaker of Vietnamese, which are identical for 100% of the data.

Chart and table 89: overview about tone: the independent variable is the Vietnamese stimulus tone with the values A1, B1 and C2; the dependent variable is whether tonal features are preserved in the response or not



Number	no	no, but features partly preserved	yes	Sum
A2	62	0	58	120
	51,67	0	48,33	
B1	22	0	78	100
	22	0	78	
C2	11	12	17	40
	27,50	30	42,50	
Sum	95	12	153	260

For this overview, the independent variable is the tone in the Vietnamese stimuli lexeme syllables with the values A2, B1 and C2. The dependent variable is if features in the respective imitation syllable can be categorized as the same Vietnamese tone. We have three values for this independent variable: yes (categorizable as the respective vietnamese tone), no (not categorizable as th respective vietnamese tone) and a third, where features are partly preserved but taken together cannot be categorizable as the respective tone. Results show that for the falling tone A2, it is quite balanced whether its properties are preserved or not with 52 vs. 48 % , slightly in favor of a non-preservation. For the rising tone B1, the picture is different: in 78% of the syllables, the rising properties are preserved so that we could categorize vietnamese tone B1. It will be discussed in a moment if this is really because speakers of French preserve the tonal features or because French intonation interveines. In 22%, features cannot be categorized as the Vietnamese tone B1. For these two tones, only the values yes and no play a role. This is different for the tone C2. In 43% of the syllables, we have a clear yes (categorization as tone C2 possible), and in 28% a clear no (categorization not possible). But

we also have a high amount of syllables, namely 30%, where speakers apparently try to preserve tonal properties but are not able to reproduce them faithfully. As this tone has properties which are no intonational properties of French, speakers of French may understand that there is something important on a phonological level, also saliency may have a role to play. But speakers fail preserving it well enough that it falls into the tonal category of C2. In figure 16, we provide the spectrogram and f0 curve of a Vietnamese stimulus syllable with the tone C2 and in comparison of the imitation by a speaker of French, who preserves some, but not all relevant features of the Vietnamese tonal category. An example is shown in figure 14, which represents the stimulus *ngã tư* [ɲa^{C2} tu^{A1}] ‘crossroads’ and figure 17, which represents the corresponding response [ɲaha.dø].

Figure 16: stimulus ngã tu [ŋa^{C2} tu^{A1}] with the complex tone C2 in the first syllable rhyme

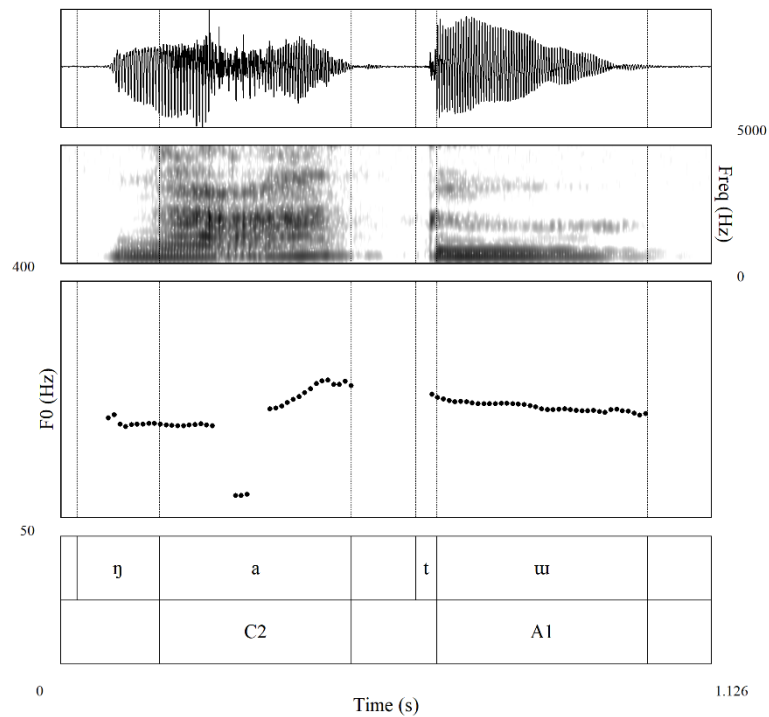
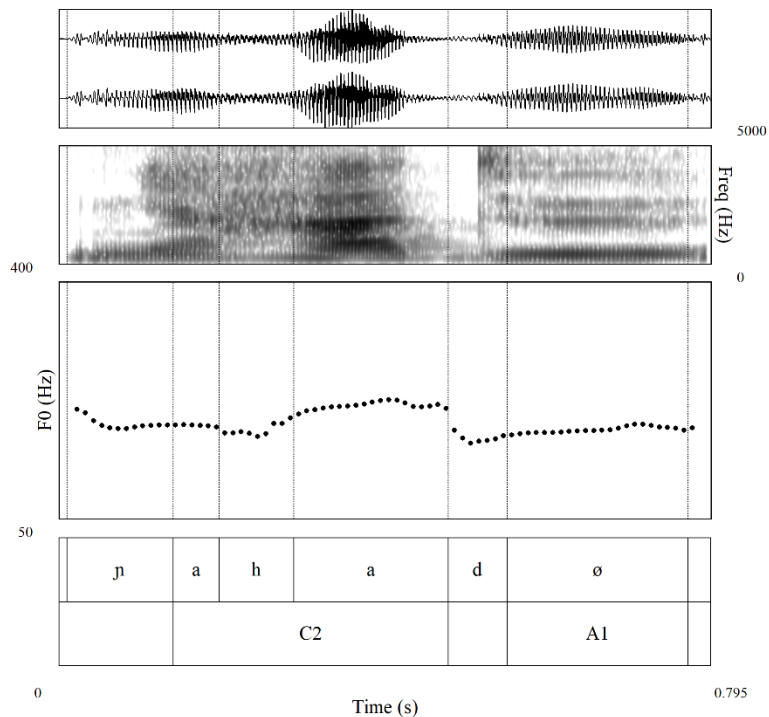


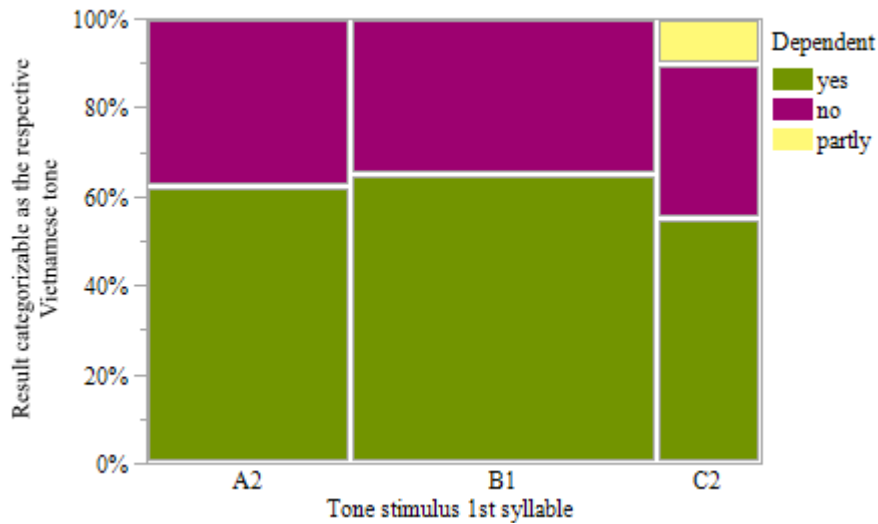
Figure 17: one response, [ŋaha.dø]. Spaces where a Vietnamese tone would be expected are the respective Vietnamese tone names



Features that the speaker preserves are the first level sequence in tone C2 before the break and the rising sequence after the break. What she fails to preserve is the break with the glottal stop. Instead, she replaces the glottals stop by the glottal fricative [h] and deletes the break. This way, one Vietnamese syllable [ŋa^{C2}] results in two syllables [ŋaha]. It seems that this speaker is aware that there are phonologically relevant features, but she replaces a tonal feature by a segmental

one, the consonant [h]. This results in a different syllable structure, and features of tones are transferred to the segmental level. After an overview and one illustrating example, we check whether it plays a role on which syllable of bisyllabic stimuli the respective tone is and start with the frequency picture for the first syllable, see chart and table 90.

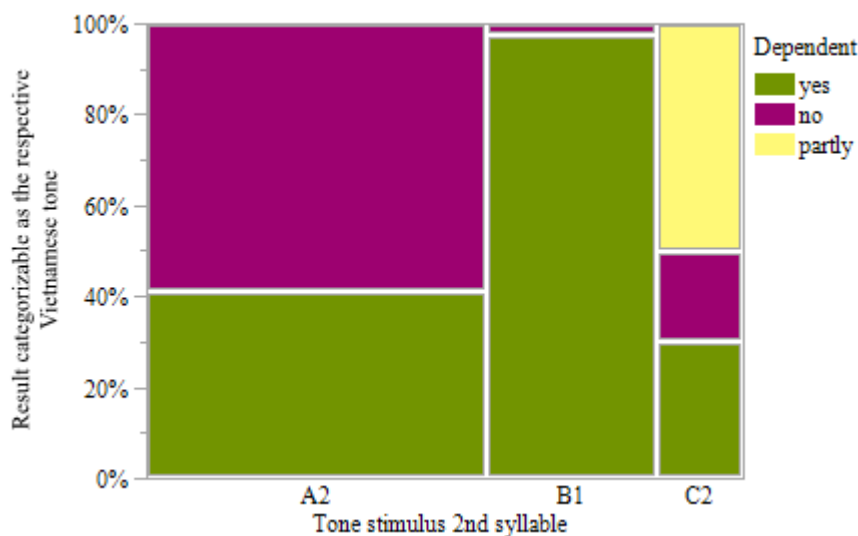
Chart and table 90: target tone is on the first syllable of the bisyllabic stimulus



Number	no	no, but features partly preserved	yes	Sum
A2	15	0	25	40
	37,50	0	62,50	
B1	21	0	39	60
	35	0	65	
C2	7	2	11	20
	35	10	55	
Sum	43	2	75	120

There are no strong differences for the three tones when the target syllable is the first syllable of the bisyllabic lexeme. The percentages of cases where tonal features are not preserved are between 35 and 37. The percentage of cases where the features still match Vietnamese tonal categories is balanced for tone A2 and B1. The only difference is that for tone C2, this percentage is somewhat lower with 55% (vs. 63 and 65%). The reason is that for 10% of the syllables speakers preserve some features but fail to produce the tonal features well enough that they match the Vietnamese tonal category. Overall, it seems that speakers of French perform quite well for the first syllable and do better for the tones A2 and B1 than for C2, but generally, frequencies are balanced. The picture is different for the results of the second syllable, which are shown in chart table 91.

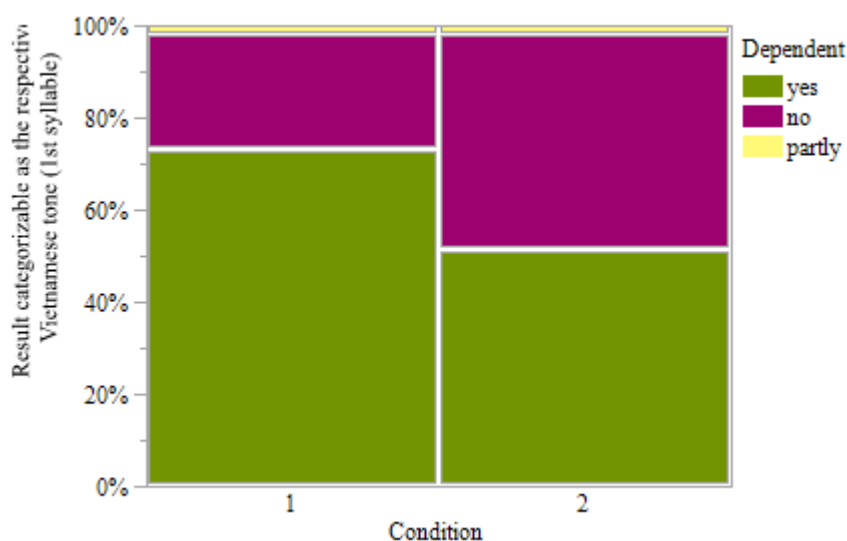
Chart and table 91: target tone is on the second syllable of the bisyllabic stimulus



Number	no	partly	yes	Sum
A2	47	0	33	80
	58,75	0	41,25	
B1	1	0	39	40
	2,50	0	97,50	
C2	4	10	6	20
	20	50	30	
Sum	52	10	78	140

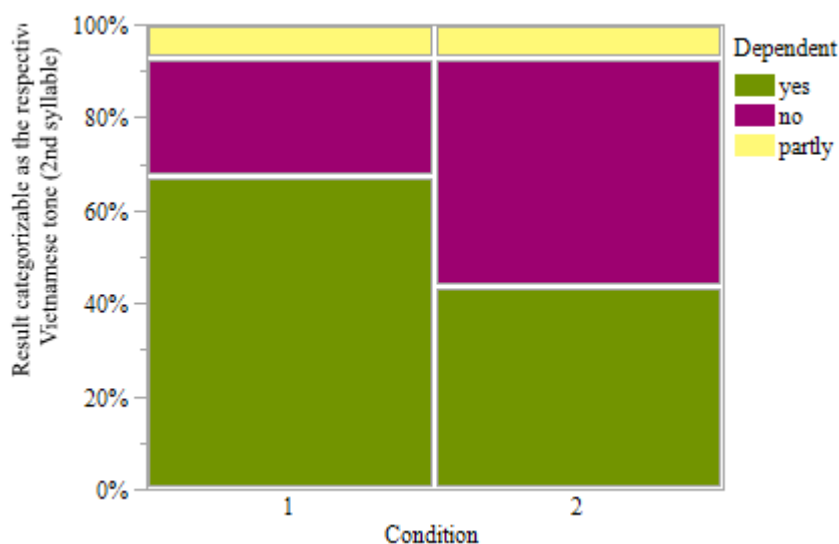
For tone A2, speakers perform 22% worse in the second syllable compared to the first: they do not preserve the tonal features in 59% of the cases (vs. only 41% preservation). To the contrary, for tone B1, they seem to perform very well: in 98% it looks like tonal categories are preserved. Again, they perform less well for tone C2, but partly preserve tonal features. Why are there substantial differences between the different independent variable values of the Vietnamese tones in the second syllable while they are so balanced in the first? An explanation could be that the second syllable is more sensitive to intonational patterns. If speakers perform so well for tone B1, then this may be only since in a carrier sentence, they raise f_0 due to intonational patterns of French, and not because they are preserving tonal features of Vietnamese. To get more evidence for this assumption, look at the independent variable of the two conditions: if speakers imitate the lexeme in isolation, we expect them to perform better than when they embed the lexeme in a French carrier sentence. This is the case, for both the first and the second syllable, as can be seen in charts and tables 92-93.

Chart and table 92 tone: condition, target tone is on first syllable of bisyllabic stimulus



Number	no	no, but features partly preserved	yes	Sum
1 (Isolation Condition)	15	1	44	60
	25	1,67	73,33	
2 (Embedding condition)	28	1	31	60
	46,67	1,67	51,67	
Sum	43	2	75	120

Chart and table 93 tone: condition, target tone is on second syllable of bisyllabic stimulus



Number	no	no, but features partly preserved	yes	Sum
1 (Isolation Condition)	18	5	48	71
	25,35	7,04	67,61	
2 (Embedding condition)	35	5	31	71
	49,30	7,04	43,66	
Sum	53	10	79	142

In both syllables, the frequency of the dependent variable value no (not categorizable as the respective Vietnamese tone) are the same: 25%. For the embedding condition, they are very similar as well: 47 and 49%. The frequencies for the value yes (categorizable as the respective Vietnamese tone) are comparable as well, the only difference is that for the second syllable, the frequency for the value of partly preservation of the features is slightly higher. Overall, the results match with our expectation that speakers of French reproduce the tonal features more faithfully in the isolation condition compared to the embedding condition. This leads us to the following assumption: generally, speakers of French reproduce features of tone quite well when they imitate the stimulus in isolation but not so well, when they embed it in a French carrier sentence, because French intonation patterns are intervening. This is relevant especially for the second syllable, on which a final rise can be frequently observed, no matter if the stimulus syllable is assigned the rising tone B1 or not. This goes perfectly in line with our results in 5.2.4. on p. 218. In this study, the same speakers of French serve as the control group for speakers of Vietnamese. They imitate French stimuli with a rise or a fall on the second syllable and then embed them in a French carrier sentence. The patterns we have observed there are the same as the patterns we observe here, which leads us to the conclusion that it does not influence the result for falling vs. rising f_0 -movements if the stimulus is French or Vietnamese. It does not matter if Vietnamese stimulus f_0 -movements relate to Vietnamese tones A2 and B1, or if French stimulus f_0 -movements relate to intonation patterns. Therefore, we cannot be able to conclude from this study that speakers of French have understood how Vietnamese works as a tonal language. Apparently, they have the same reflex to treat Vietnamese as if it would function like their native language. In this respect, they perform similarly to the monolingual speakers of Vietnamese who treat French like a tonal language, just in the other way round: although we can observe in some cases that they try hard to preserve some tonal features like we have discussed for tone C2, speakers of French tend to override features which are tonal in Vietnamese more frequently by intonational patterns when they embed the material in a French carrier sentence. This small case study for the direction Vietnamese → French has provided some insights into segmental, syllabic, and tonal features, which can be compared to the data for the other language contact direction and the loan data. In the following chapter, we summarize main results from the three studies, come back to theoretical issues and discuss several results which are worthy a deeper consideration.

7. Discussion

In this conclusive discussion, we come back to the general research questions and subsequently go through the different independent variables for our studies and the related general hypotheses. In the following, we present theoretical considerations which refer to long-standing debates on prosodic processes in language contact, including borrowings and second language acquisition. We continue by presenting a model we developed further from models in previous works. Our model allows an application to diverse language contact situations from a segmental and prosodic point of view, including borrowing in loanword adaptation and the reproduction of foreign or second language stimuli by speakers with different degrees of L2-knowledge in different language contact constellations and directions. We subsequently apply this model to our data and give illustrating examples. After having discussed the broad hypotheses in the light of our results and modelled scenarios of borrowing and second language acquisition, we will now discuss our results in a more detailed fashion and compare the different datasets under different aspects. In this chapter, we will discuss parallels and differences between these two directions of language contact, loanwords, and experimental approaches.

7.1. General research questions

Let us start with the general research questions. The central question is how repair strategies look like in loanwords and in our experimental settings of language contact. We have considered several aspects of segmental and suprasegmental repairs: single consonants, consonant clusters, specific cases of syllabification and tone. Except for consonant clusters, which we have studied in detail for the direction French → Vietnamese, we have considered all aspects for both directions of language contact. Adaptations apply to all these aspects and take place when structures of one language do not exist in another and when speakers of the second decide against reproducing them. This decision can be conceived as a mostly unconscious, but oftentimes systematic decision which reflects native language restrictions but also universal mechanisms of language contact and change. The interaction of both, native language restrictions and universal mechanisms of language contact, helps us to better understand specific adaptation patterns occurring in the contact of the two languages under investigation Vietnamese and French, but prosodic language contact in general. About the languages Vietnamese and French, we have learned how differently they function but also, under the perspective of language contact, how complex and sometimes typologically atypical each of the two languages are in themselves. Especially the aspect of syllabification patterns is revealing where the syllable structure of the source or stimulus lexeme differs from the syllable structure

of the loan, or the response. We can illustrate how both languages, Vietnamese, and French, have complex syllabification patterns and we are able to discuss under the light of language contact situations previous concepts of syllabification and their representations. Our work contributes delivering evidence for existing hypotheses and leads us to new questions. In this work, we do not want to find solutions to all problems we have met in applying existing models but contribute by asking a set of questions which can be considered in future debates on universal mechanisms of language contact and their theoretical implications.

Let us at this point come back to the different independent variables we have considered and the related general hypothesis for the different aspects and our three studies and check if they are supported, partly supported, or rejected. Most of the variables cannot be controlled for in the loan data, which is the reason why we include these variables in our experimental design to gain insights in aspects the loan data could not deliver. Some of the variables are only tested for the experimental study for the direction French → Vietnamese, because the study for the other direction is only a small case study. In the future, it seems promising to enlarge this study to have comprehensive insights for both directions of language contact.

g) Stimulus intra-speaker variability (Experiment 1 vs. 2): this variable is only tested for the experimental data of the direction French → Vietnamese. For the small case study in the other direction of language contact, we simplified the experiment design and left out this variable. For the loan data, we were not able to consider this variable as we do not have recordings of the concrete realizations of source lexemes which served as stimuli in borrowing, but we assume that in borrowing and loanword adaptation, not only one and not only two but several stimuli served as the source of the process, which we cannot reconstruct in present-day time.

As expected, the difference between experiment 1 vs. 2 is generally not very meaningful for all aspects except tone assignment. Slight differences in the response in the response patterns may have to do with phonetic details. As to tone, we observe differences for the monolingual speakers of Vietnamese for this variable. Broadly, if a French stimulus pattern is characterized by a rising f_0 -movement, we find evidence that speakers rather map this movement to a rising tone of Vietnamese than if it is characterized by a flat or falling f_0 contour. This leads us to assume that monolingual speakers of Vietnamese may treat French as a tone language in this specific experimental language contact setting.

h) Three conditions: we have tested this variable only for the experimental data. The writing condition, which we added during our fieldwork trip to Vietnam as a third condition, is tested only for the direction French → Vietnamese. For the study in the other direction, we left this variable out. We are not able to test this variable for the loan data neither but our hypothesis that the lexeme gets more and more similar to L1 structures of the speakers from the first to the last condition could give us some modest evidence for assuming a step-by-step adaptation also in borrowing situations. With this evidence, we could argue from a prosodic stance against Poplack (2018)'s refutation of what she calls the *graduality assumption* in the context of borrowing. She defines this assumption as “increasing linguistic integration with subsequent mentions” (Poplack, 2018, p. 139). According to her diachronic studies in the context of nonce borrowings and established loanwords, evidence could not be found to support the graduality assumption. Note that with our experimental approach, we are in a different context than her on the one hand, as it is a synchronic study and on the other hand, as we do not compare nonce borrowings to established loans but compare a first repetition of a lexical stimulus to a second and a third one in an experimental setting. Still, we can strive for finding evidence for the graduality assumption in our context of language contact.

For most aspects under investigation, namely consonants, clusters and syllabification, a possible effect of the three conditions seems smaller than expected in the monolingual data of Vietnamese speakers and French speakers as well. Although for each individual stimulus and participant, there is a high variability, no strong stable patterns can be found when considering the whole picture. Therefore, our hypothesis that lexemes could get more and more adapted from the first to the last condition cannot be confirmed for large parts of the data and both directions of language contact. For the speakers of Vietnamese with French L2-knowledge instead, strong and stable differences can be found between the oral and the writing condition, which can be explained by the different tasks speaking and writing.

The investigation of the three conditions is additionally helpful because it gives hints to differences between perception and production: if segments or structures are for the same stimulus and experiment participant present in one condition and not in the other, we can deduce that the omitted segment or structure is lost due to problems in production (or memorization) but not in perception.

Finally, we have some evidence that this variable might have an influence on results for tonal aspects: while for monolingual speakers of Vietnamese, no strong differences can be

found, there are differences between the two oral conditions for the speakers with L2-knowledge of French and for the speakers of French. When imitating a lexeme in isolation, they mostly imitate the f₀-pattern of the stimulus, but do not seem to store this information as relevant in their phonemic representation and it gets lost in the embedding condition or, in the case of speakers of French, overridden by intonational patterns.

- i) Different segmental material: this variable is the first we take into consideration in a very detailed fashion for all the three datasets. As expected, different segmental material in the source lexeme or stimulus is related to structural differences in the loan or the response. Overall, patterns greatly differ from segment to segment and from segment structure to segment structure. What unifies these patterns is that when segments are replaced by others, they are mostly replaced by similar segments. This happens also in clusters, and the mechanisms are the same as for single consonants, taking place independently from mechanisms of cluster repair like epenthesis or deletion. If deletion, epenthesis, or other strategies are not a cluster repair strategy but a strategy to repair illicit segmental material, the proportions also vary greatly for the variable segmental material. Overall, this variable seems to be quite important, but to discern a system, we must consider the data in detail.
- j) Speaker group: we have only tested this variable for the experimental data and the direction French → Vietnamese, because we decided to stop fieldwork in France when the outbreak of the pandemic was obvious to us and therefore did not start to recruit speakers of French with L2-knowledge of Vietnamese.

Our hypothesis is supported in that there are strong differences between the values of this variable. Our expectation that monolingual speakers deliver data which is closer to the loan data can partly be confirmed, but not for tonal aspects.

- k) Onset vs. Coda position in a syllable is a variable we tested for all the three datasets. As expected, there are strong differences in the results between the two variables. As for single segments, illicit consonants are mostly replaced in onset position and only very rarely deleted in both directions of language contact. In codas, the proportion of deletion is higher, but in the direction French → Vietnamese, also epenthesis applies. The general line of our findings that more repair takes place in the coda goes in line with results on second language acquisition by speakers of Vietnamese in Trần (2011), Benson (1986), and Sato (1984), among others, and also with Eckman (1977) in that coda consonants are more difficult to acquire than onset consonants as these are more marked structures (cf. Trần, 2011).

As for consonant clusters which we can test only for this direction, they are nearly always adapted to the Vietnamese structure and do not surface in most of the loan data. The main difference between clusters in onset and coda position is that onset clusters can be repaired by epenthesis, but coda clusters cannot. In contrast, the experimental data shows that epenthesis also occurs in coda position. The strongest difference between onsets and codas in the experimental data is the proportion of deletion: it applies to about half of the coda clusters but to even less than a quarter of the onset clusters. These results go in line with the results presented in Trần (2011), according to which deletion (what she calls *suppression*) applies more often in coda position.

- l) Syllable number is a variable which is not in the focus of this work, and it is only discussed in detail for some aspects in the loan and experimental data for the direction French → Vietnamese. It seems that this variable is related to weaker differences than other tested variables and to play a subordinated role, which goes in line with our expectations. Only for one aspect it seems important: trisyllabic lexemes seem to pose more problems for speakers of the monolingual Vietnamese group than mono- or disyllabic lexemes and the number of repairs increases drastically from bisyllabic to trisyllabic lexemes within this speaker group. This results in the fact that there is a higher variability of repair patterns for trisyllabic lexemes than for mono- and bisyllabic ones. And with this result, we want to pass to a final variable which jumped into our eyes only after having analysed the results.
- m) The variability between stimulus lexemes: for some stimulus lexemes, there is a high variability in response patterns of monolingual Vietnamese speakers, while for others there is not. As just said, this variable seems to interact with the number of syllables: lexemes with the highest variability are the three trisyllabic lexemes, for instance *crepuscule* [kʁepyskyl] ‘dusk/dawn’. Some exemplary responses are [xăp.bi.t̃wi.lɤ], [xăk.bi.fyn], [fi.li.t̃ɤ] and [ik. kiw.su.lɤ]. They differ not only in segmental material and syllable structure but also in syllable number and tone assignment. To the contrary, stimuli with a relative low variability in the responses are *ail* [aj] ‘garlic’ and *feuille-morte* [fœjmɔʁt] ‘reddish brown’. The typical responses for *ail* are [ai] or, less frequently [aj.zɤ] and for *feuille-morte* [f̃j.mɔt] or [f̃j.mɔk]. Interestingly, the variability of repair patterns not only differs between trisyllabic lexemes on the one hand and bi- or monosyllabic lexemes on the other, but also from lexeme to lexeme. While some mono- and bisyllabic lexemes are reproduced stably with similar repair patterns like the above mentioned, others vary more.

This accounts only for the data of the monolingual speakers of Vietnamese. Because in the loan data, we only have some source lexemes for which there is variation and several loan variants exist, the loan data does not provide us enough data. The experimental data with L1 speakers of Vietnamese and L2-knowledge of French does not show strong variation and delivers no considerable patterns neither. Finally, the experimental data for the other direction of language contact is too small to recognize patterns.

After having discussed possible effects of our tested independent variables in the three datasets, we now present the model we developed further from previous research and contribute in this context to the ongoing debate on role of phonetics vs. phonology, perception vs. production and monolingualism vs. bilingualism.

7.2. Our model

Research on segmental and suprasegmental patterns which arise in foreign and second language acquisition as well as loanword adaptation and borrowing has proposed several theoretical frameworks some of which we have presented in 2.1.1. and 2.1.2. As both areas share much overlap, we find it reasonable to interconnect them from a theoretical stance when we develop our own model.

We start by recapitulating the relevant theoretical assumptions about second language acquisition, continue with loanword adaptation and then present our model which formalizes the basic ideas. *Typological markedness* as well as *transfer* are important notions and discussed within the framework of second language acquisition but also loanword adaptation (see p.30). *Typological markedness* refers to structures which are rather uncommon comparing language structures of the world. Therefore, they are difficult to acquire for most second language learners. *Transfer* means that phonological knowledge about one language is used in the acquisition of a foreign or second language when a phonological interlanguage system is built. If structures are the same between the language system of the L1 and the L2, then positive transfer can apply. But if the structures are different, then negative transfer can apply. According to the *Speech Learning Model* (cf. Flege, 1995), sounds and structures which are similar to the L1 system but not the same are rather subject to negative transfer than structures which differ between L1 and L2. Another model which arose in the same year is the *Perceptual Assimilation Model* (cf. Best, 1995; Best and Tyler 2007). Their basic idea is that speakers who have no L2 knowledge will process new sounds and structures on a phonetic level but speakers with L2 knowledge will process them on a phonological level. This view has been influential

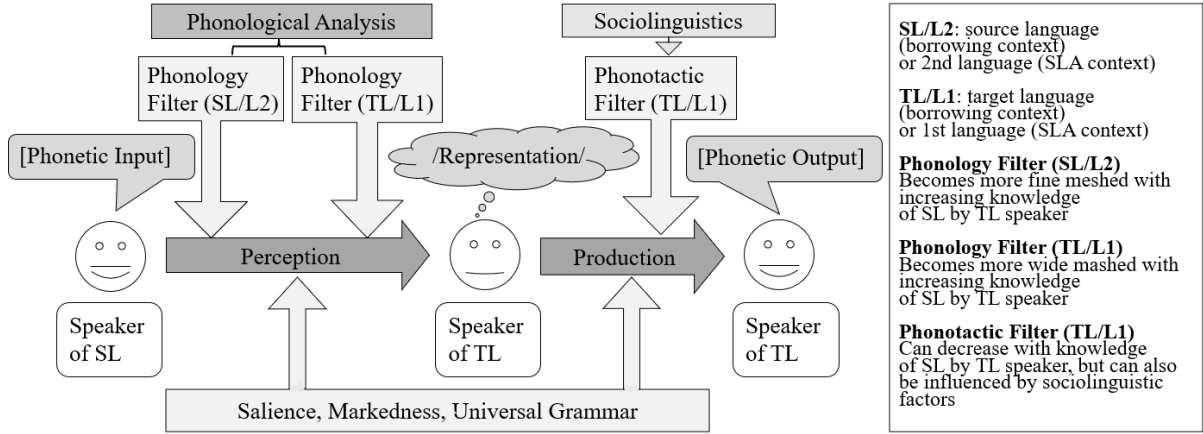
also on research of loanword adaptation as we will see in the next paragraph, and we rediscuss it for our own model.

The main questions which have been discussed in research on loanword adaptation are whether repair takes place in perception or production, which role phonology and which role phonetics plays, and finally, whether adapters are monolingual or bilinguals (see p.25). The dichotomy perception vs. production leads to the assumption that while some sounds and structures already pose problems in perception, others can be perceived but not produced. The role of phonetics vs. phonology is much discussed for perception: either speakers are sensitive to certain phonetic details, or they do not take them into account because according to their phonological system, they are no important information. Finally, it has an impact on which phonological systems speakers have access to if they are monolingual or bilingual. This way, the three questions are linked. Two models we have also summarized on p. 25 can be roughly distinguished and we recapitulate them quickly at this point. The first model is phonological, and assumes that the adapters are bilingual, i.e. capable of using the phonological systems of both source and target language to classify phonetic details of the source lexeme into phonemic categories (cf. Paradis & LaCharité, 1997 and 2005; Kang, Pham, & Storme, 2016). In contrast, the second model, proposed by various authors in various versions (cf. Peperkamp & Dupoux 2003; Broselow 2009; Yip 2006; Boersma & Hamman 2009 and Kenstowicz, 2010) is generally phonetic. Native phonology may play a role to various degrees, too, but as the second model is assumed to apply to contexts where the adapters are monolingual, the source language phonology does not intervene. Finally, it has been pointed out that both models are not contradictory and are more or less applicable depending on the degree of bilingualism and other factors: “Empirical research accumulated over the years, however, shows that adaptations of both types are amply attested.”(Kang, 2011, S. 2296).

As both models are not contradictory, we decided to combine their substantial ideas into one scheme. The scheme of our model presented in figure 18 is inspired by the scheme in Kenstowicz (2003), with the added advantage that it formalizes the basic ideas of both models in a comprehensive and general manner. It therefore includes the graduality between monolingualism and bilingualism, depending on different language contact situations (cf. Kang, Pham, & Storme, 2016, De Jong & Cho, 2012, C. Ito, 2014). Our model assumes two steps: perception and production. The idea of two steps is already mentioned in Silverman who calls them *perceptual* and *operational level* (cf. Silverman, 1992), and has not been rejected since. While previous models have been mainly developed to account for loanword phonology and to

borrowing contexts, we believe that this model can be applied also to other situations of language contact such as the experimentally studied situations in this work and to model foreign or second language accented speech.

Figure 18: general scheme of phonological borrowing processes in loanword adaptation and of second language acquisition patterns



What is called *phonetic input* refers to the utterance of the source lexeme in a loanword adaptation context and the stimulus in the experimental context. What is meant by *representation* or *lexical representation* is what speakers have in mind and is a result of perception and phonological analysis via potentially two *phonological filters*. The lexical representation can also be called the *underlying form*. The *phonetic output* refers to the utterance of the loanword or the spontaneous imitation response in the oral experiment condition. The writing condition in the experiment design and the writing from of loans can potentially mirror some features as stored at the level *representation* in the mental lexicon of speakers after the step of production. For reasons of simplicity, we have left out this step in our scheme of the model. In a loanword adaptation context, we must imagine these steps taking place multiple times with multiple speakers in multiple situations of lexeme reproduction until the form of a loanword is stabilized in a collective mental lexicon of a speaker community.

An adaptation resulting in repair patterns can take place either in perception, in production or both. In contrast to previous literature, we do not distinguish a phonological vs. a phonetic input: according to our model, the input is always phonetic, but the phonetic perception of the input can be filtered more or less through the phonology of the source language as well as through the phonology of the target language. This is also where we differ in our formalization of segmental and prosodic foreign and second language acquisition from the *Perceptual Assimilation Model* proposed in Best (1995) and Best and Tyler (2007). The extent to which the phonetic perception is filtered through which phonologic filter depends on how much

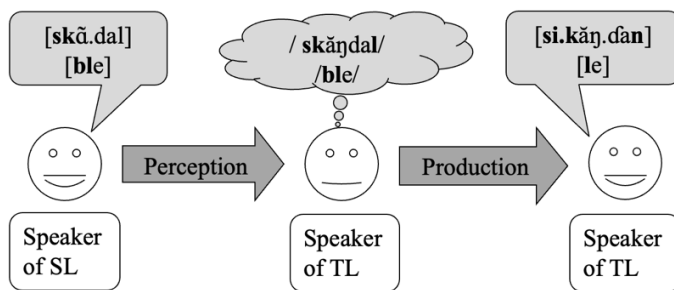
knowledge speakers have of the source language, or in the case of second language acquisition the L2: as more speakers have knowledge of the source language (or the L2), the source language filter becomes narrower meshed. Consequently, the more the *phonological filter* of the source language (or the L2) becomes narrow meshed, the *phonological filter* of the target language (the L1) becomes wide meshed. In this way, the power of the two phonological filters has an inversed proportional relationship. Even though the source language filter is active for speakers with no perfect bilingualism, the target language or L1 phonology filter is still active, and our idea is that it can directly affect perception. Therefore, a distinction must be clearly made between the influence of target language phonology in perception and in production. In production, the underlying form can be filtered through phonotactic restrictions of the target language or L1 grammar, called *phonotactic filter* in this scheme. This happens more with monolinguals, but also perfect bilinguals may choose to use this filter for sociolinguistic reasons and reasons of articulatory efficiency³⁰. In individual cases, a filtering through the target language or L1 filter in perception as well as the filtering through the phonotactic filter in production can lead to negative transfer. In the context of negative, but also positive transfer, we assume the *Speech Learning Model* of Flege (1995) to be applicable to our data and will come back to it at the appropriate point.

Finally, in both steps, perception and production, markedness (and, in generative studies linked to that the notion of universal grammar) and salience can play a role, together with other factors such as sociolinguistic ones (cf. Shinohara, 2004, 2006, Davis and Cho, 2006, Hsieh & Kenstowicz, 2008 among others). In second language acquisition as well as in borrowing contexts, it is possible that typologically unmarked structures emerge. Also, salient sounds and structures are possibly rather retained than lost. As to potential sociolinguistic factors, we have just mentioned one of them, linked to the question why and how strongly the material is filtered through the phonotactic filter in production. In the following, we come back to some examples for the loan and the experimental data and discuss their application to our model and their schematic representations. In these exemplary schemes, we apply our model to situations of language contact we have studied.

³⁰ For instance, we know a bilingual speaker of Vietnamese and German who always pronounces German speech material, be it borrowing or code switching, with Vietnamese accent when he talks in Vietnamese, although he has no Vietnamese accent when he speaks German. When we asked him why he does so, he replied that this smoothens the “flow of speech”, and that he does not want to waste his energy.

We start with five schematic representations with examples for the direction French → Vietnamese, representing both processes in loans and in the experimental data³¹. In the first scheme in figure 19, we see an example with segmental repair for the loan data: *xi cǎng đān* [si^{A1} kǎŋ^{A1} đān^{A1}] ‘scandal’ from French *scandale* [skãdal]. Directly below in the same scheme, the process for an example from the experimental data is represented: the response [le] by a monolingual speaker of Vietnamese, corresponding to the French stimulus *blé* [ble] ‘wheat’. In each schematic representation for which we have loan data and experimental data, we give two examples: for the direction French → Vietnamese, there is the loanword example above in the speech bubbles and below the example from experimental data.

Figure 19: Processes of segment and consonant cluster repair for the loan *xi cǎng đān* from French *scandale* and one experimental response corresponding to the French stimulus *blé*



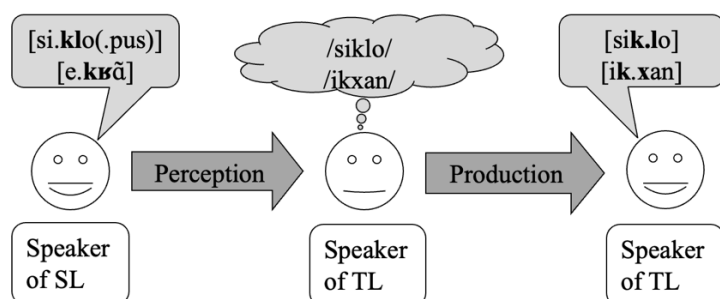
For the loan example, input segments are replaced in the output [si^{A1} kǎŋ^{A1} đān^{A1}]. The coda consonant [l] is replaced by the nasal [n]. The replacement of the coda consonant [l] by [n] occurs quite robustly in coda position: in the loan corpus, this is even systematic, and in the experimental data it is a very frequent pattern, especially for the monolingual group. While we do not exclude the possibility that [l] has been misperceived as [n], we rather believe that the repair takes place one step further in production, as the sound [l] exist in Vietnamese. Still, it only exists in onset but not in coda position. The Vietnamese phonotactic filter is therefore assumed to operate to produce a licit Vietnamese syllable coda.

With the help of both, the loan and the experimental example, we can also discuss consonant cluster repair: in the loan output [si^{A1} kǎŋ^{A1} đān^{A1}] from French *scandale*, we observe epenthesis with the epenthetic vowel [i] and in the experimental response [le] of the stimulus *blé* [ble] ‘wheat’, the first cluster consonant [b] is deleted. Let us first discuss the epenthetic vowel insertion in the loan example: even though in perception, illusory vowels could possibly emerge and therefore be already present in the underlying form before production, it is possible that a cluster can be perceived as such. In this case, the repair takes place in production as

³¹ When tone assignment is not in focus, we will not annotate it within the scheme so that readers can focus better on the relevant processes.

modelled here. While this loan example cannot give us evidence for which of the two views it true, the experimental data often gives us evidence that clusters can be perceived but not produced as such: the same speaker who produces [le] and therefore deletes one consonant of the cluster [bl] in the oral conditions, writes down a cluster in the writing condition. The speaker is not able to produce the cluster, only retains the second cluster consonant and deletes the first. Still, in the writing condition, the speaker writes down two cluster consonants. This is a hint that the speaker can perceive both consonants as a cluster sequence but is not able to produce it orally. Our experimental data therefore delivers us evidence for assuming that deletion, at least in this example, rather takes place due to articulatory difficulties in production rather than before in perception. Still, both possibilities may arise for different speakers and stimuli. Also, if speakers make use of epenthesis, this means that they can perceive both consonants, even though maybe not with certainty as a cluster sequence. As to the loan data, variability for some loans such as *kem* [kem] and *cà rem* [ka rem] from French *crème* [kʁɛm] ‘(ice-) cream’ shows that it is principally possible that borrowers have perceived both segments: otherwise, they would not have used epenthesis in *cà rem* [ka rem]. Considering again our experimental data, we have no evidence for assuming that all speakers can perceive all clusters. Still, as for all cluster stimuli there are instances of epenthesis or even clusters in at least one of the response conditions for some monolingual speakers, this means that even monolingual speakers of Vietnamese can principally perceive two consonants of all tested clusters. We therefore assume that there is a higher difficulty in production to imitate clusters faithfully to the stimulus than in perception. In what follows, we present three schemes for three types of syllabification: in figure 17, we consider syllable boundary shift, in figure 20 gemination and in figure 21 featural gemination.

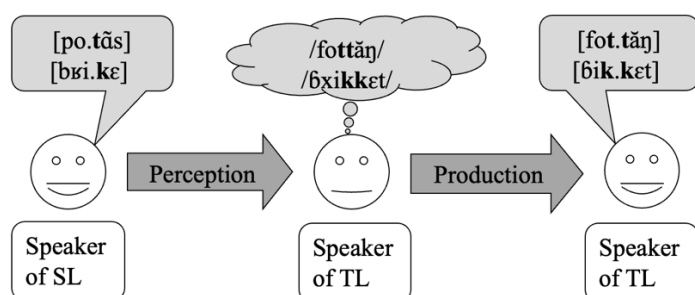
Figure 20: processes of syllable boundary shift for the loan *xích lô* from French *cyclo(pousse)* ‘pedicab’ and one experimental response corresponding to the French stimulus *écran* ‘screen’



According to what we have discussed in 7.4., the input material is organized into syllables, even though if the input is French, syllable boundaries may be less clearly articulated and more difficult to perceive, compared to Vietnamese. In the underlying form, segments are an

unsyllabified string of phonemes and in the following step of production, syllabification takes place again, but in these examples according to Vietnamese syllabification rules instead of French rules. Therefore, we cannot say that the syllable boundary shift takes place in perception or in production. It emerges as a consequence of a typical syllabification process, which in language contact can lead to differences between input and output: this can be observed for both the loan example from French *cyclopousse* above and the experimental stimulus *ecran*. Additionally, in the experimental examples, three segmental repairs take place: the consonant [ʁ] is replaced by [x], the oral vowel [e] by [i] and the nasal vowel [ã] is split into the oral vowel [a] and the nasal consonant [ŋ]. Although not in the focus of our study, let us shortly mention that nasal vowels are robustly repaired as a sequence of an oral vowel and a nasal consonant in the loan data and by monolingual speakers of Vietnamese³². For speakers with L2-knowledge of French, this pattern also emerges but not systematically. We expect all the above-mentioned repairs to take place already in perception, while the possibility that they arise only in production cannot be excluded neither. We now turn to gemination.

Figure 21: processes of gemination as observed in the loan *phôt tãng* from French *potence* ‘stem’ and one experimental response corresponding to the French stimulus *briquet* ‘lighter’

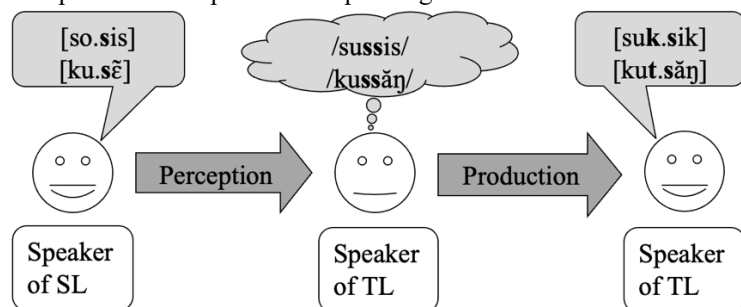


Gemination is a good example to show the momentum of phonology and phonological repair patterns as a striking language contact or interlanguage phenomenon. The following explanation is just one of several possible explanations: our conception of gemination is that the doubling of the consonant [t] in the loan example and the consonant [k] in the experimental response example takes place already in perception, possibly due to phonetic cues we have discussed in 7.3. We speculate that these phonetic cues may be the driving motor for perceiving French vowels as short. But short vowels cannot constitute a Vietnamese syllable, as a Vietnamese syllable requires a bimoraic minimum. The motivation for gemination could be the consequence to fulfil this requirement.

³² This repair is a quite universal tendency in language contact and has been reported for various language pairs in borrowings (cf. Paradis & Prunet, 2000).

In the following figure 22, we present processes of what we have called featural gemination.

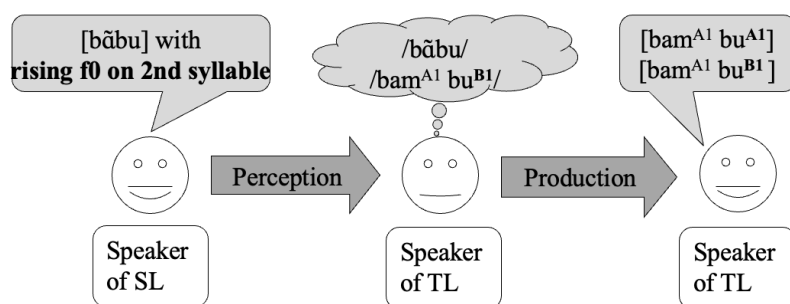
Figure 22: processes of featural gemination as observed in the loan *xúc-xích* from French *saucisse* ‘sausage’ and an experimental response corresponding to the French stimulus *coussin* ‘cushion’



Here, we expect the same process of gemination in perception as so far discussed, and the underlying form results in a geminated [s] in both, the loan, and the experimental process. Evidence for this can be found by considering the whole data of these cases and considering adaptation patterns of illicit coda consonants. The consonant which appears in the coda of the first syllable is always identical with the consonant by which the onset consonant of the following syllable would be repaired if it was a coda consonant. Therefore, we assume the onset consonant of the second syllable to be doubled. Due to phonotactic restrictions of Vietnamese, the first of the two consonants, which is syllabified in the output as a coda consonant of the first syllable, is then replaced by [k] or [t].

The problem with the representation of a model without assuming syllable boundaries in the underlying form will become even clearer for the last example. So far, we have not talked about how tone should be represented in our model. We will now consider tone assignment and this time focus on the experimental data only. We display in our schematic representation in figure 23 one exemplary response to the stimulus *bamboo* ‘bamboo’ by a monolingual speaker of Vietnamese and another response by a speaker of Vietnamese with L2-knowledge of French. We do so as substantial differences arise between the data of these two groups, while the loan data could be represented similarly to the data of the bilingual group: a rising f₀ movement in the stimulus is not stored in the Vietnamese speaker’s phonemic representation if he or she has L2 knowledge of French. Therefore, this rising movement is lost in the phonetic output. Still, it is stored as important phonemic information for monolingual speakers of Vietnamese and realized as the rising tone B1 in the output.

Figure 23: processes of tone assignment as observed in two experimental responses corresponding to the French stimulus *bambou* ‘bamboo’ with a rising f0 movement on the second syllable



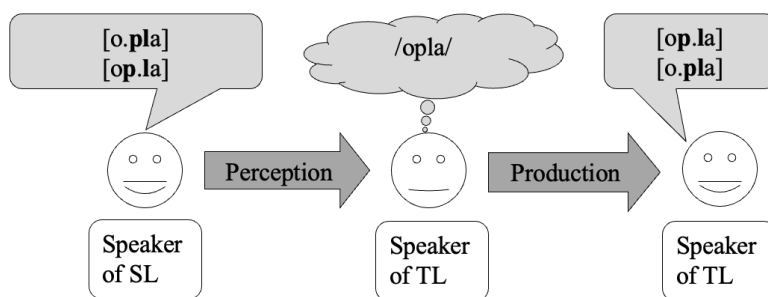
For loanwords, we assume that phonotactic tone restrictions of Vietnamese syllables have an influence on tone assignment, and we do not believe that specific f0 movements of the input has had an influence on the assignment of tones in loans. With a stabilization of a loan in the collective mental lexicon of a speaker community, we assume that tonal information for each syllable is also stored in the lexical representation. A reason for not assuming that tone assignment has taken place in perception in the case of loans, is that we imagine several inputs for one single output: one time this input can be realized with a rising f0 movement, another time with a falling, for instance. Apparently, speakers of Vietnamese, who borrowed these lexemes, were able to abstract away from these f0 movements. Otherwise, there would be more syllables with tone B1, for instance, as it is partly the case in the experimental data. In the experimental data, we have observed differences for the two groups in that the speakers with knowledge of French (represented by the example above in the speech bubble in figure 20) are oftentimes not faithful to the rising f0-movement, especially in the second oral condition, while the monolingual speakers are.

For the oral experimental conditions, it could be a topic of debate whether tones are assigned to the output or whether the rising f0-movement is phonetically imitated but not stored as a rising tone in the lexical representation. Let us assume that they are, which goes in line with our interpretation of the results. Speakers with French knowledge would then not store the f0 rise as a phonological relevant information in their first lexical representation, also not as tones, but when they embed the lexeme into a Vietnamese carrier sentence, they may still decide to assign Vietnamese tones especially in the carrier sentence condition, just to avoid interfering with a natural flow of speech in a Vietnamese sentence. This can then lead to another lexical representation where tone is stored. Although speakers in the instruction were not asked to borrow the lexeme or to treat it as if it was a Vietnamese lexeme in the carrier sentence condition but only in the writing condition, the embedding in a Vietnamese carrier sentence may have resulted in a similar reflex. The assigned tones would then be based on Vietnamese phonotactic

rules, which results in the level tone A1 in both syllables for this example. The assignment of tone A1 is done by default to all the syllables of the lexeme, a phonetic process which can stabilize phonologically in borrowing processes. In this aspect, L1 speakers of Vietnamese with L2 knowledge of French seem to act similarly to the speakers of Vietnamese who have borrowed French lexemes during the colonial period. To the contrary, monolingual speakers store f0 movements of the stimulus in the lexical representation as tones, in this example as A1 and B2. We find evidence for this assumption when we a look at the orthographic condition where speakers make extensively use of tone diacritics.

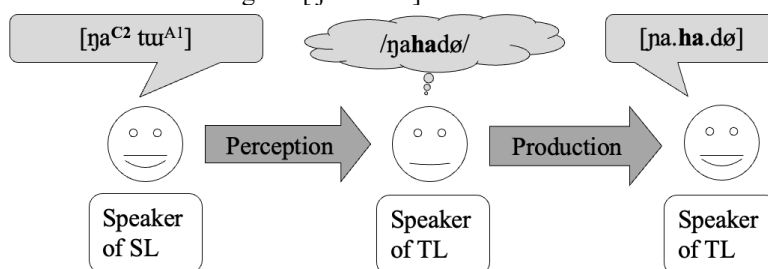
We continue with three schematic examples for the opposite direction of language contact Vietnamese → French. We will concentrate on the two aspects of syllabification and tone in figure 21 and 22, but also treat segmental aspects in figure 24.

Figure 24: *ôp la* [op^{D1} la^{A1}], a French loan from derived from French (*œuf*) *au plat* [o.pla] ‘fried egg’, serving now experimentally as a stimulus for an imitation by speakers of French



In the speech bubbles above, we can see in comparison the loan syllabification process for the direction French → Vietnamese, and below we see the Vietnamese loan lexeme as a stimulus for the other direction of language contact. A repair of illicit syllable structures takes place in both directions of language contact. Tonal material of the Vietnamese input gets lost in the output produced by a speaker of French. This is different in the following example in figure 25, where tonal material is transferred to segmental material.

Figure 25: processes of tone assignment as observed in an experimental response [naha.dø] corresponding to the Vietnamese stimulus *ngã tư* [ŋa^{C2} tu^{A1}] ‘cross roads’



But before we can explain how tonal material is transferred to segmental material, we need to explain segmental repairs. As to the stimulus consonant [ŋ], we expect the problem to arise

rather in production and not in perception as this sound is a French licit consonant at least in loans from English. But this sound is never possible in coda position in French. This is in parallel to what happens to the French coda consonant [l] which becomes [n] in the response by a speaker of Vietnamese, as [l] is also a licit sound in Vietnamese but not in coda position. For the segment [t], we expect it to be mapped onto French [d] in perception due to phonetic details, but a problem should not arise in production as [t] is known in French. As for the sound [u] and its replacement by [ø], the problem could arise both in perception or in production, as speakers of French are unfamiliar with the sound [u] and may therefore have problems to perceive it but also to produce it correctly. Still, as vowel replacement patterns do not stand in the focus of this work, we only mention it here to be complete for this example. Having explained segmental repair patterns, we can now turn to the tonal features of tone C2 which are not preserved as tones. Still, they are not totally lost and repaired by the insertion of the syllable [ha] in this case: the [h] replaces the break and the glottalization in the middle of the tone in perception and the syllable [ha] added in production consequently.

So far, we have gone through our general hypotheses and provided a concise picture of different processes in different language contact settings for the language pair Vietnamese French, explained with examples and a schematic representation of our model. Let us continue with a more detailed comparative look at our results from different datasets.

7.3. Detailed discussion of our results

In this section, we discuss segmental and prosodic structures we focus on in the loanword and the experimental studies. At first, we have a look at deletion and replacement patterns of single consonants. We then turn to consonant clusters and examine in detail which repair patterns can be observed here. The most common strategy is the deletion of one of the two consonants, while epenthesis is less common. The study of consonant clusters draws our attention to another phenomenon, a special phenomenon of syllabification. This phenomenon reveals differences in syllable structure between the French source lexeme and the loanword in Vietnamese. In addition to syllable augmentation, e.g., by epenthesis, we find that syllable boundaries in certain contexts are sometimes different in the loanword or the imitation from the source lexeme or stimulus. Second, we can identify a process in which a consonant is geminated in certain syllable structure contexts, or at least the consonant slot is doubled. In some cases, we call this featural gemination, namely, when some features of the consonant are doubled but others are lost due to phonotactic restrictions of Vietnamese. In this chapter, we will discuss possible motivations of these specific syllabification processes, especially since gemination is not a

native phonological process of Vietnamese. Finally, we turn to tone assignment patterns of French lexemes into Vietnamese and how speakers of French deal with tonal Vietnamese input.

This section is organized as follows: we treat all the just mentioned points in the same order in which they are presented in the result chapters: segmental aspects (single consonants), consonant clusters, syllabification, and tonal aspects. For all these topics we come back to our main research questions by discussing which insights we can gain into native patterns by examining language contact situations, what we can learn about universal mechanisms in language contact situations and finally which contributions we are able to deliver to ongoing discussions on borrowing and second language acquisition. For each aspect under investigation, we compare the experimental to the loan data and the two directions of language contact.

7.3.1 Segmental aspects: single consonants

We start by comparing the results of the data from our three studies: the loan study and the two experimental studies. First, we discuss the parallels and the structural patterns which emerge in the results of all three studies: no matter if the language contact situation is a borrowing context or if we look at data gained from experimental imitation, no matter if the direction is French → Vietnamese or Vietnamese → French: the pattern which emerges in all the data is that consonants which are not known to speakers by their native language are mostly repaired by similar ones in terms of featural distance, with which speakers are familiar with. For the loan dataset, there are only two exceptions: the onset consonant [p] and the onset consonant [r]. The latter exists in some native Vietnamese varieties but not in the examined one. Not all, but some speakers make use of the two sounds [p] and [r], especially when they are aware of the loan status of the lexeme where these sounds appear. For the monolingual experimental data, speakers mostly substitute sounds they are not familiar with by Vietnamese sounds. Still, some speakers produce sounds which exist neither in French nor in Vietnamese. This can be seen as an interlanguage phenomenon. Another possibility is that speakers produce sounds which are quite close to the French stimulus sound. The latter case increases in number if speakers have L2 knowledge of the respective language which we can examine for the direction French → Vietnamese: as these speakers are also familiar with non-native sounds, they can produce them and do so. Still, some consonants seem to be more difficult for speakers to produce than others. Interestingly, when these speakers are asked to write lexemes down according to Vietnamese orthography, they mostly decide to replace non-native sounds by native ones even if they can produce them orally, and they adapt sounds and structures to Vietnamese phonologically as well.

For the speakers of French, sounds which do not exist in French but in English are less difficult than sounds which exist neither in French nor English. This can be explained by the fact that we were not able to find monolingual speakers of French without any L2 knowledge of English. For the other sounds, speakers of French seem to have difficulties in reproducing sounds of Vietnamese just as speakers of Vietnamese have with sounds of French: sounds which they are not familiar with are to a high degree not reproduced faithfully to the stimulus and repaired. This is interesting as speakers of French living in Paris are probably at least passively exposed and have a greater chance to be familiar with sounds of various foreign languages, including Vietnamese, than the monolingual speakers of Vietnamese living in Thái Nguyên. At this point, we want to bring in an observation of the data we gathered in Ho-Chi-Minh-City. We did not include this data in our quantitative study, as it is too heterogenous and as most participants have at least some knowledge of English, but this data would be the most similar compared to the French speaker group, as both have some basic knowledge of English. This knowledge seems to have a great influence on the production of French consonants (and likewise consonant clusters) for the speakers of Vietnamese, as many of them exist also in English. Especially the ratio of non-deletion of coda consonants which are illicit in Vietnamese is much higher in this dataset compared to the monolingual Vietnamese dataset. Noteworthy is the following observation: speakers make extensively use of the coda consonant [s] instead of other consonants, even if these other consonants are licit in Vietnamese codas. This may be a hypercorrection feature: speakers who have succeeded to learn how to produce the coda consonant [s] may use it for this reason even when it is not present in the stimulus. For other consonants, we can observe positive transfer from the L2 English. Speakers of French, instead, might make less use of their English knowledge and less positive transfer is possible as English and Vietnamese have less consonantal overlap than French and English. Only the non-native sounds [h] and [t̪e] seem to be producible by speakers of French, probably because of positive transfer from English sounds which are similar or identical. Comparing the production of the two sounds, the fricative [h] seems still more difficult to speakers of French, and especially in the embedding condition, it is oftentimes omitted.

Comparing the two directions of language contact, it is also interesting that for some replacement patterns, we can observe the same process into both directions: a French consonant X which does not exist in Vietnamese is replaced by the Vietnamese sound Y. The other way round, the Vietnamese consonant Y is replaced by speakers of French by the consonant X. For instance, the French coda [ʁ] is often replaced by Vietnamese [k]. Even though [k] is a possible French coda consonant as well, some speakers of French replace it by [ʁ] instead of choosing a

direct mapping. This way, the same process can be observed in two directions of language contact. Still, this pattern cannot always be found. In other instances, a French consonant X is replaced by speakers of Vietnamese by the Vietnamese consonant Y, but the Vietnamese consonant Y in turn is replaced by a French consonant Z. We give an example with the French [ʁ] again, but this time as an onset consonant. It is replaced in the loan data and by speakers of Vietnamese mostly as [h], [x] or [ɣ]. Still, none of these sounds unknown in French are mapped onto the French consonant [ʁ], although it is close in terms of featural distance.

A final picture with a mixed pattern can be observed for French onset [g], which is very frequently mapped onto [ɣ] in the loan and experimental data by speakers of Vietnamese. For the Vietnamese onset [ɣ] in turn, it is just sometimes mapped onto French [g], but to a higher frequency to French [k]. This happens even though in the latter substitution, an additional stimulus feature is lost, namely the feature [voiced]. An explanation for the replacement by plosives could be of perceptive nature, for instance, that speakers of French do not perceive the fricative feature of the Vietnamese consonant [ɣ] and therefore repair it by the plosive [k] or [g]. Still, we find it astonishing that none of the Vietnamese fricatives which are illicit in French is repaired by the French fricative [ʁ], which is only one feature away from [ɣ] and not far away from [h] or [x] neither. A general explanation for why the mapping can differ between the two directions of language contact could be that native speakers of one language are sensitive to other phonetic details that speakers of another language (see sections 5.2.1. and 6.2.1.).

As to differences between the loan data and the experimental data for the direction French → Vietnamese we state that some of them could simply be explained by differences like the amount of data and a very different language contact situation. We can observe more variability for the experimental data than for the loan data, but on the one hand, the loan data is quite limited, and a low degree of variability could be explained alone by this fact, and on the other hand, the borrowing context is very different from the experimental context in that the first is a diachronic process which may have taken place over decades and the second a synchronic experiment design.

A peculiarity of the experimental data French → Vietnamese, especially the monolingual speaker data, is that not only the replacement patterns show more variability but also the general repair strategies. While in the loans, illicit onset consonants are always replaced and in codas replaced or deleted, there are more strategies available in the experimental data. Especially the strategy of epenthesis plays a role in the experimental data not only for consonant clusters but also as a repair strategy of single consonants. This way, a consonant which is illicit in coda

position becomes an onset consonant by the insertion of an epenthetic vowel and can therefore be produced, as it is licit in onset position. The illicit [l] in French *saule* [sol] ‘willow’ is not always replaced by the licit coda [n] but can also survive in onset position in the response [so lɿ]. Another response pattern which emerges, for instance in [son lɿ], has been classified as an ambiguous repair pattern. This is because both strategies are present, the replacement by [n] and additionally the preservation of [l] by adding an epenthetic vowel. As we have now gained knowledge about syllabification patterns in our data, we can regroup this ambiguous pattern as an emergence of a syllabification process, namely featural gemination: not only is there an epenthetic vowel added, but also a consonant slot. While the base retains all features of the stimulus and becomes an onset consonant, the double is now the new coda consonant, loses the lateral feature and becomes a nasal. We speak of featural gemination because not only the consonant slot, but also the feature [alveolar] is doubled. This issue will be deepened in 7.3.

We now turn to a peculiarity of the experimental data for the direction Vietnamese → French: although the coda consonants [p k t] exist in both languages French and Vietnamese, speakers of French seem to have difficulties in perception. Our assumption that the problem arises in perception but not in production is because speakers of French should generally be able to produce these coda consonants. The loss of information in perception may be due to phonetic differences: while French coda plosives are released, the Vietnamese counterparts are mostly not. Probably, the unreleased feature is responsible for the problem in perception. If speakers of French are able to perceive the closure at all, they have difficulties in perceiving the right place of articulation. A French experiment participant without any linguistic background describes this phenomenon with the following words “Il est difficile de reconnaître les consonnes à la première écoute. Par exemple le k et le t semblent se confondre [It is difficult to recognise consonants at first listening. For example, the k³³ and the t seem to get mixed up]”. Asymmetries can be observed for the three consonants: while [p] is preserved most frequently and rather deleted than replaced, [t] is most frequently replaced by [k] but not vice versa. This asymmetry is quite interesting, especially, as it is in parallel to sound changes in southern Vietnamese varieties: there too, the coda [t] is replaced by a [k], even systematically, but the [k] is never replaced by [t]. This parallel may be a hint to universal tendencies, and we could continue focussing this issue with more data in the future and deepen it by providing a detailed view on universal tendencies of saliency. After having mentioned the degree of variability as a

³³ We do not use phonetic, phonemic or graphemic brackets as the speaker also does not: he has no linguistic background knowledge.

difference between loan and experimental data and described a peculiarity of the experimental data, we now turn quickly to similarities.

A high degree of similarities between the two datasets, especially concerning replacement patterns, gives us some evidence for assuming that there must be some similarities between the processes of borrowing and spontaneous imitation. Comparing the experimental data of monolingual speakers of Vietnamese vs. speakers of Vietnamese with L2-knowledge of French to the loan data, it appears that the loan data falls somewhere in between the two but seems closer to the data of speakers with L2-knowledge of French, also in terms of variability. Our results that the proficiency of a second languages decreases the variability and increases the consistency of the results goes in line with what has been claimed in Bundgaard-Nielsen et al. (2011): in their study with a different focus, namely on the vowel perception of second language's learners, they found that higher proficient speakers in terms of vocabulary perform more consistently and less variably than speakers with a lower proficiency. We will have a look in a moment if this is also the case for consonant clusters, syllabification, and tonal aspects. Generally, it makes sense to assume that borrowers, even if they have had only little or no knowledge of French, perform closer to the French source lexeme than the monolingual speakers who participate in the experiment. This is because the experiment is designed in a way that speakers hear each lexeme only once. And this seems rather unlikely in the colonial borrowing context. Again, due to the very different language contact situations, we should be cautious about the similarities when we compare the loan data to the experimental datasets.

A concluding side note on the discussion about monolingualism vs. a certain degree of bilingualism (referred to as imperfect language learners in Kang et al., 2016) is our observation of the performance of Vietnamese participants with a very low degree of French, English or even Russian. All of them perform much closer to the stimuli than the real monolinguals, even if they had learned the foreign language very shortly and a long time ago. This observation brings us to the conclusion that a very low degree of imperfect language learning already makes a strong difference in the production of foreign language segments, compared to monolinguals. For L1 speakers of French in turn, it seems that their knowledge of English, Spanish or Russian could not help them equally in pronouncing segments close to the Vietnamese stimulus. Therefore, it seems that knowledge of a second language which is very different from the language of investigation in terms of segmental inventory leads to less positive transfer than a language which is closer. We now turn to the discussion of consonant clusters.

7.3.2. Consonant clusters

In the literature on loanwords, consonant clusters which exist in the source language but not in the recipient language can be repaired by two strategies: deletion or epenthesis. Epenthesis is typologically the more frequent strategy of the two (see p. 83). In our investigation of French loanwords into Vietnamese, it turns out that epenthesis plays only a subordinate role, and that deletion is the more frequent strategy (82% of deletion vs. 18% epenthesis). Herein, we only count the data for which we can unambiguously identify a cluster repair strategy as the driving process. Still, not all the source lexeme clusters are repaired by epenthesis or deletion. We discuss the remaining instances in 7.3.3. These special syllabification patterns are also observed in the experimental data, even in larger proportions, but as we do expect other processes than cluster repair behind these results, we continue under this section by concentrating on the remaining categories.

In the experimental data as well, we can only discuss the direction French → Vietnamese for this aspect, as consonant clusters do not exist in Vietnamese and therefore could not be integrated into the stimulus data for the reversed direction of language contact. For the response data belonging to the French cluster stimuli, the proportions between epenthesis and deletion are more balanced than in the loan data with 29% of deletion and 25% of epenthesis. While epenthesis is never chosen in coda clusters in the loan data, it is chosen in both onsets and codas in the experimental data. This way, the experimental data shares more similarities with the general typological picture in borrowing processes than the loan data, with the restriction that deletion is still more frequent than epenthesis.

If we compare the proportions of our results to proportions for this language pair in a second language contact situation in previous studies, we can see that in these studies as well, deletion is a more frequent pattern than epenthesis, in both onset and coda position (cf. Trần, 2011; Sato, 1984). The first cited author explains this result with the fact that the insertion of epenthetic vowels would lead to more open syllables. But because open syllables are less frequent than closed syllables in Vietnamese, speakers might prefer to choose deletion to not increase the number of open syllables (cf. Trần, 2011). We will discuss related issues in 7.3.3., where specific syllabification patterns deliver more evidence for her assumption that speakers of Vietnamese tend to prefer closed syllables over open ones.

Until now, we have mentioned only deletion and epenthesis. But what happens to the other remaining 46% of the experimental cluster data? Other strategies are chosen, which have not been attested in any loan data, but which also do not fit in what we describe in 7.3.1.

Additionally, they have not been found for Vietnamese L1 speakers with L2 knowledge in previous research. Still, the emergence of these other strategies shares partly similarities to patterns observed in first and second language acquisition in other contexts, as described by Kehoe et al. (2008). The strategy is called *coalescence*, which means that some features of both consonants merge to a third consonant which replaces the cluster. Coalescence makes up 12% of the response data, an example is *stuc* [sty^hk] ‘stucco’, and a response is [t^hewik] with the Vietnamese affricate [t^hɛ] instead of the French cluster [st]. The affricate preserves fricative and plosive features in one single phoneme. This way, we can attest parallels to both borrowing contexts and studies on language acquisition. It is important to keep in mind that also in previous literature, an overlap between both is attested (cf. Hansen Edwards & Zampini 2008), which is why it is not astonishing to observe the typical strategies of deletion and epenthesis in contexts of foreign second language acquisition and in our experimental data which can be situated in this context.

Finally, there is quite a high number of ambiguous response data (17%) and some less frequent strategies, such as the vowel replacement of one of the two cluster consonants. For the ambiguous data, we are not able to identify with certainty one of the just mentioned strategies. An example is the stimulus *crabe* [kʁab] ‘crab’. As adaptations of the cluster [kʁ], we find the single consonant [x], [k^h] or even [k^hx]. A possible analysis is that these sounds are phonologically mapped onto one category /x/ in Vietnamese because we assume a free allophonic variation in Vietnamese (cf. p.37), so that the onsets in the two exemplary responses [xan] and [k^hăm] are represented by the phoneme /x/. One could argue for coalescence, claiming that in the first result, the velar place feature of the [k] survives and the fricative feature of the [ʁ]. Or, in the second result, that the fricative feature is preserved in the aspiration. Still, remembering the replacement patterns for single consonant replacement, [x] is also a replacement strategy for the single consonant [ʁ]. We could also interpret the result as an instance of deletion of the first consonant [k] and a replacement of the second consonant [ʁ] by [x]. Therefore, these instances are grouped among the category ambiguous.

A different case of ambiguity can be illustrated exemplarily with the stimulus *algue* [alg] ‘algua’. One response is [a kiw], another [a lu]. On the one hand, one could classify the process as a case of deletion: in the example [a kiw], the first consonant [l] is deleted, the second one replaced by a [k] according to common replacement strategies of single consonants (see section 5.2.1.). In the second example [a lu] it would, following this interpretation, be the other way round: the first consonant [l] is maintained and the second consonant [g] deleted. Another

interpretation could be that this same second consonant is replaced by the vowel [u]. A third possibility could then be that we deal with epenthesis, but this strategy does not need to be a repair strategy of clusters but could also be due to the released feature of the French coda consonant [g], as such epenthesis occurs quite robustly. In an experimental study on the perceptual origin on loanword adaptation in Japanese (Peperkamp et al., 2008), researchers show that the release in French nasal codas is perceived as a vowel by speakers of Japanese, and Kwon (2017)'s study finds out that speakers of Korean frequently map a release after an English plosive coda consonant to a vowel in perception as well. According to our data, is it possible to assume that similar perceptive patterns with a coda release can lead to the described production patterns by speakers of Vietnamese. Overall, the picture is much more diverse and complex than expected, especially in the experimental data. The ambiguous data in the repair of single consonants and now of consonant cluster shows us that there are results which cannot be classified into one category but are rather situated between categories.

Having mentioned again the repair of single consonants in this context, the discrepancy between the experimental and the loan data is unexpected. Single consonant repair and consonant cluster repair share categorical similarities, which do not emerge for the loan data: not only deletion but also epenthesis emerges in the experimental data for single consonants and consonant clusters. Still, replacement patterns by vowels and consonants arise in both the loan and the experimental data. Vowel replacement is a repair observed for loan and experimental data for consonants and clusters, but not very frequently. Consonant replacement is a pattern which arises more frequently. But differently to Trần (2011), we identify this process as an adaptation process of single consonants, but not of consonant clusters: if one of the cluster consonants is replaced by another consonant or even both are replaced, the structure remains a cluster. If we have understood the patterns of replacement of single consonants, we can observe the same replacement patterns in consonant clusters as well, but they happen independently from cluster repair.

For instance, in the loan data, we have the French source lexeme *talc* [talk] 'talc' with its corresponding loan *tan* [tan^{A1}] in Vietnamese. If we did not know that the single coda consonant [l] is regularly replaced by [n], for instance in *caramen* [ca^{A1} ra^{A1} men^{A1}] 'caramel' from French *caramel* [kaʁamɛl], we would not be able to understand the pattern in *tan* [tan^{A1}]: here as well, the consonant [l] is replaced by [n]. But if only replacement of illicit consonants applied, we would still have a cluster, namely [nk]. Therefore, the cluster repair strategy is the deletion of the consonant [k], and the replacement of the consonant [l] by [n] takes place in addition to

cluster repair. A corresponding example from our experimental data is the French stimulus consonant cluster in *perle* [pɛʁl] ‘pearl’ and the response [pɛn] by a monolingual speaker of Vietnamese. The single coda consonant [l] is frequently replaced by [n] in the experimental data as well, for instance in the stimulus *ciel* [sjɛl] ‘sky’ and a response [sɛn]. For this reason, we do not list consonant replacement as a consonant cluster repair strategy although it appears frequently in this data. Patterns for both processes, replacement and consonant cluster therefore overlap but do not conflict each other: they happen independently and do not influence each other.

Let us continue with the remaining similarity between consonant and consonant cluster repair. In both we have instances in which a cluster emerges in the response: in the repair of single consonants, we call this strategy fission. As it emerges quite seldom and only for experimental data, we do not discuss it further, but just recall one example: the French stimulus *griffe* [gʁif] ‘claw’ is reproduced by some monolingual speakers of French as [ripf]. For stimulus clusters, we find clusters in the response more often, namely in 11% of the experimental data, while in loans, this is hardly ever the case. A cluster is reproduced mainly in the responses of the speakers with second language knowledge of French. Still, also some monolinguals are successful in producing clusters even though they may not be faithful to the features of the two cluster segments.

An interesting observation concerning the speakers of Vietnamese with L2-knowledge of French is that although they mostly produce the clusters in the two oral conditions, they decide to make use of epenthesis when they are asked to write down the lexeme according to Vietnamese orthography. This way, they ‘vietnamize’ the lexeme according to Vietnamese phonotactic requirements. An example can be given by the stimulus *briquet* ‘lighter’ [bʁike]. The two oral repetitions are [bʁike], and no adaptation to the Vietnamese phonological system takes place. Only in the writing condition, the speaker decides for <bờ ri ke>, which can be converted to IPA as [bɤ^{A2} ri^{A1} ke^{A1}]. In contrast to monolingual speakers of Vietnamese, this speaker group decides systematically for a syllable augmentation by epenthesis in the written condition to be faithful to single segments of French. Two explanations are possible: either their knowledge of French has influenced them the rank the constraint lower to have optimally one or two syllables in a Vietnamese lexeme. Or they are able to better perceive and memorize each single segment than monolingual speakers of Vietnamese.

As we can control for monolingualism vs. L2-knowledge of French in the Vietnamese speaker groups, we are able to gain insights into differences between the two groups. Again, patterns

observed in the loan data can be situated somewhere between the results of the two experimental speaker group data. While speakers with French knowledge produce clusters but use epenthesis extensively when they Vietnamize the imitated stimuli in the writing condition, monolingual speakers use deletion more frequently in all three conditions, for instance one oral response [fɛk] by a speaker corresponding to the French stimulus *flaque* [flak] ‘puddle’. This implies that in contrast to single segments, the data of monolingual speakers is closer to the loan data for consonant clusters. On the other hand, patterns emerge in the experimental, and especially in the monolingual data, which are not attested at all in the loan data and patterns are much more complex. We can find similarities to patterns observed in first or second language acquisition such as coalescence, which to our knowledge do not surface neither in any previously studied loan or borrowing context nor in our studied loanword data.

If speakers make use of epenthesis, they decide most of the time for the sound [ɤ], a tendency which has been observed for the loan data and is even stronger in the experimental data with 66%. This is a similar frequency compared to the results in Trần (2011), where a “vocoïde de type schwa” is inserted between the consonants in 62,5 of the epenthetic data. Still, according to our data, we would not tend to interpret the epenthetic sound as a schwa sound but rather as the Vietnamese full vowel [ɤ] in most of the cases. A strong difference between her data and ours is that the vowel [o] has been used quite frequently in onset position in hers, while we could not observe a similar pattern in our data. Vowels other than [ɤ] occur quite marginally in the experimental data, but for both the experimental and the loan data, we can explain some patterns with vowel harmony (see p.82, 181) and go in this aspect in line with Trần (2011).

Finally, we want to discuss some detailed results for deletion patterns as the dependent variable and consonant cluster material and position as the independent variable in loanwords and in the experimental data. With a total amount of 66 items, it is the second consonant in loanwords which deletes in 77% vs. the first in 23% of the data³⁴. In the experimental data instead, the frequency of the deletion of the first vs. the second consonant is more balanced and what we have seen for loans remains a slight tendency: in 40%, it is the first consonant which deleted and in 52%, the second, with a total amount of 960 items. For the remaining 8%, either both are deleted, or it is unclear which consonant is deleted. If we compare our experimental results to the results in Trần (2011), the expected tendency is similar but a bit stronger than in our data:

³⁴ Positional effects have been discussed in Jun (2011), among others, for languages where it is C2 and not C1, which is more dominant. Still, this is only claimed for intervocalic position.

in 58,15%, the first consonant of a cluster is deleted while the second one is deleted in 39,57% of the cases, and in only 2,28 %, both consonants are deleted.

For each cluster group, onsets vs. codas, we have additionally looked at the segmental material of the cluster consonants. For onset clusters, we have focussed on two groups, namely C+ [ʁ] vs. C + [l], for which we are able to find categorical differences. If the second consonant is [ʁ], it is systematically deleted, but if it is [l], it is preserved. A possible interpretation could be that the lateral is better perceived by speakers of Vietnamese in this cluster combination, and one could also argue assuming a higher perceptual saliency of the lateral than the fricative in this context. Still, when looking at the experimental data, this categorical pattern is again only a slight tendency with 56 vs. 52% of deletion of the second consonant [ʁ] vs. [l]. Overall, it does therefore not make sense to argue in terms of perceptual saliency for the whole data³⁵.

For coda clusters in loans, it is mostly the second cluster consonant which deletes. With a total number of 32 occurrences, we only count three exceptions for which this is not the case, and in two of them, the second consonant is the nasal [m]. Still, arguing with saliency can be problematic: first, this dataset is very small, and second, the first consonant in these two exceptions is either [ʁ] or [l], and we have no argument for assuming that the nasal [m] should be more salient than the lateral [l] for instance. Patterns for coda cluster deletion do not deliver evidence for the possibility that in clusters with [m] as the second consonant, it is rather the first which deletes. Therefore, the relatively small dataset of loans is promising in that it is quite stable for patterns of deletion, but this can also be due to a relatively small dataset. As to the experimental data, a higher variability can be found and stable patterns are neither visible and nor similar to the patterns in loans: if at all, we can only observe slight tendencies. Again, the variability is very high especially for the monolingual speakers and speakers with second language knowledge are in comparison more consistent.

As a conclusion of the discussion on consonant clusters, we want to compare our overall results to the general lines in Trần (2011). While the majority of speakers in our data are monolinguals, the participants of her studies are all learners of French. Still, consonant clusters pose a big problem for them: from a total of 3840 clusters, 66,7 % are not correctly pronounced (cf. Trần, 2011). Our experimental data consists mainly of monolingual speakers of Vietnamese who reproduce French stimuli, and therefore can be seen as the very first step in the acquisition of a foreign language. The number of repetitions faithful to the stimulus clusters in the monolingual

³⁵ cf. Côté, 1997, for a discussion of phonetic saliency and consonant cluster simplification in French varieties, where patterns do not correspond to our data and overall seem more systematic.

data is much lower than in Trần (2011) and in the second language learner's data a bit higher. Therefore, it completes the picture of different difficulties at different stages of second language acquisition. Trần (2011) has also tested the assumption of Greenberg (1978) in her thesis, according to which second language learners have more difficulties in acquiring coda clusters than onset clusters. She has found that this can only partly be confirmed for her data, and that the variable of cluster material seems to play a role therein. According to our data, Greenberg (1978)'s assumption can be confirmed only as a very slight tendency: in onsets, 12% of the clusters are reproduced as clusters and in codas 7%. Let us at this point conclude the section on consonant clusters and continue with the aspect of syllabification, under which certain patterns of stimulus consonant clusters which do not surface in the response will again be discussed under another perspective.

7.3.3. Special patterns of syllabification

Syllabification in its general meaning refers to the process in which segmental material is organized into syllabic units. Therefore, syllabification in its common sense is something which applies to all the data of our studies. When talking about special patterns of syllabification, we refer to a subset of syllabification patterns where syllable structure differs between source lexeme and loanword in the loan data or stimulus and response in the experimental data.

There are overlaps between single consonant and consonant cluster repair on the one hand and on the other hand cases where syllabification differs between the source lexeme /stimulus and the loan/response. Finally, we will have a detailed look at these cases. In this context, we compare results in loans and experimental studies but also for the two directions of language contact. By doing so, we discuss possible explanations for the emergence of the syllabification patterns under investigation, bring in again the discussion about perception and production and formulate theoretical implications for the studied languages and universal tendencies in language contact.

We now move on by recapitulating different types of syllabification processes which result in differing structures in the source lexeme vs. the loan in a borrowing context and in the stimulus vs. the response in the experimental context. For both language contact contexts, we can identify three general categories: syllable augmentation, syllable boundary shift and consonant slot doubling including gemination and featural gemination processes. As a recapitulation, we give an example for each of the processes, one for loanword adaptations and another for the experimental data. If in the experimental data, cases emerge in both directions of language contact, we give a third example.

Syllable augmentation

Syllable augmentation mainly occurs in the language contact direction French → Vietnamese. In syllable augmentation, a syllable is added, for instance, by the insertion of an epenthetic vowel. Epenthesis has been identified as a cluster repair strategy, or a strategy to be faithful to illicit coda consonants by adding a vowel so that these consonants become onsets. Still, epenthesis can also emerge in other contexts, and then, it cannot be a strategy to remain faithful to coda consonant features or to repair clusters. This happens only in the experimental data. Not only vowels can be added but also complete syllables. We provide the stimulus examples *ail* [aj] ‘garlic’ for which one response is [aj.si] and *alg* [alg] for which one response is [aj.ɣiw.si]. The additional syllable [si] in both examples cannot be explained by the beforementioned strategies.

Other instances of syllable augmentation are potentially cases in which a consonant is adapted as a vowel, which consequently can become a nucleus of an additional syllable. In loanwords, we have found some ambiguous cases (19 in total) for which this could be the case: examples for the French source lexemes are *iod* [jod] ‘iodine’ or *piano* [pja.no] ‘piano’. In both cases, the glide [j] is an onset consonant, in the first example as a single segment and in the second it is part of a consonant cluster. In both cases as well, the glide is replaced by the full vowel [i]. This results in the syllable structure *i-ót* [ʔi.ot] or *piano* [pi.a.no]³⁶ in the Vietnamese loan. Still, as we cannot perceive a glottalization at the onset of the syllable which follows the [i] in realizations of these lexemes by speakers of Vietnamese, we are not sure if these are real instances of syllable augmentation or if we should rather assume syllable-internal diphthongs and transcribe the lexemes as follows [ʔiot], [pia.no]. While [ia] is a licit diphthong in native Vietnamese, [io] is not, and we therefore leave these cases in their ambiguous status.

This issue would also be an opportunity to question if an obligatory onset should be assumed for Vietnamese and to consider whether a glottal stop, be it phonetic or phonological, is indeed always obligatory in Vietnamese at the beginning of an otherwise bare syllable. Or whether this possibly hard constraint in native speech becomes a soft constraint for loanwords and in language contact situations. However, since our results do not deliver enough evidence to support this possibility, let us close the discussion at this point.

³⁶ We do not use tone diacritica when talking about syllabification issues to better concentrate on the segmental material at syllable boundaries.

In the experimental data for the same direction of language contact, we count even less items of this pattern, namely 10 in total. All these items have either the stimulus *ciel* or *pjaf* and the responses are all attested for the writing condition and the speakers of Vietnamese with L2-knowledge of French. An example is the stimulus *ciel* [sjɛl], which is written down as <ci en>, which would result in [si.ɛn] in the IPA. As this is the writing condition, it is possible to assume that the empty onset of the second syllable would be filled by the glottal stop if it was produced orally. [iɛ], just as [io], is no licit diphthong in Vietnamese. All these items are in consonant cluster conditions, and we can draw a parallel to epenthesis as a strategy for cluster repair. These instances of syllable augmentation as well can be seen as a cluster repair strategy, which has not been previously paid attention to.

Let us finally come to syllable augmentation in the experimental data for the direction Vietnamese → French. Probably, if our dataset was larger, we would have been able to collect a higher number of occurrences. For this small data set, the occurrence is limited to one case, i.e. the stimulus *con mèo* [kɔn.mɛw], which is imitated in both oral conditions as [kɔn.mɛ.o] by one speaker of French. Just as for the experimental data of the other direction, a glide becomes a full vowel.

To conclude, we can state that syllable augmentation can mainly be explained by consonant and consonant cluster repair, strategies described in 7.1. and 7.2. In this section about syllabification, we only discussed some marginal phenomenon which are ambiguous or for which this is certainly not the case. Overall, the data for syllable augmentation cases which cannot be explained by single consonant or cluster repair strategies is relatively small. We therefore turn to the categories syllable boundary shift consonant slot doubling including gemination, as there is much more data for both phenomena in all datasets.

Syllable boundary shift

We start with syllable boundary shift. Syllable boundary shift means that the syllable boundary is placed in the loan or response one segment before or after the syllable boundary in the source lexeme or stimulus. Syllable boundary shift can be a consequence of syllable augmentation as can be observed in the just discussed cases, but it can also happen without syllable augmentation. At this point, we turn to instances where syllable boundary shift occurs without syllable augmentation. The syllable skeleton for the source lexeme or stimulus is (CV).CCV(C), and the one for the loan response is categorically CVC.CV(C), if none of the source cluster consonants is deleted. An example from our loanword corpus is *xích lô* [sik.lo]

from French *cyclopousse* [si.klo.pus] ‘pedicab’ and from our experimental data for the direction French → Vietnamese is *écran* [e.kʁã] ‘screen’, which is imitated by a speaker as [ik.xan]. In both cases, the syllable boundary is moved between the two cluster consonants. In the experimental data, the second cluster consonant [ʁ], which does not exist in Vietnamese, is additionally replaced by [x]. The same or a similar structure applies to about half of the experimental monolingual responses for this stimulus. To the contrary, considering speakers of Vietnamese with second language knowledge of French, it is unclear for a higher amount of the data if the syllable boundary is shifted or not: phonetically, there is no syllable boundary marking like a pause and both are possible interpretations. For the loanwords, we have only a small dataset to our disposition and count 11 items in total where we can observe a syllable boundary shift, plus 19 instances of processes in schwa-syllables, where it is possible to interpret the same structural process but where also other interpretations are possible.

For the opposite direction of language contact, we test if the just described process is reversed, taking a Vietnamese lexeme as the stimulus. This lexeme actually is a loan: *ốp la* [op.la] and derives from French (*oeuf*) *au plat* [o.pla] ‘fried egg’. If French speakers without any knowledge of Vietnamese syllabification rules store the segmental material on a phonemic level and then apply their native French syllabification rules in production, it makes sense to assume that the utterance of speakers of French results in [o.pla], which is the same syllabification as in the original French source lexeme. This accounts for 36 % of the data, and only for a minority of the data, the Vietnamese syllable boundary is preserved, which means that speakers of French somewhere store the Vietnamese syllabification information and do not apply their French syllabification rules to the segment string. Although this happens only seldom, it could be somewhat unexpected that it happens at all, and we would rather expect speakers to just apply their French syllabification rules. Apparently, the pause as a phonetic cue of syllable boundary marking in the Vietnamese stimulus is perceptively so salient that it is reproduced by speakers of French. For the remaining 50% of the data, it is unclear where speakers of French realize the boundary and both interpretations would be possible.

This lets us assume that substantial differences between Vietnamese and French syllabification also have an impact on language contact and the application of syllable boundary shift in the two directions of language contact. Comparing these directions of language contact for the experimental data, we see that syllable boundary shift takes place for about half of the respective monolingual data for the direction French → Vietnamese, and speakers of Vietnamese apply their native syllabification rules. For the rest of the data, they reduce the cluster of the second

syllable, which also changes the syllable structure. Possibly, speakers do not syllabify segmental material as expected because they are not able to perceive both cluster consonants. Therefore, the fact that speakers do not shift a syllable boundary but make other changes instead does not need to mean that they are sensitive to French syllabification rules and apply them.

This seems different for the speakers of French: although most of the speakers shift the syllable back according to French syllabification rules, some speakers of French preserve the Vietnamese syllable structure, which cannot be observed in the monolingual Vietnamese speaker data at all. This may be the case because syllable boundaries in Vietnamese are better perceptible than French syllable boundaries in utterances: one does not need to be able to have acquired Vietnamese syllabification rules before to perceive where one syllable ends and the next starts, as boundaries are relatively easily perceptible also to non-native speakers.

Generally, we believe that syllable boundaries in Vietnamese are more clear from a phonetic point of view, in contrary to French, where syllables are organized and restructured into larger units within the rhythmic group. In Vietnamese, we believe that this is different, as syllable structures are quite limited and remain static. While it seems to be a difficult or maybe impossible endeavor to measure syllable boundaries phonetically in many languages, it may be worth questioning that this assumption holds universally and cross-linguistically. The syllable as a unit plays a much more important role in a language like Vietnamese than in a language like French, also, as it is the domain of tone, including the rhyme. Boundaries therefore may surface more clearly on a phonetic level as tones do.

This way, the fact that there is so much ambiguous data for the speakers of Vietnamese with L2 knowledge of French and for the native speakers of French supports our assumption that French syllable boundaries are less perceptible than the Vietnamese are. But if syllable boundaries are not so well perceptible and probably not always phonetically grounded, then they must still be present on an abstract level. This abstract level would be formulated in syllabification rules in the model we have described, but how can we be sure that syllabification rules apply in the utterance, if they are not always clearly perceptible and ambiguous, especially in these contexts of language contact? Wouldn't it be better to have syllable boundaries stored on a phonemic level and organize at this level the string of segments into syllables instead? This would be the best decision for Vietnamese, a language without flexion morphology. But in a language with flexion morphology, this is problematic as all word forms of one lexeme would then have to be stored holistically. Also: how should we represent the fact that speakers of French sometimes preserve Vietnamese syllabification although it contradicts French syllabification rules? Should

we assume in this case that due to phonetic cues in Vietnamese syllabification, speakers of French are able to quickly learn Vietnamese syllabification rules and that just some stimulus lexemes can be sufficient for this acquisition? If this is the case, we do not run into a problem with the existing model. Evidence for this can be found in the assumption of one native speaker of French who states after the experiment run that there are remarkable pauses in the stimulus utterances. This likely refer to pauses between two syllables of a lexeme. Still, we believe that language contact challenges theoretical assumptions on syllabification and that models which should apply universally could in future work be rethought and refined.

So far, we have discussed syllable boundary shift, considering similarities and differences between our different datasets. At this point we want to answer the question why we did not discuss this phenomenon under consonant cluster repair previously in 7. 2. First, syllable boundary shift, differently from deletion and epenthesis, is not a known consonant cluster repair strategy in any other loanword phonology, so why should the language pair Vietnamese French be so outstanding in this respect? Still, it is also possible that this phenomenon has simply been overlooked in the past. To complete the picture, we want to continue with the next category, namely consonant slot doubling, including gemination. For these processes, there is no cluster in the source lexeme or the French stimulus, as the skeleton is CV.CV(C). But the result is still the same syllable skeleton as in syllable boundary shift: CVC.CV(C).

Drawing structural parallels between the two categories of differing syllabification helps us to recognize a pattern, which can be identified as the driving motor behind both processes that we categorize as syllable boundary shift and consonant slot doubling, including gemination. The following discussion explains our assumption that both processes, in their structural similarity, are also similarly motivated and that syllable boundary shift is probably not primarily a strategy of consonant cluster repair, but a consequence rather than a cause. Also, frequency patterns in the experimental results are comparable and deliver the following proportions: in the data of monolingual speakers of Vietnamese, syllable boundary shift or consonant slot doubling applies to 42% of the data vs. only 7% in the data of L1 speakers of Vietnamese with second language knowledge of French.

Gemination and consonant slot doubling

An example for gemination from our loan data is *phót-tăng* [fot.tǎŋ] from *potence* [po.tãs] ‘stem’ (bicycle). The respective example from the experimental data for the language contact direction French → Vietnamese can be given with the stimulus *briquet* [bʁi.kɛ] ‘lighter’ and

the response [bik.ket] of a monolingual speaker of Vietnamese. An example for consonant slot doubling where only features of the second syllable onset are preserved in the double from the loan data is *xúc xích* [suk.sik] from French *saucisse* [so.sis] ‘sausage’. An example for the experimental data is the stimulus *coussin* [ku.sɛ̃] ‘cushion’ with the response [kut.sǎŋ]. In the loan data, we count 29 of these instances plus four instances where it is possible to interpret the same structural pattern. In all these in total 33 cases, there is no consonant cluster in the French source lexeme. Still, the first syllable is open in the source lexeme and closed in the response.

As to the experimental approach for the same language contact direction, the dataset is much larger. In total, the described structures emerge, including syllable boundary shift, where they are possible for a percentage of 39, compared to 12% in the loan data. Additionally, similar structures also emerge in syllable surroundings where they do not emerge in the loan data: for instance in one experimental response [e.pit.sɿ], corresponding to the French stimulus *épice* [e.pis], we cannot only observe an epenthetic vowel insertion after the final syllable but also a consonant slot doubling of the coda consonant [s]. In the response coda, it is replaced by [t] and in the onset of the epenthetic syllable, it remains [s] (see p.193). Another peculiarity in this experimental dataset compared to the loans is that both categories, syllable boundary shift and consonant slot doubling, become more similar in the response compared to differences between both categories in the loan data. Therefore, this categorization makes less sense for the experimental data, where structural differences only arise in the stimulus, but not in the response. This is another evidence for assuming the same motor behind both processes, syllable boundary shift and consonant slot doubling including gemination.

For the other direction of language contact, we have three Vietnamese stimuli, one of which the loan *ắc quy* [ǎk.kwi] ‘battery’ from French *accu(mulateur)* [a.ky]. We checked that none of the speakers of French can recognize that this is a French loan. Speakers of French perform differently for the three stimuli, which seems to be related to the length of closure or pause between the two syllables and the length of the preceding vowel. If the closure and the preceding vowel is rather short, then speakers of French do not preserve the two consonants for 95% of the data, but if there is a pause at the syllable boundary and the preceding vowel is longer, 65% preserve them, including the pause at the syllable boundary.

Finally, after having discussed syllable boundary shift and consonant slot doubling including gemination, we summarize our statement derived from this discussion and provide an explanation: both processes are similar and result in the same structure: the first of the two syllables in focus, which is open in the French source lexeme or stimulus, is closed in the loan

or the response. This leads us to assume the following hypothesis which we call the closed-syllable-template-hypothesis:

In language contact with French, Vietnamese speakers tend to borrow or imitate French lexeme material in a way that syllables are closed even if they are open in French.

Several explanations are possible and deliver a better understanding of native phonology and language contact mechanisms. First, we provide an argument in terms of distribution in refreshing what we have presented in the background section 2.2.1. on p.42: the frequency of closed syllables in the native lexicon is higher in Vietnamese than the frequency of open syllables. The distribution of open vs. closed syllables in French is inversed compared to the distribution in Vietnamese. Therefore, we assume that an optimal Vietnamese syllable is closed. In this fashion, we justify the tendency of speakers of Vietnamese to close open stimuli or source lexemes in situations of language contact, be it in borrowing or spontaneous imitation: in terms of distributions, the source or stimulus material is vietnamized by the tendency of closing open syllables.

Additionally, phonetic misperception may have a role to play. To find more evidence for this assumption, phonetic measurements would need to be undertaken in the future. Still, we want to give this assumption some room right now as it helps us to find some interesting parallels between Cantonese and Vietnamese as well as between borrowings from English to Cantonese on the one hand and borrowings from French into Vietnamese on the other. Our assumption is that since there is no length distinction in French vowels but in Vietnamese vowels, there is such a distinction: for some vowels, this distinction is phonemic and for others, vowels stand in complementary distribution for length, depending on surrounding segmental material (see p.39). Our hypothesis is that French vowels are overall relatively short compared to Vietnamese long vowels and could therefore be best mapped onto Vietnamese short vowels. We find one hint to this hypothesis in the statements by French speakers who participated in our experiment. One speaker's reply is that he noticed vowels are long in the stimuli. Comparative phonetic measurements of vowel length must be undertaken, and if this hypothesis turned out to be supported by such measurements, then we could argue the following way: French vowels have a high chance to be mapped onto short vowels in Vietnamese in language contact as their relative overall length corresponds best to them, as long Vietnamese vowels are longer than the mean of a French vowel.

This assumption in turn can be combined with the observation that short vowels in native Vietnamese never appear alone in a syllable: a syllable containing a short vowel is always closed and only long vowels can appear in open syllables. This could be a universal tendency, as also German, some southern French varieties, Limousin and Cantonese pattern this way as well. For Cantonese, Thai, and Vietnamese, it has been claimed that well-formed syllables must fulfil a bimoraic requirement (see p.42, and our paper Scholvin 2022).

Interestingly, the similarity between native Vietnamese and Cantonese that syllable must minimally have two morae could be related also to a similar pattern in language contact. In Silverman (1992), processes of gemination are described for English loans in Cantonese. One example is [kəp.pi] from English *copy*³⁷. In Cantonese just as in Vietnamese, gemination is not a native process. The difference to Vietnamese loan phonology and the experimental data with Cantonese loan phonology is that this process is blocked for consonants which are not allowed in Cantonese codas. This is not the case in Vietnamese: consonants, which are not allowed in Vietnamese codas, still double according to our analysis and are repaired by similar sounds in coda position according to Vietnamese coda restrictions. Therefore, in contrary to Cantonese, Vietnamese goes beyond the usual pattern of consonant doubling described in gemination: in gemination, the base and the double are identical. This appears in the Vietnamese loan and experimental data as well. Still, it is oftentimes just the consonant slot which is doubled and some features are lost. Both, gemination and what we call featural gemination, has additionally been described for English loans in Thai (Rungruang 2008). Just as in Vietnamese and Cantonese, Thai syllables are also minimally bimoraic. When we compare the French-Vietnamese contact situation to the English-Thai one, it is so striking that featural gemination patterns, described in Rungruang (2008) as homorganic patterns, are nearly identical. For instance, in Thai [k^hlaat.sik] from English *classic* [klæ.sɪk], the consonant slot of [s] doubles but not all its features are retained in the double, which is the coda consonant [t] in the first syllable of the loanword. This goes in analogy to the French loan *ét xăng* [ɛt.sǎŋ] from French *essence* [e.sãs] and the experimental response [kut.sǎŋ] corresponding to the French stimulus *coussin* [ku.sɛ̃] ‘cushion‘ (this and more examples for Thai with striking similarities to our data can be taken from Rungruang, 2008, p.112). Even the same patterns of syllable boundary shift found for the pair French-Vietnamese exist for the pair English-Thai, and occasionally for the same lexeme: English *taxi* [tæ.ksi] has been borrowed into Thai as [t^hɛk.sii] (example taken from Rungruang, 2008, p. 113), and French *taxi* [ta.ksi] into Vietnamese as [tǎk.si]. It is striking

³⁷ Interestingly, as similar loan from the same English source also exists in Vietnamese: *cóp py* [kəp.pi].

that although Cantonese, Vietnamese and Thai are all languages of different families, language contact between these languages have shaped the three languages in a way that similar or even the same patterns emerge when speakers are in contact with speech material of English or French. Finally, gemination has also been the subject in other language's loanword phonologies (cf. Kawahara, 2015, Ito, Kubozono, & Mester, 2017 and Tanaka, 2017 among others for Japanese; Repetti, 2009 for Italian; Kertész, 2006 for Hungarian). For the studied languages, namely Japanese, Italian and Hungarian, gemination also occurs as a phonological process in the native lexicon. This is according to actual research not the case for Vietnamese, and therefore the observed pattern in the loan and experimental data is especially noteworthy.

As to the opposite direction, it seems that in Vietnamese syllable structures with a double consonant, e.g., the same coda consonant material as the onset consonant material of the following syllable, oftentimes are not realized by speakers of French, but in a sense 'degeminated'. An interesting point in this context is a language historical degemination development that has led to long vowels in Limousin. The process described in Meinschaefer (2020) has similarities to the processes that could be identified for the Vietnamese → French direction and can be understood as exactly the opposite process to the process observed for the direction French → Vietnamese: while in Limousin, degemination goes in hand with the emergence of long vowels, French vowels perceived as short by speakers of Vietnamese may be the explanation for gemination processes. Both processes are linked to a dimoraic minimum in both, Limousin and Vietnamese: the mora which would otherwise miss, is either filled by a lengthening of the consonant or the vowel. Such a reverse parallel is particularly interesting if we want to turn more deeply to the role of long and short vowels in French and Vietnamese and eventually Limousin, and their interaction in language contact and change in the future.

7.3.4. Tonal aspects

Considering tonal aspects, we find substantial differences between loan data and experimental data on the one hand and the two directions of language contact on the other. While for consonant and consonant cluster repair as well as for syllabification, we are able to find many parallels between the contact situations and datasets, this is less the case for the issue of tone. Differences between the two directions of language contact relate to different hypotheses for the two and the fact that Vietnamese is a tone language and French is not: in the direction French → Vietnamese, we expect tone assignment to great parts of the data, while we expect that for the direction Vietnamese → French, speakers meet difficulties with reproducing tonal features

or even fail. On the other hand, we expect that Vietnamese L1 speakers perform very differently if they are monolingual or if they have L2 knowledge of French concerning tonal aspects. The results, which generally confirm our hypotheses, help us to come up with new hypotheses concerning the debate on monolingualism vs. bilingualism in borrowing situations.

Let us start with the most important difference between supposed language contact situations in a colonial loanword borrowing context on the one hand and the experiment design of a present-day language contact situation on the other. In our experiment design with monolingual speakers of Vietnamese, these speakers are not used to hear French or any other foreign language input in their daily life. Also, during the experiment run, they hear each lexeme only once and reproduce it only twice orally (plus write it down). For the loanword borrowing context, we expect the situations to be substantially different and possibly also very different from lexeme to lexeme. Even if we assume monolingual speakers of Vietnamese having been the borrowers instead of bilinguals or imperfective learners of French, these speakers may have been used to hear French at least from time to time and to hear a French lexeme multiple times before borrowing it into Vietnamese. As we have discussed for the speakers of Vietnamese with very superficial or passive foreign language knowledge, this may have a great impact on the ability to reproduce segments and prosodic structures of a foreign language input. Our results about tonal aspects deliver evidence for this assumption. As in our experimental setting, speakers hear each stimulus only once with a certain f_0 pattern, there is the possibility that monolingual speakers relate these patterns to tones and assign Vietnamese tones to the French stimulus which come closest to French intonational f_0 patterns. This can be observed especially in the writing condition, where speakers make extensive use of tone diacritics.

In the loan data, speakers who have heard a lexeme several times before borrowing it, they may have heard it with different f_0 movements in different intonational context and therefore have been able to abstract away from these f_0 movements: they may have quickly understood that f_0 movements in French are not relevant information on the lexical level. In this regard, it is not astonishing that the loan data is under tonal aspects more like the experimental data with speakers of French L2 knowledge than with the monolingual Vietnamese data. While f_0 movements of the stimuli seem to have an influence on tone assignment for the monolingual speakers of Vietnamese, this is not observed for speakers with L2-knowledge of French. Results of the loan data are similar, where tone A1 is very frequently assigned to syllables and the assignment of other tones can be explained by tone restrictions of Vietnamese alone.

Although we have no knowledge about the concrete realizations of each French source lexeme, we would have expected results to be different if information of f₀ movements would have been stored in the loanword. This way, our conception of borrowers in colonial times is that they can be conceived in a certain way as having a very basic L2 knowledge of French, even possibly without much active knowledge of French and even though this knowledge is based on the perception and recognition of sound segments and prosodic patterns only. Apparently, situations of superficial but repetitive language contact combined with a very low eventual degree of L2 knowledge can have a high influence on the production of segmental and prosodic patterns. This goes in line with research on first language acquisition, where children acquire sound and prosodic patterns earlier than the lexicon or grammatical aspects of a language (cf. Ohala 2008 for an overview on this topic). After having discussed some general conceptions about prosodic first and second language learning, we conclude this discussion by summarizing our results of concrete language contact for the direction French → Vietnamese. While for monolingual speakers of Vietnamese, it is possible that they conceive French as a tonal language if they hear a French lexeme only once with only one f₀ movement, speakers of Vietnamese with L2 knowledge of French who are exposed to the same experimental design abstract away from the F₀ movements of the stimuli. It is plausible to assume this also for the borrowing context. Still, it must not mean that in all colonial borrowing settings which gave birth to loanwords, speakers of Vietnamese had acquired French as the participants of our experiments did: for understanding that French is not a tonal language, and more generally, understanding prosodic patterns of a foreign language, one must not have active knowledge of that language but even little or passive but repetitive exposure to that language may be sufficient.

Let us now consider some patterns of tone assignment in a more detailed fashion and compare tone assignment patterns in loans with tone assignment patterns in the experimental data. For the experimental data, we focus in the frame of this comparison on the writing condition. We do so because only here, we have some insights on how tones are represented phonologically in a speaker's mind because of the use of tone diacritics. Even though the f₀ patterns in the oral conditions mostly correspond to the tone diacritic in the writing condition, this does not tell us with certainty if this is a tone assignment pattern or just a faithful imitation of French intonation patterns, for instance. Therefore, we only consider the writing condition for this comparison to the likewise written dataset of loanwords.

First, the relatively high number of tones D1 and D2 compared to the loan data (see p.202) could be explained by other phonetic details such as the relatively short length of the French stimulus vowels: possibly, this shortness could be a phonetic cue to associate tones with short durations such as D1 and D2. Tone D1 and D2 occur, just as in the loan data, due to Vietnamese phonotactic constraints: if the syllable is closed by a plosive, then these are the only possible tones also in native Vietnamese. But it could also be the other way around: if there is a short vowel with rising f_0 in the French stimulus, it could be perceived as tone D1 instead of B1 due to its shortness and consequently get closed by a plosive in the result, although there is no coda consonant in the respective stimulus syllable. The same could hold for tone D2 instead of B2. This corresponds to the issue we have discussed so far in 7.3.: the tendency to add a coda consonant in the result, probably if the stimulus vowel is mapped onto a short vowel by speakers of Vietnamese. This way, the emergence of a process we have described with the closed-syllable-template-hypothesis is also linked to the aspect of tone assignment.

Another aspect is the assignment of tone A2: a conspicuous detail in the data of loanwords is that lexemes with an open first syllable sometimes get assigned tone A2 as in *bờ lu* [bɤ^{A2} lu^{A1}] from *blouse* [bluz], 'blouse'. In the experimental data, we can find a similar tendency, but having a larger dataset to our disposition, another aspect jumps into the eyes which could also account for the pattern in the loan example above. It is the epenthetic syllable, characterized by the rhyme [ɤ], which often gets assigned tone A2 (see p.207). This epenthetic vowel in the loan data often falls together with the first syllable. But in the experimental data, there is much more epenthesis also in other positions within a lexeme. Still, the epenthetic syllable gets assigned tone A2 here as well, as for instance in *an gờ* [an^{A1} ɤ^{A2}], a reproduction of the French stimulus *algue* [alg] 'algua' by a speaker of Vietnamese. Therefore, we find evidence that it is rather the fact that a syllable consists of the epenthetic vowel [ɤ], which leads to the assignment of tone A2 than the position of a syllable within a lexeme. Here, the results of our experimental study go in line with what Vurong (1992) has claimed for loanwords: the tendency he observed is even much stronger in the experimental data and we are additionally able to control for the independent variable syllable position.

Let us at this point discuss other typical characteristics of epenthetic vowels which could potentially be related to the assignment of A2. We focus on vowel quality and vowel reduction. As to vowel quality, epenthetic syllables are mostly characterized by the vowel [ɤ] in the rhyme, a tendency active in loan data and strengthened in the experimental data. In total, most of our data for epenthetic vowels is characterized by the vowel [ɤ] and other vowels are very

infrequent. As to the loan data, we identify possible reasons for the emergence of these vowels the surrounding material, among them vowel and consonant quality. In the experimental data, it seems that vowel harmony may have a role to play as well (cf. Trần, 2011), even though vowel harmony is not a native process in Vietnamese phonology. The possibility that vowel harmony emerges in the assignment of vowel quality to epenthetic vowels could be interpreted as a universal tendency, even if not active in a language specific phonology.

As to epenthetic vowels we classify as reduced, we analyse this category as transitory between the binary distinction of epenthesis and no epenthesis but decide to count them under the category epenthesis. Reduced vowels showing up in the first condition of imitation of the stimulus in isolation can stabilize in the following conditions as a full epenthetic vowel but can also disappear or vice versa. Sometimes, in the first oral condition (imitation in isolation), the epenthetic syllable is reduced but becomes a full syllable in the second oral condition (embedding in a carrier sentence). Sometimes it remains reduced in both oral conditions. Although reduced epenthetic vowels in the first or both oral conditions sometimes disappear in the writing condition (as discussed in 7.2.), they can also stabilize in the writing condition. In the result section, we have broad up the following examples: while one speaker realizes a reduced epenthetic vowel in the first oral condition [b(ɤ) li] but the cluster [bl] cluster in the second oral condition and the writing condition, another one realizes the reduced vowel in the first oral condition as [b(ɤ) lit], which gets stabilized as a full vowel in the second oral condition [bɤ lit] and in the writing condition as well <pò lít>, converted into IPA as [pɤ^{A2} lit^{D1}]. The stimulus of both is French *blé* [ble]. Here, the chance is high that the epenthetic vowel receives the tone diacritic of tone A2. Reduced epenthetic vowels can appear in any position of the response lexeme, including the lexeme-final position.

The assignment of tone A2 to epenthetic syllables may have to do with the possibility that epenthetic vowels can be less prominent than others because of reduction. Still, the results may not have to do with prominence but with other factors, as a low f0 does not seem to be a correlate of prominence (see p.47). A low f0 which results in the assignment of tone A2 in epenthetic syllables therefore can rather not be related to prominence. This way, we cannot explain satisfactorily patterns in which epenthetic vowels, which are mostly characterized by the vowel [ɤ], have a high chance to get assigned tone A2.

Let us now come back to our studies and consider tonal aspects in the direction Vietnamese → French. Generally, even though speakers of French are not deaf to f0 movements of the Vietnamese stimulus (in contrary to their often studied and discussed stress-deafness cf.

Dupoux et al., 2008), they are for the most part of the data not able to reproduce tonal patterns faithfully. In the condition where they imitate the stimulus lexeme in isolation, speakers perform relatively well, but when they embed the lexeme in a French carrier sentence in the second condition, f_0 patterns which are sometimes similar to the stimuli in the isolation condition now get lost and are overridden by French intonational patterns. Especially the second syllable in bisyllabic lexemes seems to be sensitive to these intonational patterns (see p.251). This seems especially to be the case for tones with simple rising and falling f_0 movements, in contrast to tones where also creaky voice or glottalization and complex contours characterize the tone. French speaker's performance for the falling tone A2 and the rising tone B1, is less good compared to their performance of tone C2. Features have a higher chance to be preserved, be it the complex contour, be it glottalization or be it through syllable augmentation. For the latter, we provide again the example of the Vietnamese stimulus *ngã tư* [$\eta a^{C2} tu^{A1}$] 'cross roads', which is reproduced by a speaker of French as [naha.dø] (see p. 249). The first part of the tone with the fall is one syllable, the glottalization is replaced by the segment [h] and the rising sequence becomes the rhyme of another syllable, together with the segment [h] as its onset.

This way, speakers are not able to reproduce tone C2 neither, but it is possible that they understand that at least some of the features which are tonal in Vietnamese, are important on a phonemic level and therefore pay attention to preserve them. In contrast, it is possible that f_0 originally belonging to tones A2 and B1 are overridden by intonational movements in the carrier sentence condition, especially in the second syllable, because they share phonetic properties with French intonation. They may have a lower chance to be stored as important lexical information but misinterpreted as intonational patterns. This goes in line with the Speech Learning Model of Fledge (1995) according to which patterns, which are very distinct to a first language of speakers, are easier for them than patterns which are similar but not the same. In this way, tone A2 and B1 are similar to intonational patterns and therefore have a lower chance to be preserved on a lexical level whereas tonal features of tone C1 have a higher chance to be recognized as lexical information. Consequently, speakers try harder to preserve them. This must not imply that they preserve tone C2 correctly so that speakers of Vietnamese could identify it as such, but we can interpret the emergence of the described patterns as a hint to a difference in the mental representation of tonal material of C2, which is totally lost less frequently than tonal material of tones A2 and B1.

Additionally, we can observe difference between speakers: while some of them do not seem to be sensitive to tonal patterns at all, others perform a little better and preserve some of the tonal features, even not perfectly, even in the embedding condition. This may have to do with the saliency of certain tonal features: our hypothesis is that tonal features (i.e., of Vietnamese) may be more salient than intonational patterns (i.e., of French). Evidence for the salience of tone as perceived by speakers of a language without lexical tone can be brought by the study on the ability of French speakers to identify and discriminate Mandarin Chinese. Compared to Mandarin Chinese speakers, they perform much weaker in a categorical perception but are still sensitive to tone contour differences (Hallé et al., 2004; Gómez et al. 2018). In our experimental metadata, we can find additional evidence for the perceptual salience of tones in what participants stated after the experiment run when they were asked if they had noticed anything about this language. One participant said he had recognized strange accents, and another said that the melody seems to be important in that language. A third even used the term *tone*, even though this speaker has no linguistic background and could not explain the term further.

For tonal aspects, we have considered in this subchapter that monolingual speakers of Vietnamese possibly conceive French as a tonal language whereas in the loan data, the tone assignment is rather only driven by Vietnamese tone restrictions. Data of speakers of Vietnamese with L2-knowledge of French behave in this respect more similarly to the loan data. Finally, speakers of French have strong difficulties to preserve Vietnamese tonal material, especially, if it has the same correlates as French intonation. Tonal features seem to have a better chance to be preserved in complex tones, as these have no corresponding intonation pattern in French.

8. Conclusion

After this comprehensive discussion showing how complex, partly systematic, and partly variable the examined patterns of prosodic language contact are, we want to conclude our work by summarizing the outcomes of the three studies and what we can learn from them.

A study based on a corpus of loanwords in 4. is the point of departure. These loanwords were adapted into Vietnamese in a colonial language contact situation. Since the French colonial period covers a time span of about 100 years, this language contact situation extended over a longer period, and the borrowing processes which resulted in these loans can also be situated within this period. The focus of our study is not on which documents prove the first occurrence of which loan words, and how exactly these arose and possibly changed based on historical evidence. Rather, we approach a diachronically developed dataset from a synchronic perspective and examine segmental and prosodic patterns of loanwords as they are currently in use by comparing them with their French source lexeme. We are aware that this approximation is a simplification and does not come close to doing justice to each individual borrowing process in its historical depth. However, we gain with this study detailed insights into regular patterns and find out in which ways Vietnamese phonology played a significant role in the adaptation of loanwords.

The experimental studies which follow in chapter 5 take a different perspective but focus on the same language structures that have already been studied for loanwords. We conduct synchronic studies on synchronic language contact situations: recordings of French lexemes are played to speakers of Vietnamese, and they are asked to repeat them, embed them in a Vietnamese carrier sentence, and then to transcribe them. The participants belong to a group of monolingual Vietnamese speakers on the one hand and to individuals whose L1 is Vietnamese and L2 is French on the other. By synchronously comparing their results, we gain insight into how patterns in foreign or second language acquisition may change and in which ways the role of Vietnamese phonology may decrease with the L2 knowledge of French. Finally, we are also interested in the opposite direction of language contact. To obtain the results presented in 6, we created an experimental language contact situation in which speakers of French imitate Vietnamese lexemes and incorporate them into a French sentence. In summary, both experimental language contact situations in both directions arise spontaneously from speakers of one language being confronted with stimuli from another and reproducing it as they processed it. The outcome is that some patterns are similar in both directions, which can be interpreted as the emergence of universal mechanisms. In contrast, other patterns differ and

cannot be reproduced by changing the contact situation. This is where language specific properties come into play.

We finally come back to our hypotheses and the ongoing debates on borrowing contexts such as loanword integration as well as to theoretical assumptions on foreign and second language acquisition. We can see that both share a lot of overlap. It can be assumed that foreign and second language acquisition, even if in a very early stage, always has a role to play in borrowing contexts, even if the acquisition just starts and eventually stops with the moment of borrowing. On the other hand, we have seen that our experimental data for both directions of language contact shares similarities with the data of loans which have been borrowed from French into Vietnamese. Differently from the loan data, we can contrast in this data monolingual speakers with second language learners, at least for the direction French → Vietnamese. With our experimental approach, we are therefore able to gain more insights on the substantial differences of phonological patterns between the very first stage of second language acquisition and later stages. The fact that the loan data shares similarities to both experimental data groups shows that segmental and prosodic patterns in borrowing situations are even more complex than has previously been examined. In this sense, we conclude that it may not always help to continue by contrasting monolingualism vs. bilingualism in debates on borrowings; and by contrasting experimentally elicited repetitions with nonce borrowings and established loanwords in the sense of Poplack (2018) and Haspelmath (2009); and finally by contrasting phenomena observed in borrowing with second language acquisition contexts. Rather, we would like to put more emphasis on the complexity and the graduality of phonological phenomena and patterns which arise from diverse segmental and prosodic language contact situations. With our studies on the language pair Vietnamese and French, we have provided evidence for this understanding.

9. Bibliography

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9. Appendix

All data and metadata which our thesis is based on can be accessed by clicking the link to the following reference and downloading the zip file data_thesis_prosody_fr_vn:

Scholvin, Vera (2021). Data belonging to the thesis intitled “Prosody in Language Contact. French and Vietnamese” [Data set]. Zenodo. <https://doi.org/10.5281/zenodo.5731529>

9.1. Links to the data used in chapter 4:

To access the table of loan data and metadata, please visit the link above, download the file and go to tables/loanword_data

9.2. Documents and links which belong to chapter 5:

9.2.1. Complete list of 49 French stimulus lexemes

French stimulus lexeme	IPA	Glosse
ail	aj (phonetisch auch aij)	garlic
algue	alg	algua
bambou	bãbu	bamboo
bisque	bisk	bisque
blason	blazõ	coat of arms
blé	ble	wheat
bloc-cuisine	bløkqisin	kitchen unit

boyau	bwajo	tubeless tyre
bric-à-brac	bʁikabʁak	bric-a-brac
brique	bʁik	brick
briquet	bʁike	lighter
cableuse	kabløz	FEM wiring specialist
carpe	kaʁp	carp
chameau	ʃamo	camel
ciel	sjel	sky
cloche	klɔʃ	bell
coude	kud	elbow
coussin	kusɛ̃	cushion
crabe	kʁab	crab
crapaud	kʁapo	toad
crépuscule	kʁepyʁskyl	dusk/dawn
écran	ekʁɑ̃	screen
efface	efas	rubber
épice	epis	spice
étang	etɑ̃	pond
ferme	fɛʁm	farm
feuille-morte	fœjməʁt	dead leaf (lit. reddish brown)
flaque	flak	puddle
frai	fʁe	Fish/frogg egg
gignol	gijɔl	joker
gigot	ʒigo	legg (gastr., i.e., of a mutton)
glace	glas	ice-cream
griffe	gʁif	claw
hamac	amak	hammock
insecte	ɛ̃sɛkt	insect
matelas	mat(ə)la	matelas
menotte	mənɔt	handcuffs
pas	pa	step
perle	pɛʁl	pearl
piaf	pjaf	sparrow, little bird
plume	plym	feather
port	pɔʁ	harbor
poulet	pule	chicken (gastr.)
prune	pʁyn	plum
radeau	ʁado	raft
saule	sol	willow

stuc	styk	stucco
stylo	stilo	pen
yeuse	jœz	holm oak

9.2.2. Invitation letter and questionnaire for speakers of Vietnamese

THƯ MỜI THAM GIA THÍ NGHIỆM NGÔN NGỮ

Tên tôi là Vera Scholvin. Hiện tôi đang tiến hành một nghiên cứu về sự tiếp xúc giữa ngôn ngữ Pháp và ngôn ngữ Việt. Kết quả của thí nghiệm sẽ không những giải thích nhiều về mối liên hệ hai tiếng Pháp và Việt mà còn giúp đỡ cho việc dạy tiếng Pháp cho người Việt và tiếng Việt cho người Pháp. Tôi trân trọng kính mời bạn tham gia thí nghiệm. Thí nghiệm rất dễ dàng và bạn sẽ giúp tôi nhiều.

Quy trình thí nghiệm: Trong trình chiếu, bạn sẽ thấy hình ảnh của tổng cộng 50 đối tượng, động vật, thực vật và món ăn. Bạn sẽ nghe tên tiếng Pháp cho từng đối tượng.

1. Bạn được yêu cầu nhắc lại các từ vừa nghe được.
2. Tiếp theo, bạn được yêu cầu chèn từ tiếng Pháp bạn vừa nghe vào câu tiếng Việt của cấu trúc sau : Cái/con/món này tên ...bằng tiếng Việt.
3. Hãy viết những từ bạn vừa lặp lại

If speakers know both, Vietnamese and French, then 3. is slightly different:

3. Hãy tưởng tượng rằng những từ này đã được mượn vào tiếng Việt và thay đổi để người Việt Nam có thể dễ dàng phát âm chúng. Hãy viết những từ bạn vừa lặp lại bằng cách sử dụng chính tả tiếng Việt như thể chúng là những từ tiếng Việt.

Monolinguals:

Tổng thời gian thí nghiệm 20-30 phút. Toàn bộ phần hướng dẫn được thực hiện bằng tiếng Việt.

Speakers of L1 Vietnamese with French as a foreign language:

Tổng thời gian thí nghiệm 30-40 phút. Cuối cùng, bạn sẽ đọc một đoạn văn ngắn bằng tiếng Pháp và có một cuộc trò chuyện ngắn bằng tiếng Pháp với tôi.

Speakers of L1 Vietnamese with French as a second language:

Tổng thời gian thí nghiệm 40 phút. Cuối cùng, bạn sẽ nói chuyện với một người Việt khác tham gia thí nghiệm bằng tiếng Pháp. Bạn có thể nói về những gì bạn muốn, ví dụ, như thế nào khi bạn đến Pháp, có gì khác biệt giữa tiếng hoặc văn hóa Pháp và Việt, bạn có mối liên hệ nào với tiếng Việt và tiếng Pháp. Nhưng bạn cũng có thể nói về những chủ đề hoàn toàn khác mà bạn quan tâm. Bạn chỉ không nên nói về những điều riêng mà bạn không muốn được ghi âm.

All speakers:

Trong quá trình thí nghiệm ngôn ngữ, giọng nói của bạn sẽ được ghi lại. Thí nghiệm sẽ được ẩn danh và tên của bạn sẽ không xuất hiện ở bất kỳ đâu trong kết quả. Trước khi chúng tôi bắt đầu thí nghiệm, tôi yêu cầu bạn trả lời các câu hỏi sau.

Bạn bao nhiêu tuổi?

Bạn sinh ra ở tỉnh/thành phố nào của Việt Nam? (Nơi sinh)

Bạn lớn lên ở tỉnh/thành phố nào của Việt Nam?

Bố mẹ của bạn sinh ra và lớn lên ở tỉnh/thành phố nào của Việt Nam?

Bạn nói bằng giọng của vùng/miền nào?

Bố mẹ của bạn có nói bằng giọng vùng miền khác với giọng của bạn không?

Bạn có quen nói bằng giọng nào khác không?

Nếu có, tại sao (ví dụ giọng của người bạn hay tiếp xúc: giáo viên/đồng nghiệp/người giúp việc...)?

Questions only to speakers residing in Vietnam:

Ngoài tiếng Việt, bạn học ngoại ngữ nào khác hay không?

Nếu có, từ bao lâu?

Questions only to speakers residing in France:

Bạn học tiếng Pháp từ bao lâu?

Bạn ở Pháp từ bao lâu?

Ngoài tiếng Việt và Pháp, bạn có học ngoại ngữ nào khác hay không?

Nếu có, từ bao lâu?

9.2.3. Instruction for speakers of Vietnamese

HƯỚNG DẪN THÍ NGHIỆM

Cảm ơn bạn đã đồng ý tham gia thí nghiệm này. Thí nghiệm này mất khoảng 30-40 phút và rất giúp đỡ nghiên cứu của tôi.

Bất cứ khi nào bạn mệt mỏi hoặc cần nghỉ ngơi, bạn có thể dành thời gian. Tất nhiên, nếu bạn muốn dừng thí nghiệm, bạn luôn có thể làm điều đó.

Không có tác dụng phụ cho thí nghiệm này ngoại trừ việc bạn có thể hơi chán. Tôi hy vọng bạn không cảm thấy buồn chán và xin cảm ơn vì sự kiên nhẫn của bạn.

Trong thí nghiệm, ở mỗi slide bạn sẽ nhìn thấy một hình ảnh của một đối tượng. Luôn luôn hai slide thuộc về nhau và tạo thành một cặp. Trên slide đầu tiên, bạn sẽ thấy một hình ảnh của một đối tượng. Trên slide thứ hai, bạn sẽ thấy một hình ảnh khác của cùng một đối tượng.

Bạn hãy nhìn vào bên trái màn hình, bạn sẽ thấy đèn giao thông.

Khi bạn nhấp vào „Ghi âm“, đèn giao thông sẽ chuyển sang màu vàng.

Ở bước thứ nhất, sau khi bạn nhấp vào „Ghi âm“, bạn sẽ nghe thấy giọng của một cô gái nói tiếng Pháp. Cô ấy sẽ gọi tên đối tượng trên ảnh bằng tiếng Pháp. Bạn hãy lắng nghe. Khi đèn giao thông chuyển sang màu xanh bạn hãy lặp lại từ cô pháp vừa nói. Khi nói xong, bạn nhấp vào „Dừng lại“, đèn giao thông sẽ chuyển sang màu vàng, và sau đó là màu đỏ báo hiệu việc trả lời đã hoàn tất.

Bạn có thể chuyển sang slide tiếp theo bằng cách nhấp vào biểu tượng >>. Trên slide thứ hai có bước thứ hai. Bạn sẽ xem ảnh khác của đối tượng vừa xem trong slide một. Vui lòng hoàn chỉnh câu theo mẫu này:

Cái/con/món này tên ... bằng tiếng Pháp.

Trước khi bắt đầu nói, xin nhấp vào „Ghi âm “, lưu ý ghi nhớ từ pháp và chuẩn bị hoàn chỉnh câu này.

Khi đèn giao thông chuyển sang màu xanh, xin vui lòng nói.

Bạn hãy nhớ nhấp vào „Dừng lại “ khi nói xong. Khi đèn giao thông sẽ chuyển sang màu đỏ, hãy lắng nhấp vào biểu tượng >>. Bạn đã hoàn thành cặp slide đầu tiên.

Ở sang slide, bạn hãy bắt đầu từ đầu với một đối tượng mới. Tổng cộng có 54 đối tượng, thí nghiệm mất 20-30 phút. Có tổng số 118 slide. Để bạn biết bạn còn lại bao nhiêu slide, mỗi slide có số.

Lưu ý: Trước khi bắt đầu thí nghiệm, bạn sẽ thấy một số slide ví dụ để hiểu rõ hơn về cấu trúc của thí nghiệm. Khi bạn đã xem xong các ví dụ và hiểu mẫu thí nghiệm, thí nghiệm sẽ được bắt đầu. Cảm ơn bạn rất nhiều vì đã giúp tôi thực hiện nghiên cứu của tôi. Nếu bạn quan tâm đến kết quả, xin vui lòng cho tôi biết.

9.2.4. Declaration of consent for speakers of Vietnamese

Vera Scholvin
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vera.scholvin@fu-berlin.de

Giấy xác nhận đồng ý tham gia

Tên:

Cùng với việc ký vào mẫu đơn này, tôi chấp thuận tham gia phỏng vấn cho nghiên cứu: Sự tiếp xúc giữa ngôn ngữ Pháp và ngôn ngữ Việt, và cho phép ghi âm nội dung phỏng vấn. Tôi chấp thuận và ủy quyền cho nhà nghiên cứu (Vera Scholvin) được toàn quyền công khai kết quả nghiên cứu nghiên cứu tôi tham gia dưới hình thức ẩn danh (không nêu tên người tham gia), và biết rằng những nội dung này sẽ chỉ được sử dụng cho mục đích nghiên cứu mà không có bất kỳ lợi nhuận kinh tế nào.

Địa chỉ E-mail (tùy chọn) /E-mail address _____

Ngày _____ địa điểm _____

Chữ ký _____

9.2.5. Table of metadata

To access the metadata, please visit the link on p.316, download the file, go to tables/experimental_metadata.xlsx and choose the table Monolingual Vietnamese or Vietnamese French Learners within this excel file.

9.2.6. Links to the transcribed data and recordings

To access the data of monolingual speakers of Vietnamese, please visit the link on p.316, download the file and go to recordings/direction_french_vietnamese/monolingual_vietnamese

To access the data of L1 Vietnamese speakers with foreign language knowledge of French (used for phonetic small-case study in 5.2.4.), please visit the link on p.316, download the file and go to recordings/direction_french_vietnamese/vietnamese_french_foreign_language

To access the data of L1 Vietnamese speakers with second language knowledge of French, please visit the link on p. 316, download the file and go to recordings/direction_french_vietnamese/vietnamese_french_second_language

9.3. Documents which belong to chapter 6

9.3.1. Complete list of 16 Vietnamese stimuli

Vietnamese stimulus lexeme	IPA	Glosse
ắc quy	ăk ^{D1} kwɪ ^{A1}	battery
bờ lu	ɓɤ ^{A2} lu ^{A1}	blouse
cá con	ka ^{B1} kɔn ^{A1}	little fish
các con	kak ^{D1} kɔn ^{A1}	each fish
cá mèo	ka ^{B1} mew ^{A2}	catfish
cám mèo	kam ^{B1} mew ^{A2}	dry cat food
chẩn đoán	tɛɯ̃n ^{C1} đwan ^{B1}	diagnoe
công ty	koŋm ^{A1} ti ^{A1}	company
cuộc gặp	kuək ^{D2} ɣăp ^{D2}	meeting
học phí	hɔk ^{D2} fi ^{B1}	tuition fee
khung cảnh	xuŋ ^{A1} keŋ ^{C1}	landscape
ngã tư	ŋa ^{C2} tu ^{A1}	intersection

ngat mũi	ŋat ^{D2} muj ^{C2}	cold (nose affected), stuffy nose
ốp la	op ^{D1} la ^{A1}	fried egg
tàu thuyền	taw ^{A2} t ^h wiən ^{A2}	boat
thế cờ	t ^h e ^{B1} kɿ ^{A2}	chess move

9.3.2. Instruction of the experiment for speakers of French

Merci d'être intéressé à participer à cette expérience. Elle prend environ 15 minutes et est très utile pour mes recherches. Si vous êtes fatigué ou avez besoin d'une pause, prenez le temps. Bien sûr, si vous voulez arrêter l'expérience, vous pouvez le faire à tout moment. Cette expérience n'a pas d'effets secondaires, mais vous pouvez vous ennuyer un peu. J'espère que ce n'est pas le cas et je vous remercie de votre patience.

Dans l'expérience, vous verrez l'image d'un objet sur chaque diapositive. Deux diapositives vont ensemble et forment une paire. Sur la première diapositive, vous verrez l'image d'un objet. Sur la deuxième diapositive, vous voyez une autre photo du même objet.

Si vous regardez à gauche de l'écran, vous verrez un feu de circulation.

Lorsque vous cliquez sur "Enregistrer", le feu tricolore devient jaune.

Dans la première étape, après avoir cliqué sur "Enregistrer", vous entendez la voix d'une femme. Elle nomme le sujet de l'image dans sa propre langue. Veuillez écouter. Lorsque le feu passe au vert, répétez le mot qu'elle vient de dire. Lorsque vous avez fini de parler, cliquez sur "Stop". Le feu passe au jaune, puis au rouge, indiquant que la tâche est terminée.

Vous pouvez passer à la diapositive suivante en cliquant sur le symbole >>. Sur la deuxième diapositive, il y a une deuxième étape. Vous verrez une autre image de l'objet que vous venez de voir sur la première diapositive. Veuillez compléter les phrases en utilisant cette phrase :

Ça veut dire... dans cette langue.

Avant de commencer à parler, veuillez cliquer sur "Enregistrer", mémoriser le mot et vous préparer à compléter cette phrase. Lorsque le feu passe au vert, veuillez parler.

N'oubliez pas de cliquer sur "Stop" lorsque vous avez fini de parler. Lorsque le feu de circulation devient rouge, cliquez sur le symbole >>. Vous avez terminé la première paire de diapositives.

Sur la diapositive suivante, recommencez avec un nouvel objet. Il y a 47 diapositives au total. Pour que vous sachiez combien il vous reste, un numéro est attribué à chaque diapositive.

Avant de commencer l'expérience, vous verrez quelques diapositives d'exemple pour vous aider à comprendre la mise en place de l'expérience. Les enregistrements de ces derniers sont en Français pour vous faciliter la tâche. Une fois que vous aurez passé les exemples et compris le modèle de test, l'expérience commencera. Merci de bien vouloir m'aider dans mes recherches. Si vous êtes intéressé aux résultats, n'hésitez pas à me le faire savoir.

9.3.3. Declaration of consent and questionnaire for speakers of French

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Déclaration de consentement

En signant ce formulaire, j'accepte volontairement d'être enregistré(e) dans l'expérience pour le projet de recherche sur les contacts linguistiques entre le français et le vietnamien. J'accepte et autorise la chercheuse (Vera Scholvin) à publier les résultats de l'expérience à laquelle je participe de manière anonyme, sachant qu'ils seront utilisés uniquement à des fins d'investigation sans aucun profit économique.

Adresse courriel (optionnel) _____

Jour _____ Lieu _____

Signature _____ Quelques questions :

Quel âge avez-vous ?

De quelle région êtes-vous originaire ?

Où avez-vous grandi ?

Parlez-vous un dialecte où avez-vous un accent régional ?

Est-ce que vos parents parlent un dialecte/ ont un accent régional ?

Parlez-vous d'autres langues que le français ?

Si oui, lesquelles ?

Depuis quand parlez-vous ces langues ?

Connaissez-vous le niveau auquel vous parlez ces langues (A1-C2) ?

Après l'expérience :

Savez-vous de quelle langue proviennent les mots que vous venez d'entendre ?

Si oui, comment le savez-vous ?

Que savez-vous de cette langue ?

Avez-vous remarqué quelque chose à propos de cette langue ?

Aimeriez-vous apprendre cette langue si vous en aviez le temps ?

Quel pourrait être le but de cette expérience ?

9.3.4. Table of metadata

To access the metadata, please visit the link on p.316, download the file, go to tables/experimental_metadata.xlsx and choose the table Native French within this excel file.

9.3.5. Links to annotated data and recordings

To access the data of monolingual speakers of Vietnamese, please visit the link on p.316, download the file and go to recordings/direction_vietnamese_french/native_french

9.4. Declaration of authorship and self-reliance

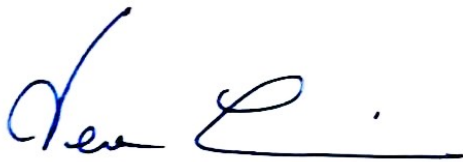
I hereby declare that I have written this dissertation myself. I have not used any other than the cited sources. Also, I have neither submitted this, nor any other work as a as a dissertation before.

Déclaration de l'auteur sur la rédaction de cette thèse

La présente déclaration indique que j'ai rédigé cette thèse moi-même. Je n'ai pas utilisé d'autres sources que celles qui sont citées. En outre, je n'ai jamais soumis ce travail, ni aucun autre travail, en tant que thèse doctorale auparavant.

Selbstständigkeitserklärung

Hiermit versichere ich, dass ich diese Dissertation in allen Teilen selbstständig angefertigt habe. Ich habe keine anderen als die angegebenen Quellen verwendet. Auch habe ich weder diese noch eine andere Arbeit zuvor als Dissertation vorgelegt.

A handwritten signature in blue ink, consisting of a stylized first name followed by a surname and a period.