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THÈSE

pour obtenir le grade de

DOCTEUR de l'Université Paris I Panthéon Sorbonne

Discipline : **Sciences Économiques**

Titre:

IMMIGRATION, WAGES AND EMPLOYMENT EVIDENCE FROM FRANCE

présentée et soutenue publiquement

par

Anthony Edo

le 13 Octobre 2014

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Jury

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L'UNIVERSITÉ PARIS 1 n'entend donner aucune approbation ou improbation aux opinions émises dans cette thèse. Ces opinions doivent être considérées comme propres à leur auteur.

À tous ceux qui ont rendu possible cette thèse,

À mes amis, à ma famille,

À Jeanne

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General Introduction

“Si je savais une chose utile à ma nation qui fut ruineuse à une autre, je ne la proposerais pas à mon prince, parce que je suis homme avant d’être français, ou bien parce que je suis nécessairement homme et que je ne suis français que par hasard”.

“If I knew of something that could serve my nation but would ruin another, I would not propose it to my prince, for I am first a man and only then a Frenchman...because I am necessarily a man, and only accidentally am I French.”

Montesquieu (1689-1755), Pensées, n. 350

Over 232 million people now reside in a country where they were not born.¹ Immigrants thus account for 3.2% of the world's population. Among international migrants, 60% live in developed countries, while this share was 53% in 1990.² "Much of the developed world is now increasingly composed of nations of immigrants" (Borjas (2014), p. 1). The share of foreign-born in developed countries increased from 7% in 1990 to 10% in 2010. Nearly 11.5% of the population in France, 13% in Germany and the United States, and 20% in Canada is foreign-born (OECD, 2013).

The rise in the demographic importance of international migration over the past decades has given more audience to the economic consequences of immigration and the types of immigration policies host countries should pursue (Friedberg and Hunt, 1995; Borjas, 2001; Longhi et al., 2005). A major concern in the public debate is that immigrants could take away native jobs and reduce their wages (Bauer et al., 2001). The financial crisis of 2008 and subsequent economic downturn in most OECD countries has further strengthened these concerns (Dancygier and Donnelly, 2014). Mayda (2006) also shows that attitudinal questions regarding concerns about labor market competition are associated with preferences for tighter immigration regulation.

The economic literature on the effects of immigration on labor market is particularly debated. *What impact do immigrants have on the employment opportunities of natives? What is the impact of immigration on the wages and employment of native workers?*

This dissertation is devoted to shed new lights on these questions through a deep empirical investigation of the labor market effects of immigration in France.

Trade and Migration

One of the first analytical frameworks in economics to study labor flows, and therefore immigration, has been provided by international trade theory (Borjas, 1989). The question of factor mobility (and labor mobility) forms an entire part of international trade theory (Mundell, 1957; Ethier, 1985). "The reigning theory of

¹United Nations, Department of Economic and Social Affairs (2013).

²Developed countries include Europe, Northern America, Australia, New Zealand and Japan.

international trade: the Heckscher-Ohlin-Samuelson factor endowments model” (Rodrik (1997), p. 13) assumes that labor is perfectly immobile between countries. In the absence of labor flows, the standard factor endowments model yields two fundamental theorems that are relevant to the study of migration (Feenstra, 2003).

On the one hand, the *Heckscher-Ohlin Theorem* indicates that a country exports the good using intensively the factor it has in relative abundance. If a country is relatively more abundant in labor than another country, the former will export the labor intensive good. On the other hand, the *Factor Price Equalization Theorem* suggests that the free trade of goods equalizes relative incomes of factors between countries through the equalization of relative goods prices. International trade thus leads to complete equalization of factor prices. These theorems have two main implications.

1. Within this basic framework, trade and labor flows are substitutes. The export of labor intensive goods leads to the equalization of wage rates across countries even if labor itself is immobile. The trading of goods therefore substitutes for the trading of people. A common way to understand how international factor movements can substitute for trade is to realize that countries do not simply trade goods. In an indirect way countries are trading factors of production.³ A labor abundant country will indirectly export its labor embodied in its labor-intensive exports. As a result, the indirect trade of production factors – through international trade of goods – leads to complete equalization of factor prices across countries. “The introduction of immigration into the Heckscher-Ohlin-Samuelson framework, therefore, does not fundamentally alter the results of the analysis since the international immigration of income-maximizing persons is simply another way of ensuring that factor prices are equalized across countries” (Borjas (1989), p. 459).
2. The Heckscher-Ohlin-Samuelson model implies that trade and labor flows produces losers and winners. International trade benefits the factor that

³This refers to the factor content of trade – *i.e.*, by trading goods, countries are indirectly trading the factors that are contained in the production of these goods.

is specific to the export sector of each country but hurts the factor specific to the import-competing sectors. In other words, trade will adversely affect the *relative* earnings of workers with the skills intensively used in import-intensive sectors. Since international factor movements are perfect substitutes for trade, migration of labor is similar in its distributional effects to international trade. Factors for which immigration are substitutes will lose relative to factors that are complementary. Thus, immigration will redistribute income by lowering the wages of competing workers (who have skills similar to those of the migrants) and increasing the wages of complementary workers (who have skills that complement those of immigrants).

It is important to notice that the first part of this dissertation (**Chapters I and II**) deals only with the effects of immigration on the labor market outcomes (*i.e.*, wages and employment) of competing natives. This part thus focuses only on the (potential) losers from immigration. Instead, the second part of the dissertation (**Chapters III and IV**) accounts for the complementarity effects induced by immigration. This part thus provides the overall effects of immigration on native wages by considering the winners and losers from migration.

Since the entry of specific goods into a country is equivalent to the immigration of workers with particular skills, the economic impacts of immigration and trade are closely linked. They both increase the “effective” labor supply of particular groups of workers in a country, and therefore they both induce wage effects. In a simple competitive model, the wage response to immigration and trade should be proportional to the change of the “effective” labor supply. Moreover, those groups of workers that experience the largest import- and immigrant-induced supply shifts should lose relative to the ones that experience the smallest supply shifts.

Borjas et al. (1997) are among the first to simultaneously estimate the effects of trade and immigration on the wages of skilled and unskilled native workers. For the United-States, they show that both trade and immigration augmented the nation’s effective supply of less-skilled workers by more than they augmented the effective supply of more-skilled workers. After calculating the factor content of trade and immigration flows together, they find that both imports and immi-

gration have decreased the relative income of low-skilled native workers from 1980 to 1995. This result is consistent with the predictions of the Heckscher-Ohlin-Samuelson model. However, because migration changes the “effective” (unskilled) labor supply by a great deal more than trade, the main factor responsible for the wage losses experienced among the low-skilled workers is immigration.

Although trade and labor flows may have similar economic consequences, three fundamental aspects (at least) distinguish migration and trade in their effects on the labor market. First, trade can have a substantial impact on the wages of workers even if foreign goods never actually enter the national economy (Borjas, 2001). In order to stay competitive, domestic firms could reduce workers’ wages. This behavior may prevent the penetration of imported goods (from foreign firms) in the domestic market. Thus, the threat of trade may be sufficient to ensure that labor market conditions in the national economy are affected by the labor market conditions in the countries that produce competing goods.

Second, a critical difference between the effects of trade and immigration on the labor market outcomes of native workers is the prevalence of a non-traded sector in each economy. In particular, immigrants work in manufacturing, but also work in non-traded sectors. While native workers can escape some of the trade competition from abroad by specializing in the production of non-traded goods, native workers cannot avoid competition from immigrants by moving their labor supply to non-traded sectors (Borjas et al., 1997).

Third, the temporality of the effects of trade and migration may differ, so immigration does not simply induced short-run effects but also have medium- and long-term effects on host countries. In fact, while most traded goods displace domestic production in the same period, the economic impact of today’s immigration is not limited to the current year and generation (Borjas et al., 1992). An immigrant will contribute to the economy in every subsequent year s/he is economically active.⁴ Immigration may also lead to labor market adjustments in the medium- and long-run (through capital accumulation and changes in the industry structure). These adjustments should attenuate the negative short-run

⁴This explains why immigration-induced supply shifts are described in empirical works by the stock of the work force who are immigrants relative to the total labor force, rather than by the flow of immigrants to labor force.

effects of immigration on wages (Lewis, 2005; Ottaviano and Peri, 2012). Moreover, “because of the intergenerational link between the skills of parents and children, current immigration policy might already be determining the skill endowment of the labor force for the next two or three generations” (Borjas (2008a), p.12). Current immigration should therefore induce very long-run effects on a host economy.

Main Literature on the Labor Market Effects of Immigration

The economic literature on immigration generally ignores the international trade aspects of labor migration and focuses exclusively on the effects of immigration on the labor market outcomes (*i.e.*, wages and employment) of natives. *What happens to native labor market outcomes as a result of immigrant-induced labor supply shifts?*

The literature usually defines immigrants as persons (*i*) who live permanently in a country where they were not born (*ii*) and who arrive in their host country with a foreign citizenship (or nationality). In other words, the terms immigrant and foreign-born are always used interchangeably to refer to all individuals born abroad to foreign biological parents. This definition implies that the “immigrant status” is permanent. Even if foreign-born individuals acquire the citizenship (or nationality) of their host country, they will always remain immigrants.

From a theoretical viewpoint, it is important to distinguish between the average wage effect of immigration and its distributional effects. The average wage effect of immigration depends on the dynamic response of physical capital accumulation. By decreasing the amount of physical capital per worker, an immigration-induced supply shock should decrease the marginal product of labor, and therefore, average wages.⁵ However, in the medium- and long-run, firms should respond to the increased supply of immigrants through capital accumulation to compensate the fall of the capital-labor ratio. In the long-run, a textbook model of a competitive labor market thus predicts that the host country’s wage is independent of migration.

⁵This result assumes that immigrants and natives are perfect substitutes in production. If they are complements in production, the average wage of natives should increase in the short-run.

Even in the long-run, after all adjustments have taken place, economic theory implies that immigration has distributional consequences: an immigration-induced supply shift produce losers as well as winners. In particular, standard economic theory suggests that immigration should reduce the outcomes of competing workers (who have skills similar to those of the migrants), and increase the outcomes of complementary workers (who have skills that complement those of immigrants). The relative wage must decline for the skill groups that experienced the largest immigration-induced supply increases. If immigrants are assumed to be less skilled than the average native worker, immigration will increase the average earnings of skilled native workers and decrease the average earnings of low-skilled native workers. However, if the skill distribution of immigrants is similar to that of natives, immigration will not affect the relative supply of skills and thus will not change the structure of wages.

In many host countries, immigrants cluster in a limited number of geographic areas. Some empirical studies exploit this fact to identify the labor market impact of immigration by comparing labor market conditions in “immigrant cities” with conditions in markets not affected by immigration (Card, 1990; Altonji and Card, 1991; Hunt, 1992). This “spatial correlation approach” is the first method used in various studies to determine how immigration affects the economic opportunities of natives. The typical study correlates wages and some measure of immigrant penetration across geographical areas (*i.e.* cities, states, regions). The results derived from this method do not suggest that workers living in areas penetrated by immigrants earn much less than workers in areas where few immigrants reside (Borjas, 1994; Friedberg and Hunt, 1995). From these studies, Friedberg and Hunt (1995, p. 42) therefore conclude that “the effect of immigration on the labor market outcomes of natives is small.”

However, three limitations have been provided to explain why the area approach may lead to biased results (Borjas et al., 1997; Dustmann et al., 2005). First, immigrants may not be randomly distributed across labor markets. If immigrants cluster in cities with thriving economies, there would be a spurious positive cor-

relation between immigration and local employment conditions. Second, local labor markets are not closed. Natives may respond to the immigrant supply shock by moving their labor or capital to other areas, thereby diffusing the impact of immigration over the country and *in fine* re-equilibrating the national economy. Thus, the findings of a negligible wage impact of immigration might arise because native workers respond to immigration by moving from the immigrant areas to the non-immigrant areas. Third, the “spatial correlation approach” generally uses a small sample size to calculate the penetration of immigrants across geographical areas (such as cities), whereas small sample sizes attenuate the estimated impact of immigration on wages (Aydemir and Borjas, 2011).

The studies by Friedberg (2001); Card (2001), as well as Borjas (2003) offer a reliable solution to address some of these limitations. To identify the wage impact of immigration, Friedberg (2001); Card (2001) divide the national economy into different skill groups defined in terms of “occupation.” This strategy should attenuate the possibility that natives may respond to immigration by moving their labor supply. However, as explained in Card (2001), natives might still move from an occupation to another. In order to neutralize the native response to immigration, Borjas (2003) thus divides the national labor market in different skill-cells defined in terms of both education and years of work experience. In fact, it is impossible for natives to suddenly become younger or older in order to avoid immigrant competition from an immigrant influx into particular experience groups, and it is very costly (and would take some time) for natives to obtain additional education.

The “national skill-cell approach” by Borjas (2003) thus identifies the impact of immigration from changes within education-experience cells over time.⁶ In other words, this approach examines how the evolution of wages in a narrowly defined skill group is affected by immigration into that group. Presumably, those skill groups that experienced the largest supply shocks would be the ones where wages either fell the most or grew the least. This approach has been implemented in multiple studies (*e.g.* for the United States, Canada, Norway), and they mostly underline a strong inverse relationship between wage changes and

⁶I use this approach in **Chapters I and II**.

migration-induced labor supply shifts. More specifically, they find that a 10% immigration-induced increase in workers within a skill-cell reduces the wages of natives in that cell by 3% to 4% (Borjas (2003); Aydemir and Borjas (2007); Bratsberg and Raaum (2012)). For Germany, Glitz (2012) finds no detrimental effect of immigration on the wages of competing natives but adverse employment effects due to immigration.

The fact that migrants may not be randomly distributed across skill-cells would lead the (OLS) estimates to be biased. Suppose that the labor market attracts foreign-born workers mainly in those skill-cells where wages and employment are relatively high. There would be a spurious positive correlation between the immigrant share and native outcomes (Borjas, 2003; Bratsberg et al., 2014). As a result, the previous estimates (given by the “national skill-cell approach”) should understate the true wage impact. This is consistent with Monras (2013) who finds a negative wage adjustment due to immigration by around 10% for the United States by using an instrumentation strategy.

Moreover, it is important to notice that the “national skill-cell approach” only captures a (i) within-cell and (ii) short-run effect of immigration. This method does not provide a full picture of the immigration impact on native outcomes (Ottaviano and Peri, 2012). First, this approach only estimates the within-cell effect of a particular immigrant influx on the wage of directly competing native workers (for given supply in other groups), without capturing the cross-cell effects on the wage of other natives. Second, this approach does not allow capital to respond to immigration; whereas in both medium- and long-run, capital accumulation is expected to offset the negative short-run impact of immigration (as predicted by standard economic theory). From agnostic approaches, the literature has therefore turned to structural methods so as to take account of these two additional channels through which immigration may impact worker outcomes.⁷

Structural methods impose a structure on the technology of the local labor market – *i.e.*, they assume a specific functional form for the aggregate production

⁷I use a structural method in **Chapters III** and **IV**.

function such as the Cobb-Douglas production function. Such assumption allows for the estimation of the complete set of factor price elasticities that determine how immigration affects the entire wage structure.⁸

Using a structural method (called the “structural skill-cell approach,” Borjas (2003); Borjas and Katz (2007) report evidence of an overall negative wage impact for the United States in the short-run and no detrimental effect in the long-run.⁹ Instead, Manacorda et al. (2012); Ottaviano and Peri (2012) find that immigration actually raises the average wage of native workers in the long-run. In their studies, the main losers from immigration are the previous waves of immigrants.¹⁰ These two opposite results point out the importance of the assumption about the degree of substitutability between natives and immigrants. Indeed, Manacorda et al. (2012); Ottaviano and Peri (2012) allow workers within education-experience cells to be imperfect substitutes while Borjas (2003); Borjas and Katz (2007) assume them to be perfect substitutes.

The degree of substitutability between natives and immigrants of similar education and experience is therefore crucial to determine how immigration impacts native outcomes. The question on how natives and immigrants of similar education and experience levels do interact in the production process has led to a growing literature on immigration economics (Borjas et al., 2012; Card, 2012; Ottaviano and Peri, 2012). A first set of empirical studies argues and finds that immigrants and natives of similar education and experience are perfect substitutes in production (Grossman, 1982; Jaeger, 1996; Borjas et al., 2012). Perfect substitutability means that immigrants and natives of the same education-experience level are perfectly interchangeable in the production process: immigrants and natives compete in the same labor market (*i.e.* for the same types of jobs). The perfect substitutability assumption thus implies that immigrants and natives (of

⁸The earliest studies on the labor market effects of immigration already used a structural framework (Grossman, 1982; Borjas, 1986).

⁹In the long-run, physical capital accumulation (due to immigration) offsets the negative short-run effect of immigration on wages.

¹⁰Severe limitations of structural methods are provided by Borjas et al. (2012); Borjas (2014). One of them relies on the use of a linear homogeneous aggregate production function to describe the economy. In effect, this assumption is not an innocuous as it constrains the average impact of immigration on wages to be negative in the short-run and to be zero in the long-run (depending on the extent to which capital has adjusted to the presence of the immigrant influx). In other words, structural methods “pre-determine” the mean wage impact of immigration wages.

similar education and experience) are equally productive and they have similar skills. The result of perfect substitutability is consistent with the previous studies (e.g., Borjas, 2003), which find that immigration has a negative effect on the wage of competing native workers.

Other studies challenge the idea that natives and immigrants are perfect substitutes within an education-experience cell (Manacorda et al., 2012; Ottaviano and Peri, 2012).¹¹ These studies find that immigrant and native workers of similar education and experience are not equally productive since they do not have the same types of skills. Therefore, immigrants and natives do not compete for the same types of jobs. In particular, Peri and Sparber (2009); Ottaviano and Peri (2012) argue that immigrants and natives differ in terms of language abilities, quantitative and relational skills, so they specialize in differentiated production tasks. Immigrants thus specialize in manual-intensive jobs for which they have comparative advantages, while natives of similar education and experience pursue jobs more intensive in communication tasks (Peri and Sparber, 2009). Because of this “within-group complementarity,” immigration therefore pushes some native workers into more cognitive and communication-intensive jobs that are relatively better paid and more suited for their skills (Peri and Sparber, 2009; Ortega and Verdugo, 2014). As a result, an immigration-induced supply shift within a skill-cell should increase the wage of native workers in that group through a reallocation of their task supply.

Since its introduction by Borjas (2003), the “skill-cell framework” has been widely used to study the labor market effects of immigration. However, this empirical framework may have some limitations. The classification of individuals into skill-cells based on their education-experience characteristics may be not appropriate, especially when immigrants work in occupations that do not correspond to their observed skills Dustmann and Preston (2012); Dustmann et al. (2013). In fact, “immigrants may compete with natives at parts of the skill

¹¹To the best of my knowledge, the first study which suggests that immigrants and natives may be imperfect substitutes is Ethier (1985).

distribution which are different to where they have been assigned due to their observed characteristics” (Dustmann and Preston (2012), p. 217). If immigrants considerably downgrade their skills, the pre-assignment of immigrants to skill-cells may therefore lead the “skill-cell framework” to provide biased estimates of the effects of immigration (Dustmann et al., 2013).¹²

For the United Kingdom, Dustmann et al. (2013) thus apply an alternative methodology. They estimate the wage effects of immigration along the distribution of native wages, without pre-assigning immigrants to skill-cells. They find that immigration exerts downward wage pressure below the 20th percentile of the wage distribution (where the density of immigrants is the highest). However, they find that immigration leads to slight wage increases in the upper part of the wage distribution (where the density of immigrants is the lowest). These two effects combined lead to a slight overall positive wage effects due to immigration.

Research Questions

Although there is an abundant literature on the labor market effects of immigration, there is still much to learn. In particular, the role played by (downward) wage rigidities in shaping the effects of immigration on native outcomes has been mostly overlooked in the existing literature. *What are the effects of immigration on the wages and employment of natives when the wage structure is rigid? If wages are rigid, how does native employment respond to immigration? What are the underlying mechanisms?* This dissertation is devoted to answer these questions through an empirical investigation. This investigation may provide new insights into the underlying mechanisms of the immigration impact. It may also help our understanding on how labor markets respond to supply shocks.

This dissertation is also devoted to examine and understand the distributional effects of immigration. *Who are the winners and losers from immigration? How*

¹²Since immigrants work in occupations requiring lower levels of education than they have, their pre-assignment to skill-cells may also produce an “illusion” of imperfect substitutability between natives and immigrants of similar education and experience (Dustmann and Preston, 2012). Actually, the measured imperfect substitutability would be the consequence of the misclassification of immigrants to skill-cells. Thus, “it may be misleading to conclude that immigrants and natives are intrinsically different types of input into production” (Dustmann and Preston (2012), p. 221).

does the skill composition of immigrants matter in determining their impact on the wage distribution of native workers, in particular when wages are rigid? Given the strong feminization of migrant flows, does immigration affect the gender wage gap?

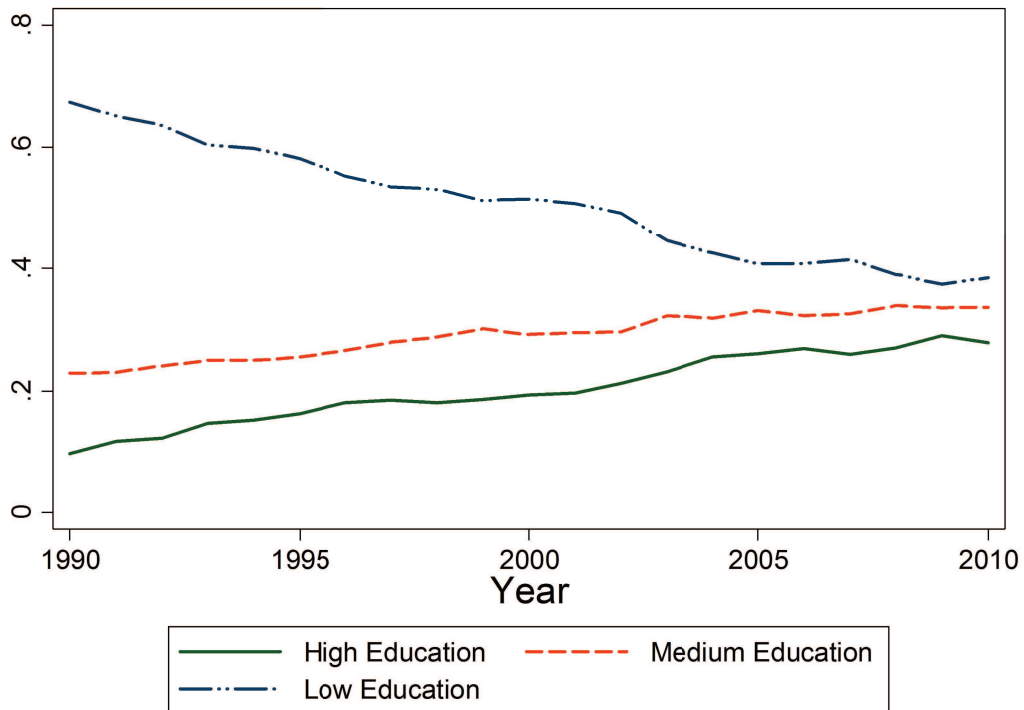
I use the French labor market to investigate these questions. I exploit a rich individual-level dataset available for the period 1990-2010. This pseudo-panel is based on the French annual labor force survey (LFS) produced by the French National Institute for Statistics and Economic Studies. Over the past two decades, the share of immigrants in the labor force climbed from 7% to 10%.¹³

The French labor market provides an excellent framework for examining the previous questions. First, France has a variety of institutional features that prevent wage adjustment following labor supply shocks. The French labor market is characterized by strict employment protection, a high minimum wage and generous welfare state benefits. It is also characterized by a high coverage of collective bargaining agreements, with more than 90% of employees covered by collective bargaining contracts. All these institutional dimensions affect the wage-setting mechanism (Babeckÿ et al., 2010), the reservation wage (Cohen et al., 1997) and the scope for bargaining, which in turn should have an impact on the responsiveness of wages to labor supply shocks (induced by immigration). The prevalence of wage rigidities in France is consistent with Card et al. (1999). They show that labor supply shocks have much less impact on the adjustment of wages in France because of wage rigidities, as compared to the United States and Canada.

Second, wage inequality between high and low educated workers has decreased continuously in France since 1970 (Charnoz et al., 2013; Verdugo, 2014). According to the French labor force surveys, the relative wage of high educated workers has decreased by around 15% since 1990.¹⁴ This pattern of inequality contrasts with various countries, such as Canada, the United-Kingdom and the United-States. These countries actually experienced a continuous and sharp increase in wage dispersion during the last thirty years (Krueger et al., 2010). The decline in wage inequality between high and low educated workers in France is

¹³While the flows of migrants has doubled over the period 1990-2000, they are relatively constant since 2002 with an average number of new entrants per year by around 200,000 (Thierry, 2004, 2010).

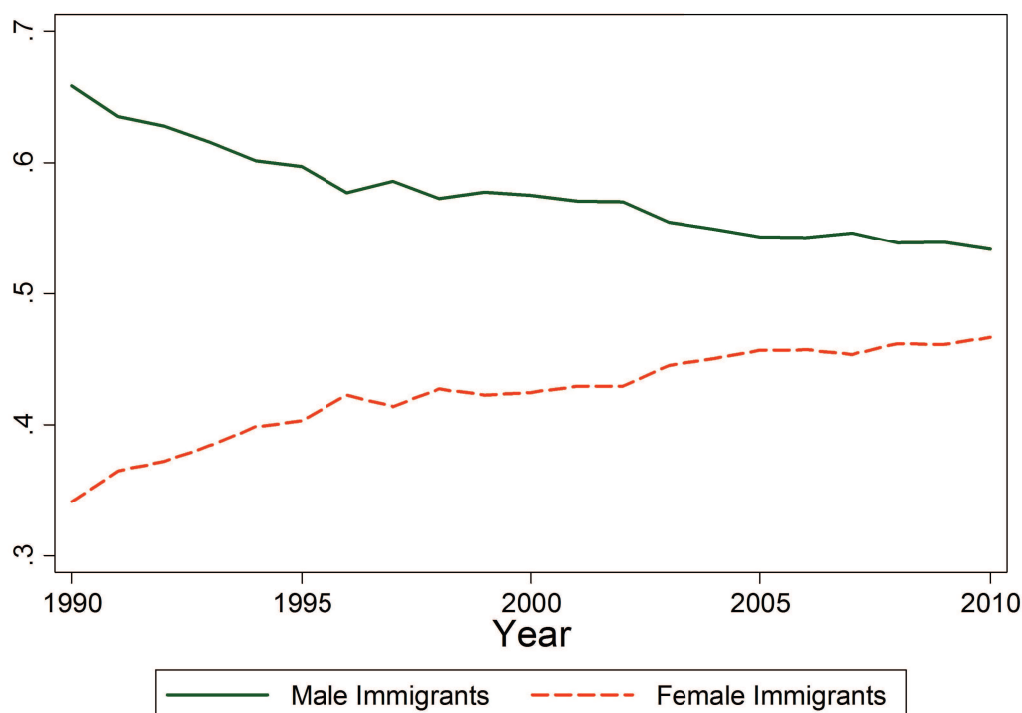
¹⁴The decline in wage inequality is mainly due to a lower increase in the wage of high educated workers than in the wage of low educated ones.

Figure 1: The Educational Distribution of Immigrants over Time

Notes. The Figure reports the shares of high, medium and low educated immigrants in the immigrant labor force between 1990 and 2010. The population used to compute these shares includes all immigrants participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

mainly explained by the increase in the educational attainment of the labor force (Charnoz et al., 2013; Verdugo, 2014).

At the same time, in France, immigration has disproportionately increased the number of high educated workers in the past two decades – *i.e.*, the immigrant contribution to the supply of skills has become increasingly concentrated in the higher educational categories. This is illustrated in Figure 1. While 10% of the immigrant labor force was highly educated (with a college education) in 1990, this share increased to 28% in 2010. By contrast, the share of low educated immigrants (below high school) in the immigrant labor force declined substantially from 67% in 1990 to 38% in 2010. The French labor market therefore provides an excellent framework to investigate whether or not immigration has contributed to the reduction of wage inequality between low educated and high educated workers.

Figure 2: The Gender Distribution of Immigrants over Time

Notes. The Figure reports the shares of male and female immigrants in the immigrant labor force between 1990 and 2010. The population used to compute these shares includes all immigrants participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

This investigation is also relevant to understand how the skill composition of immigrants matters in determining their impact on the wage distribution of native workers.

Third, immigration in France has disproportionately increased the number of female workers. Over the past two decades, immigration augmented the supply of female workers by more than it augmented the supply of male workers (see Figure 2). While 34% of the immigrant labor force was women in 1990, this share increased to 47% in 2010. Given the relative increase in the number of female immigrants, the French labor market provides an appropriate framework for examining how immigration have affected the gender wage gap.

Immigration to France: A Brief History

Before going any further, I document some historical findings about the past interactions between immigration and the labor market. A historical analysis is important to understand and contextualize the main results of this dissertation. The case of France during the first half of the twentieth century is very interesting. Over this period, France is the only European country to experience considerable immigration, most of the others experiencing emigration.

Historically, France is a country of labor immigration (Noiriel, 1992). “Large-scale immigration, and especially labor migration, has been an important structural feature of the evolution of the French nation-state and French capitalism since the late-nineteenth century” (Miles and Singer-Kérel (1991), p. 274). During the first half of the twentieth century (especially between 1891-1931), immigrants came to France to fill both the gap in demographic structures caused by the early reduction in fertility and slow population growth from the beginning of the nineteenth century; and the more specific gaps in certain sectors of the economy where labor was in greater demand (Singer-Kérel, 1991; Rystad, 1992).

Between both World Wars, France experienced the most important migration flows in terms of absolute numbers of people moving in the world (Noiriel (1988), p 21). The immigrant share in the total population was around 7% in 1931, as in 1982. During this period, the foreign labor force was predominantly male and unskilled (coming from Italy, Poland, Spain and Belgium), and they were extensively employed in “arduous sectors” such as the heavy industry (mining and chemicals), textile, industry or in the agriculture sector (Noiriel, 1988, 1992). As explained in Rystad (1992, p. 1184), “Foreign workers were primarily recruited to perform jobs which the native population avoided for various reasons, such as low wages, unclean or heavy duties or hazardous conditions.” More generally, historical researches underline the fact that immigrants accept jobs that native do not want *at the going wage* (Noiriel, 1986, 1988; Singer-Kérel, 1991; Blanc-Chaléard, 2001).¹⁵ Also, the immigrant population has the particularity to be more willing

¹⁵In other words, natives did not want to work in some of the jobs that immigrants have. This does not say, however, that natives would refuse to work in those jobs if the immigrants had never arrived and employers were forced to raise wages to fill the positions.

to accept lower wages than natives with similar skills. Some works suggest that immigrants are characterized by a greater “docility” and “vulnerability” compared to equally productive natives, so they may be relatively more attractive for firms (Gemahling, 1910; Déchaux, 1991). These differences between immigrants and natives partly explain why immigrants have been considered by labor unions and the native population as a threat for wages and employment during the first half of the twentieth century (Blanc-Chaléard (2001), p. 13, 27; Fayolle, 1999).

The sentiment that migrant competition is harmless for the native workforce also lead the French state to introduce Foreign Laws (1932, 1934) in order to protect domestic workers against foreign competition, especially in the 1930s given the massive unemployment of this decade (Singer-Kérel, 1989). These laws introduced quotas for immigrant workers throughout the economy and restrict public employment to French citizens.¹⁶ In addition, the French authorities decided to stop immigration and encouraged immigrants to return to their home country to protect the national workforce from unemployment. Similarly, the first oil crisis in 1973 and the rise of unemployment lead France to follow the example of other European countries and stopped all recruitment programs for foreign workers in 1974; after a period of massive inflow of immigrants (1956-1974) mainly from Portugal and North African countries (Ogden, 1991). After 1974, the end of the migration of foreign workers was followed by a new phase of migration associated with the process of family reunification (de Wenden, 1991).

Two main conclusions can be drawn from this historical background. First, history shows that the fear of labor market competition due to immigrants is not new and it is not directed toward specific wave of immigrants. Second, one explanation behind the sentiment that immigrants hurt native outcomes is related to the fact that immigrants are more willing to work at lower wages (and to exert more effort in production) than natives. The first part of this dissertation (**Chapters I and II**) is partly devoted to investigate how these dissimilarities between immigrants and natives can shape the labor market effects of immigration.

¹⁶However, these laws were perceived by the left wing party and labor unions as counter-productive since they would only reinforce the “vulnerability” of foreign-born workers on the labor market (Singer-Kérel, 1989, 1991). In order to protect native workers from foreign competition, the left wing party rather suggests forcing firms to pay foreign-born workers at decent wages, while unions advocated introducing a national minimum wage.

The Empirical Framework

The literature on immigration uses different empirical frameworks to measure the effects of immigration on the labor market. A part of the literature estimates the wage impact of immigration within localities or geographical area (Altonji and Card, 1991). Other studies use the national labor market to estimate the wage impact of immigration within skill groups. While Card (2001); Friedberg (2001) define the skill groups in terms of occupation, Borjas (2003) defines the skill groups in terms of educational attainment and work experience. Some empirical works extend the “national skill-cell approach” introduced by Borjas (2003) to account for the cross-cell effects induced by immigration (Aydemir and Borjas, 2007; Manacorda et al., 2012; Ottaviano and Peri, 2012).

In this dissertation, I investigate the labor market effects of immigration by decomposing the national labor market into skill group defined in terms of education and experience. On the one hand, I chose to study the labor market effects of immigration at the national level, rather than at the regional (or locality) level because “natives may adjust to the immediate impact of immigration in an area by moving their labor or capital to other localities” (Borjas (1987), p. 15). If immigration reduces the employment opportunities in certain regions, natives should move elsewhere. The internal flows of native workers may therefore diffuse the impact of immigration into geographic regions that were not directly affected by the immigrant influx, leading to bias results (Borjas, 2006).¹⁷ For instance, the estimated impact of immigration on the wages of natives within areas may be negligible not because immigration had no economic effects, but because the effects of immigration are diffused across the economy. Consequently, since immigration affects the labor market outcomes in every region (through the native migration response) and not only in regions with the highest concentrations of immigrants, I use the national level to examine the labor market effects of immigration.

On the other hand, I chose to define skill groups in terms of education and experience (Borjas, 2003), rather than in terms of occupation (Card, 2001). In fact, “individuals can move between occupations, and they would be expected to do

¹⁷This limitation also applies when the influx of immigration to an area is truly exogenous.

so if there is a relative oversupply of workers in a particular occupation” (Card (2001), p. 32). The response of natives to immigration should therefore undermine the ability to identify the impact from looking at effects within occupations. By shifting the focus of analysis to education-experience cells, the composition of the native workforce in each of the skill-cells is relatively fixed.¹⁸ The “skill-cell” unit of analysis therefore limits the “contamination bias” due to incentives among natives to respond to supply shocks.

The possibility that natives can move from a region or an occupation to another should bias the measured effects of immigration on wages. In particular, the negative (positive) effects of immigration on native wages should be underestimated (overestimated) when measured at both regional and occupational levels. The remaining of the section provides a preliminary analysis to show that this pattern is consistent with my data.

For each year of the data, I divide the French labor market (*i*) into 22 regions, (*ii*) into 22 occupations and (*iii*) into 24 skill-cells (three education groups and eight experience groups).¹⁹ The size of the immigrant-induced supply shock that affects regions, occupations or education-experience cells is measured by the share of immigrants in the total labor force.²⁰

Table 1 provides the estimated effects of the immigrant share on the monthly wage of (full-time) natives at the regional level, at the occupational level and at the skill-cell level. I use individual-level wage regressions (Friedberg, 2001; Bratsberg et al., 2014).²¹ I control for education, experience, job tenure and the type of job contract (short-term or permanent). I also use a vector of fixed effects indicating the region of residence, a vector of fixed effects indicating the occupation and a vector of fixed effects indicating the time period of the observation. Moreover, I control for within-cell variation in native labor supply since native supply shocks

¹⁸In the following the term “skill-cell” refers to education-experience cell.

¹⁹I pool all the cross-section observations over time (from 1990 to 2010). I follow most empirical studies and restrict my attention to individuals aged from 16 to 64, who are neither enrolled at school nor self-employed (farmers and entrepreneurs) and who have between 1 and 40 years of labor-market experience.

²⁰The share of immigrants p is defined as follows: $p = M/(M + N)$ with N and M the number of natives and immigrants in the labor force respectively.

²¹The total number of observations is the total number of full-time native workers. This number almost doubles when women are included in the sample.

Table 1: The Wage Effect of Immigration using Alternative Units of Analysis (1990-2010)

	Regional Level		Occupational Level		Skill-cell Level	
	Male	Male & Female	Male	Male & Female	Male	Male & Female
Immigrant Share	-0.009	-0.010	-0.030***	-0.026	-0.064***	-0.060***
T-statistics	(-1.24)	(-1.31)	(-3.01)	(-1.67)	(-4.82)	(-5.08)
Partial R ²	0.588	0.588	0.588	0.589	0.591	0.591
Observations	457,280	778,171	457,280	778,171	457,280	778,171

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level.

Notes. This table reports the estimated effects of the log share of immigrants in the labor force computed at the regional level, at the occupational level and at the skill-cell level on the monthly wage of natives. Standard errors are respectively adjusted for clustering within regions, occupations and skill-cells. Regressions are weighted using an individual weight computed by the INSEE.

should also affect wages (Bratsberg et al., 2014). Notice that the control variables are identical for each regression. In order to facilitate the interpretation of the coefficient on the immigrant share, I take the log of the immigrant share. Finally, since the share of immigrants vary either at the regional, occupational or skill-cell level, the standard errors need to be adjusted for clustering within region, occupation and skill-cells.

Table 1 shows that the estimated wage effects are sensitive to whether the labor market is defined at the regional level, at the occupation level or at the skill-cell level. The estimated coefficient is -0.01 at the regional level, increases to -0.03 at the occupational level, and jumps to -0.06 at the skill-cell level.²² Moreover, the estimates are not significant at the regional level. By defining the national labor market at the skill-cell level, the measured wage impact of immigration becomes much more significant for both samples than when it is defined at the occupational level.

These results indicate that the measured wage effect of immigration is less negative at both regional and occupational levels. This is perfectly consistent with

²²The last estimate implies that a 10% increase in the immigrant share due to an influx of immigrants is associated with a 0.6% fall in the monthly earnings of natives in that skill-cell. I discuss the magnitude of this estimate in the next section.

the idea that natives tend to respond to immigration by moving across regions and occupations, thereby diffusing the immigration effect from the affected local labor markets to the national economy. The insensitivity of wages to immigration at the regional level is also consistent with Borjas (2006). He shows for the United States that the native migration response strongly attenuates the measured impact of immigration on wages when the labor market is defined at the state level.

Hence, I cannot reject the possibility that a classification of individuals by region or occupation will not bias the estimated effects of immigration (due to native migration response) – at least in my data. Consequently, I choose to use the “national skill-cell approach” introduced by (Borjas, 2003) to study the effects of immigration on the labor market outcomes of natives.²³

Main Findings and Contributions

This dissertation is composed of two main parts. Both parts claim that immigrant and native workers are perfect substitutes in production.²⁴ **The first part of the dissertation** exploits the “national skill-cell approach” (Borjas, 2003) in order to estimate the within-cell effects of immigration on native outcomes. It is important to recall that this approach only captures the short-run impact of immigrants on the labor market outcomes of natives who have similar skills. In the first part of the dissertation, I therefore ignore all the cross-cell effects of immigration on the outcomes of natives who have different skills, as well as the labor market adjustments induced by immigration in the medium- and long-run. This part of the dissertation underlines several contributions.

- I use the same framework of analysis to examine the labor market effects of immigration on three distinct native outcomes: the probability to be employed, wages, and the employment rate to labor force. While most

²³The estimates of Table 1 also suggest that immigrants and natives with similar education and experience are likely to work in similar occupations (Steinhardt, 2011; Dustmann et al., 2013). This implies that a skill-cell analysis is more appropriate (at least in France) to capture the competitive effects of immigrants on native outcomes compared to a classification by occupation.

²⁴This result is specific to France over the period 1990-2010 only. It should not be generalized to other countries or other time period of the French history. For instance, during the first half of the twentieth century, the recruitment of foreign labor aimed at alleviating the important shortages in the domestic supply of labor, so that immigrants were likely to complement the native workers of similar education and experience (Spengler, 1951; Syme, 2000).

Table 2: The Effects of Immigration on the Outcomes of Competing Natives

	Employment Probability	Monthly Wages	Employment Rate
All Immigrants	-0.6 pp	-0.6 %	-3.0 %
Due to Non-European	-1.0 pp	-1.0 %	-3.0 %
Due to European	0.0 pp	0.0 %	0.0 %
Due to Naturalized	0.0 pp	0.0 %	0.0 %

empirical studies investigate the effect of immigration on wages, few of them examine how native employment responds to immigration. Moreover, the investigation of the effects of immigration on various outcomes allows me to investigate the mechanisms behind the immigration impact. Table 2 summarizes the main results.

- I show for France that immigrants decrease the outcomes of natives who compete with them (at least in the short-run). First, I find that immigration has a negative impact on the natives' probability to be employed. A 10% increase in the immigrant share²⁵ reduces the employment probability of natives in that cell by 0.6 percentage points (pp). Second, immigration has a very small negative effect on wages. A migration-induced labor supply shift of 10% in the supply of labor is associated with a 0.6% movement of monthly wages in the opposite direction.²⁶ Finally, I find that immigration decreases the employment rate of natives with similar education and experience: a 10% increase in the immigrant share due to an influx of immigrants is associated with a 3% fall in the employment rate of natives in that skill-cell.
- While I find small wage effects due to immigration, the literature indicates a within-cell adjustment of wages by 3-4%. In order to show that this difference in magnitude is due to the prevalence of downward wage rigidities

²⁵In the past two decades, the share of immigrants in the French labor force increased by 42.9% (from 7% in 1990 to 10% in 2010).

²⁶By way of comparison, my estimates also imply that an additional year of schooling raises the monthly wages of natives by 3%. Moreover, an additional year in the same firm increases the monthly wages of native workers by 1%.

in France, I decompose the sample of native workers according to their employment contracts (short-term/permanent). I find that permanent contracts – which are characterized by high firing costs, strict employment protection legislation and indefinite-term – have a strong effect on downward wage rigidity. Actually, the very small sensitivity of wages to immigration is mainly due to the fact that 90% of native workers have permanent contracts. Whereas permanent contracts workers are protected from wage cuts, I find that the population of natives under short-term contracts experiences important wage losses due to immigration.

- This dissertation digs into the interpretation behind the negative effects of immigration on the wages and employment of competing native workers. One important reason behind these effects is that immigrants have lower outside options (as well as different cultural norms)²⁷ than natives. In particular, I find that immigrants are more willing to accept lower wages and harder working conditions than equally productive natives. While immigrants and natives are equally productive (or perfect substitutes), they are not equally profitable for firms. Therefore, an immigration-induced increase in workers within a skill-cell weakens the bargaining power of natives (since firms have another and cheaper source of labor to draw from), and thus their (bargained) wages. Immigrants, being relatively more attractive for firms, moreover displace some native workers in the production process.
- I systematically decompose the immigrant population into three groups: the non-European immigrants (coming from the non-EU15),²⁸ the European immigrants (coming from the EU15) and those immigrants who acquired the French citizenship (*i.e.*, the naturalized immigrants).²⁹ The purpose of this disaggregation is to test whether the negative wage and employment effects are due to differences in outside options between natives and immi-

²⁷For instance, the wage reference of immigrants is very likely to be lower than for similarly skilled natives since they typically come from countries with inferior labor market outcomes (lower wages or higher unemployment).

²⁸The population of non-European immigrants is likely to be heterogeneous. However, I do not decompose this group due to data constraints and identification issues.

²⁹Immigrants can become naturalized (through citizenship acquisition) or stay non-naturalized.

grants. In fact, both European and naturalized immigrants enjoy far more privileges due to the single-market and the French citizenship as compared to the non-European immigrants. The European and naturalized immigrants therefore have much higher outside options. Consequently, it should be less profitable for firms to hire European and naturalized immigrants relative to non-European immigrants. In accordance with this expectation, I find that the negative effect of immigration on the wages and employment of competing natives is mainly driven by the supply of non-European immigrants – those immigrants who have lower outside opportunities and different cultural norms than natives. This result also emphasizes that the labor market adjustment caused by influx of migrants is masking important country distinctions.

Although the skill-cell approach provides interesting results, it does not fully capture how immigration changes labor market opportunities for the native-born. In fact, the skill-cell approach does not account for the cross-cell effects of immigration (between immigrants and natives who are not competing in the same skill-cell). In order to capture the within- and cross-cell effects of immigration on native wages, **the second part of the dissertation** uses a structural method called the “structural skill-cell approach” (Aydemir and Borjas, 2007; Manacorda et al., 2012; Ottaviano and Peri, 2012).³⁰ Since the French wage structure does not adjust perfectly to immigrant-induced labor supply shifts, I allow the structural model to account for wage rigidities (D’Amuri et al., 2010).

The short-run simulations indicate an overall negative effect of immigration on native wages by around 0.6%.³¹ The long-term simulations (once capital has

³⁰Structural methods are also widely used by the literature on the wage structure and wage inequality (Katz and Murphy, 1992; Autor et al., 2008; Goldin and Katz, 2009; Verdugo, 2014).

³¹The prediction of this structural model closely correspond with the one predicted by the non-structural wage elasticity presented in Table 2. The similarity of results between structural methods and agnostic approaches is also found in Borjas (2003); Aydemir and Borjas (2007). Using the “structural skill-cell approach” (Aydemir and Borjas, 2007) and the “traditional” skill-cell approach (Borjas, 2003), both studies find, in the short-run, that a 10% rise in the immigrant labor supply within a skill-cell is associated with a 3% movement of wages in the opposite direction in that cell.

Table 3: Simulated Wage Impact of 1990-2010 Immigrant Influx on the Wages of Natives

	All Natives	High Education	Medium Education	Low Education	Male	Female
French Wages	0.0 %	-0.96 %	0.24 %	0.43 %	0.06 %	-0.11 %
Flexible Wages	0.0 %	-2.22 %	0.45 %	1.11 %	0.11 %	-0.25 %

fully adjusted) indicate no average impact of immigration on native wages. I also study the distributional effects of immigration by education and gender. Over the past two decades, I find that immigration has produced losers and winners among the native workers. The second part of the dissertation emphasizes three main contributions (Table 3).

- The skill composition of immigrants matters in determining their impact on the wages of native workers in the long-run. Because the supply shocks of immigrant labor to France has been greater for high educated workers, I find that low educated natives have gained relative to high educated natives. The long run simulations indicate a drop of 0.96% in the relative wage of highly educated native workers, a 0.24% gain in the relative wage of workers in the middle of the education distribution, and an increase in the wage of low educated natives by 0.43%.³² As a result, immigration-induced shocks to French labor supply have had a negative effect on the relative wages of high educated natives, thus reinforcing a labor market trend to lower wage inequality. More specifically, I find that immigration accounts for about 18% of the reduction of wage inequality between high and low educated workers in France.³³

³²The simulated results have a *ceteris paribus* interpretation. The simulations yield the change in wages due to immigration only, without accounting for the other factors that may affect native wages.

³³In the data, I find that the wage gap between the high educated workers and low educated workers has decreased by 15% since 1990. The simulations imply that immigration has reduced the relative wage of high educated native workers by 2.7%. Thus, 18% of the decrease in wage inequality can be attributed to immigration only. See **Chapter III** for details.

- Immigration to France has increased gender wage inequality over the past two decades. In particular, the long-term effects of immigration are detrimental for the relative wage of female natives. The long-run simulations reveal that immigration has lowered the wage of female natives by 0.11% and increased the wage of male natives by about 0.06%. This asymmetric impact is due to the facts that immigration has disproportionately increased the number of female workers, and also that men and women of similar education are imperfect substitutes in the production process. This result has an important implication: the increasing feminization of immigration in the world may damp a labor market trend to lower earnings inequality between (native) men and women in developed countries.
- Finally, the last row of Table 3 underlines the role played by wage rigidities in reducing the impact of immigration on wage inequalities. When wages are perfectly flexible, the positive and negative wage effects induced by immigration are both larger. Thus, the immigration impact on the relative wage of (i) high educated natives and (ii) female natives is more detrimental when I assume the French wage structure to be perfectly flexible.

Description of the Chapters' Content

Chapter I examines the effects of immigration on the outcomes of competing native workers over the period 1990-2002. This chapter underlines some important characteristics of the immigrant population. I show that foreign-born workers have a 2-3% lower wage and they are more likely to do late hours, and work at night or on the weekends compared to natives with similar human capital and job characteristics. A reason behind this gap in employment conditions is that immigrants are more willing to accept lower wages and harder working conditions.³⁴

This interpretation is supported by the fact that immigrants often have lower outside options compared to natives, such as lower job market opportunities. The notion that immigrants have lower outside options is supported by Wilson

³⁴Notice that the prevalence of downward wage rigidities in France is not inconsistent with the fact that firms can hire immigrants at lower wages than incumbent workers. Besides, hiring at lower wages is a well-used strategy in France to achieve labor cost flexibility. (Babeckÿ et al., 2012).

and Jaynes (2000); Sa (2011); Foged and Peri (2013); Malchow-Møller et al. (2012); Battisti et al. (2014). Immigrants also have different cultural norms than equally skilled natives (Sayad, 1999; Constant et al., 2010) and they typically come from countries with lower labor market outcomes (lower wages and higher unemployment). Hence, their expectations about their wages and working conditions are lower than similarly skilled natives – *e.g.*, because their reference is the prevailing employment conditions in their country of origin (Wilson and Jaynes, 2000).

While immigrants and natives are equally productive (or perfect substitutes), they are not equally profitable for firms. In fact, the employment of immigrants may help firms to reduce their production costs, as well as to provide them with additional flexibility firms might need to adjust their production level. In addition, immigrant may be relatively more attractive for firms because they are less likely to disrupt the production process than comparable native workers (Sa, 2011).

These dissimilarities between natives and immigrants should have important implications in terms of how native outcomes may respond to an immigration-induced supply shift. In fact, as indicated in Friedberg (2001, p. 1379), the negative wage effect due to immigration should “be magnified if immigrants are prepared to work for less than natives.” In order to examine this implication, I use the skill-cell approach by Borjas (2003) since this econometric strategy allows capturing the own-effect of immigrants on the outcomes of competing natives.

However, I find that immigration has no detrimental impact on the wages of competing natives. This result is consistent with the prevalence of downward wage rigidities in France. In order to show that the insensitivity of wages to immigration is due to wage rigidities (rather than to a statistical artefact), **Chapter I** digs more deeply into the source of downward wage rigidities. For a panel of European countries, Babecký et al. (2010) show for European countries that permanent contracts – which are characterized by high firing costs, strict employment protection legislation and indefinite-term – have a strong effect on downward wage rigidity. I therefore decompose the native workers into two groups according to whether they hold short-term or permanent contracts. In line with Babecký et al. (2010), I find that the insensitivity of wages to immigration is even more striking for the

population of native workers under permanent contracts. However, the native workers under short-term contracts (*i.e.*, fixed duration contracts or “contrats à durée déterminée”) experience wage losses due to immigration.

While immigration has no detrimental effect on average wages, the empirical analysis shows that immigration depresses the employment of competing native workers. The estimates imply that a 10% increase in the size of the skill-cell due to immigrants reduces the employment probability of natives in that cell by 3%. Since immigrants are relatively more attractive for firms (while they are identical to natives in all other respects), a substitution mechanism operates between natives and immigrants. In order to test for this channel of interest, I exploit the heterogeneity of migrants with respect to their nationality by using a two-way breakdown of the immigrant population: naturalized and non-naturalized immigrants. The relevance of the decomposition by citizenship status is based on the fact that immigrants who acquired the French citizenship are, by definition, not restricted in terms of rights. Moreover, naturalized immigrants are, on average, more integrated (DeSipio, 1987; Portes and Curtis, 1987). With higher levels of outside options and integration, the naturalized immigrants tend to be similar to natives, and therefore, they should have very close labor market behaviors. In this regard, the last finding of **Chapter I** reports that the detrimental employment effect of immigration is completely driven by the presence of non-naturalized immigrants (and especially, the non-European immigrants). These results indicate that when migrants and natives share similar outside options as well as similar cultural norms, immigration no longer affects native employment.

One important finding of **Chapter I** is that average wages are perfectly insensitive to labor supply shocks induced by immigration. Although the French labor market is characterized by rigid institutions, it may be too restrictive to admit that French wages do not respond to immigration. Moreover, two methodological considerations can be raised to understand why my earlier estimates do not necessarily provide the true wage effect of immigration. First, the national-level immigrant share (used in **Chapter I**) may be endogenous because persons

who are attracted to migrate to France might belong to the skill-cells that offer a relatively high payoff (Borjas, 2014, p.94). This behavior would imply that my estimates reported in **Chapter I** understate the true wage impact of immigration. Therefore, it might be that the true effect of immigration on the wages of competing is actually negative, albeit small. Second, the skill-cell approach uses a wide range of fixed effects to isolate the wage impact of immigration, and therefore captures most variance of the dependent variable. This may lead my estimates to be insignificant.

As a result, the aim of **Chapter II** is to extend the empirical analysis of **Chapter I** by digging more deeply into the effects of immigration on the wages of competing native workers. The methodology used in **Chapter II** differs from the skill-cell approach (Borjas, 2003), in the sense that I do not aggregate the dependent variable by skill-cells. This allows me to implement individual-level wage regressions. However, I still use the share of immigrants in the labor force computed for different education-experience cells as the regressor of interest (as in the “traditional” skill-cell approach). This “individual-level” methodology induces important differences with the skill-cell approach. First, this approach deals with a larger number of observations to run regressions as they are implemented at the individual level. This strategy may therefore provide a significant relationship between immigration and wages since a larger number of observations “has the advantage of added efficiency” (Friedberg (2001), p. 1384). In order to increase the number of observations, I moreover use an additional wave of data from 2003 to 2010, so I can study the wage effect of immigration over a longer period of analysis (1990-2010). Second, individual-level wage regressions require controls at the individual-level (rather than at the skill-cell level). Thanks to the rich individual-level data from the French LFS, I use a wide range of controls (such as age of completion of schooling, work experience, job tenure, occupation, region of residence, etc.).

The empirical results indicate that a 10% increase in the share of immigrants in an education-experience cell decreases the monthly wages of similar natives by about 0.6%.³⁵ The finding of an inverse relation between immigrant-induced

³⁵To isolate the causal within-cell effect of immigration on native outcomes, I use historic

supply shifts and wages complements the results provided in **Chapter I**. However, in comparison with the literature who generally shows a wage reduction by 3-4%, my estimates indicate a modest negative impact of immigration on the wages of competing native workers. This sizeable contrast suggests that labor market institutions do play an important role in determining the wage effects of immigration. In addition, I decompose the immigration impact on wages across a wide set of occupations. I find that the negative wage effects due to immigration are mainly concentrated within low-skilled occupations. By contrast, the wages of native workers in high- and medium-skilled occupations are much less affected by immigration. Actually, this result is consistent with the literature on wage rigidity (Campbell III and Kamlani, 1997; Babecký et al., 2010), which reports that white-collar wages are much more rigid (and much less responsive to economic shocks) than blue-collar wages. One explanation is that firms are reluctant to cut the wages of white-collar workers because their effort are difficult to monitor and more valuable (in terms of value-added).

An important part of **Chapter II** is also devoted to investigate one potential mechanism through which immigration can depress the wages of competing natives. I show that a higher share of foreign-born workers (within a skill-cell) weakens the bargaining power of natives by improving the firm's outside option. By decreasing the bargaining position of competing natives with respect to firms, immigration thus affects wage formation and decreases native wages. This result is consistent with historical studies (Noiriel, 1986; Singer-Kérel, 1991; Blanc-Chaléard, 2001) which emphasize the hostility of unions against immigrants during the first half of the twentieth century, and in parallel, the supports for immigration by employers.

In order to show that immigration affects the bargaining position of native workers, my strategy relies on McDonald and Solow (1981); Cahuc and Zylberberg (2004) who explain that wages partly depend on the "probability of finding alternative jobs." In order to investigate this dimension, I examine how the employment probability of competing natives is affected by the supply of migrants. I show that immigration reduces the employment probability of native workers.

immigration patterns as instruments for migrant inflows.

Under the assumption that the employment probability is positively correlated with the bargaining power of workers (McDonald and Solow, 1981; Cahuc and Zylberberg, 2004), my results therefore indicate that immigration weakens the bargaining power of competing natives.

Finally, **Chapter II** analyzes the extent of labor market competition between natives and different groups of migrants. As in **Chapter I**, this decomposition aims at distinguishing immigrants according to their levels of outside options and integration. I disaggregate the immigrant population into three nationality groups: the European immigrants, the non-European immigrants and the naturalized immigrants.³⁶ Given the fact that the European countries prohibit any kind of discrimination between native-born and immigrants in terms of labor market accessibility and welfare state benefits eligibility, European immigrants are expected to have higher outside opportunities than non-European immigrants. Also, the European immigrants are very likely to have closer cultural norms than the non-European ones. As a result, I show that the depressive immigration impact on native outcomes is entirely driven by a change in the supply of immigrants coming from outside Europe. In accordance with **Chapter I**, the labor market effects of immigration are mainly driven by the migrants who have the lowest outside options.

In both **Chapters I** and **II**, I focus on the short-run effects of immigration on the outcomes of competing natives. I thus omit potential capital adjustments that may happen in the long-run, a channel that should attenuate the negative short-run impact of immigration. Also, both chapters examine the labor market effects of immigration on competing native workers. They only provide within-cell estimates.

In **Chapter III**, I estimate not only the effect of a particular supply shift on the wages of competing workers, but also the cross-effects on the wages of workers with different education and experience levels. This chapter also examines the

³⁶We classify migrants as European if they come from the EU15 countries plus Norway, Iceland and Liechtenstein (as members of the European Economic Area) and Switzerland (through a bilateral agreement).

long-run effects of immigration on wages, by considering the mechanism of capital adjustment over the period 1990-2010.

Chapter III exploits the “structural skill-cell approach” (Borjas, 2003; Manacorda et al., 2012; Ottaviano and Peri, 2012). As shown in **Chapters I** and **II**, the French wage structure does not adjust perfectly to immigrant-induced labor supply shifts. The structural model thus incorporates wage rigidities as in D’Amuri et al. (2010) to account for the sluggish adjustment of the French labor market.

I find no detrimental effect of immigration in the long-run. The short-run simulations rather indicate that immigration have widened the French wage structure by only 0.6%. This prediction of the structural model closely correspond with the one predicted by the non-structural wage elasticity presented earlier. While both estimates reinforce each other, they also point to the dampening effect of wage rigidities in France.

Chapter III also focuses on the distributional effects of immigration. I show that the skill mix of immigrants matters in determining their impact on the wages of native workers. Since immigrants to France has been disproportionately high educated in the past two decades, I find that immigration has reduced the wage of highly educated native workers by about 1% and has contributed to raise the wage of low educated ones by 0.5%. Thus, immigration-induced shocks to French labor supply have served to reduce wage inequality between low educated and high educated workers. In particular, the simulations imply that immigration explains one-fifth of the decrease in wage inequality over the 1990-2010 period – *i.e.*, immigration has been a crucial factor in accounting for the drop in the relative wage of high educated workers in France. This result echoes the study by Aydemir and Borjas (2007) which shows that immigration has narrowed wage inequality in Canada, and increased wage inequality in the United States over the past decades. These results are consistent with the facts that immigration has disproportionately increased the number of high-skilled workers in Canada, while immigrants to the United States have become disproportionately low-skilled.

In order to offer some guidance with respect to immigration policy, **Chapter III** simulates the impact of different policies with respect to migration. The simulations show, in particular, that selective migration policies in favor of highly

educated immigrants reduce wage inequality by far less than when they promote low educated immigration. I also find that these effects are larger under a scenario when I assume wages to be perfectly flexible.

One of the most significant migration trends in the recent years has been the feminization of the migration population (Zlotnik, 2003; Omelaniuk, 2005), especially in France where immigration has greatly increased the relative number of female workers (see Figure 2 above). **Chapter IV** thus extends the analysis of **Chapter III** by investigating the effects of the increasing feminization of migrant flows on the gender wage gap. This question is of particular interest as men and women of similar observable characteristics tend to not compete for the same type of jobs – *i.e.*, within an education-experience cell, men and women are likely to be imperfect substitutes. In fact, this imperfect substitutability should protect the relative wage of male natives from an immigration-induced increase in female workers.

In accordance with multiple studies (Anker et al., 1998; Blau et al., 2002), **Chapter IV** firstly reports a great deal of occupational segregation between men and women. For instance, I find a disproportionate concentration of women in non-manual skilled occupations. Similar results are found by Sikora and Pokropek (2011). They show that, in almost all countries, girls lead boys in their interest in non-manual occupations. Moreover, **Chapter IV** finds that occupational segregation by gender is more important than occupational segregation by nativity status.³⁷ Similar results are found for the United Kingdom (Dustmann et al., 2007) and Spain (Amuedo-Dorantes and De La Rica, 2011). This preliminary analysis suggests that men and women of similar education and experience may be imperfect substitutes.³⁸

The literature in economics, sociology and psychology points to numerous drivers of this imperfect substitution. Within an education-experience cell, men

³⁷This implies that the imperfect substitutability between similarly educated men and women is consistent with both findings of imperfect and perfect substitutability between natives and immigrants.

³⁸By imperfect substitutability, I mean that men and women are not competing for the same types of jobs.

and women may have different skills, and therefore different productive characteristics. In this regard, Croson and Gneezy (2009) identify strong gender differences in attitudes and behaviors, aversion to competition and overconfidence. These different productive characteristics should lead employers to prefer men or women to perform certain jobs or functions. Also, men and women of similar education may differ in terms of their physical and relational skills, leading (i) men to be overrepresented in physically arduous sectors (such as construction) and (ii) women to perform some jobs related to service and social interaction (Charles and Grusky, 2005).

Men and women may not compete for the same types of jobs for an additional reason. Actually, gender discrimination and sexist considerations among employers may lead them to prefer men over women (or women over men) in the production process. The behaviors of employers should therefore produce some imperfect substitutability between men and women (even if they are equally productive).

Within an education-experience cell, men and women seem to be imperfect substitutes. In **Chapter IV**, I explicitly test whether or not men and women of similar education and experience are imperfect substitutes. I find that men and women are imperfect substitutes in the production process. As a result, **Chapter IV** extends the structural framework used in **Chapter III** by allowing men and women of similar observable characteristics to be imperfect substitutes.

Given (i) the fact that immigrants in France tend to be disproportionately female and (ii) the “within-group complementarity” between men and women, the long-run simulations indicate heterogeneous wages effects across gender: native women are losing while native men are gaining from immigration. Phrased differently, the feminization of the immigration workforce increased the gender wage gap in France over the past two decades. This result has an important implication: the increasing feminization of international immigration may damp a labor market trend to lower earnings inequality between men and women in developed countries.

CHAPTER 1

The Impact of Immigration on the Wages and Employment of Competing Native Workers

1 Introduction

The literature in economics has stressed two important considerations when estimating the effects of immigration on the wages of natives. First, a particular immigration-induced supply shift does not only affect the wages of directly competing native workers. Immigration also induces complementarity effects on the wages of natives with different skills. In order to estimate the overall wage effect of immigration, economic studies thus have to capture both direct and complementarity effects induced by immigration (Ottaviano and Peri, 2012).

Second, immigrant-induced supply shocks lead to economic adjustments in the medium- and long-run. In this regard, the literature points out the important role played by capital accumulation (in response to immigration) in shaping the wage effects of immigration (Ortega and Peri, 2009; Ottaviano and Peri, 2012; Borjas, 2013). Accounting for capital accumulation, Aydemir and Borjas (2007); Borjas and Katz (2007) find no detrimental wage impact of immigration, while other studies find positive wage effects (Manacorda et al., 2012; Ottaviano and Peri, 2012; Brücker and Jahn, 2011; Dustmann et al., 2013).¹

These findings naturally contrast with the negative wage effect documented in studies estimating partial *and* short-run effects of immigration on competing natives (see, *e.g.*, the studies by Borjas (2003, 2008b); Orrenius and Zavodny (2007) for the United States and Puerto Rico; Aydemir and Borjas (2007) for Canada; Bratsberg and Raaum (2012); Bratsberg et al. (2014) for Norway). In the short-run, some empirical works also find depressive employment effects due to immigration (Angrist and Kugler, 2003; Glitz, 2012). This set of studies is consistent with the general sentiment that the native population suffers from the competition with equally skilled immigrants (Bauer et al., 2001; Mayda, 2006). These beliefs are particularly stringent in Europe where one in two EU citizens is afraid of job losses due to immigrants (Thalhammer et al., 2001).

The sentiment that immigrants take jobs away from natives is partly based on the idea that immigrants and natives with similar skills differ considerably in their propensity to bargain over wages and working conditions. In particular,

¹Manacorda et al. (2012); Ottaviano and Peri (2012) rather show that immigration decreases the wages of previous immigrants.

immigrants are generally viewed as more willing to accept lower wages and to exert more effort in production than competing natives. This dissimilarity may therefore lead firms to substitute immigrants for equally skilled native workers.

In the present paper, I examine this new issue by focusing on the direct effects of immigration on the wages and employment of competing native workers in the short-run.^{2,3} The study focuses on the French labor market for two main reasons. First, France provides an excellent framework to *also* examine the role played by wage rigidities in shaping the labor market effects of immigration, a dimension that has been mostly overlooked in the existing literature. The French labor market is characterized by a wide set of institutional features which should affect the responsiveness of wages to immigrant-induced supply shocks (Card et al., 1999; Saint-Paul and Cahuc, 2009), such as minimum wage laws, generous unemployment benefits, collective bargaining coverage and strict employment protection. Second, a rich dataset is available for France. It provides a wide set of demographic, social and employment characteristics at the individual level. These micro-level data are provided from 1990 to 2002, a period over which the share of migrants in the labor force increased from 6.5% to 8.5%.⁴

The richness of the French data allows to show a strong dissimilarity between immigrants and natives in terms of employment conditions. Controlling for a wide range of observables (such as education, experience, job tenure, region of residence and occupation), I find that foreign-born workers exhibit a 2-3% lower wage and they are more likely to do late hours, work at night or on the weekends than similar natives. A reason behind this gap in employment conditions is that immigrants are more willing to accept lower wages and harder working conditions than equally productive natives.

This interpretation is supported by the fact that immigrants have lower outside options (Foged and Peri, 2013; Malchow-Møller et al., 2012; Battisti et al., 2014),

²I use the terms immigrant and foreign-born interchangeably here to refer to all individuals born outside France to parents who are not French citizens.

³The present research aims at focusing exclusively on the partial elasticity of native outcomes to immigration in the short-run. See Edo and Toubal (2014a) for a long-run analysis on the overall impact of immigration on wages in France.

⁴Over this period, the average number of new entrants by year is around 145,000 (Thierry, 2004).

such as lower job market opportunities.⁵ Immigrants also have different cultural norms than natives, so their expectations about their wages and working conditions are lower than similarly skilled natives (Sayad, 1999; Constant et al., 2010) – *e.g.*, immigrants may be more willing to work at lower wages because their reference is the prevailing wage in their country of origin (Wilson and Jaynes, 2000). The discrepancy between natives and immigrants in terms of outside options and cultural norms is consistent with Constant et al. (2010) who find (for Germany) that immigrants have lower reservation wages (*i.e.* the crucial wage above which an individual is willing to work) than equally skilled natives.

As a result, immigrants may be relatively more attractive/profitable for firms than equally productive natives.⁶ In fact, the employment of immigrants may help firms to reduce their production costs, as well as to provide them with additional flexibility firms might need to adjust their production level. In addition, immigrant workers are less unionized, less informed about the employment protection legislation and less likely to claim their rights (Sa, 2011). Thus, immigrant workers should be less likely to disrupt the production process than comparable native workers.

While immigrants and natives of similar education and experience are equally productive, they are not equally profitable for firms. According to Friedberg (2001, p. 1379), if “immigrants are prepared to work for less” (while they are similar to natives in all other respects), an immigration-induced increase in the number of workers should have a strong depressive impact on the wages of competing natives. However, in France, immigration should have a negligible impact on wages due to rigid institutions. Then, the question is how the employment of natives will be affected by immigration, especially when immigrants are relatively

⁵For instance, immigrants (especially non-citizens) have a limited access to public sector jobs. These employment restrictions apply in many countries, such as Canada (DeVoretz and Pivnenko, 2005) and the United-States (Yang, 1994; Bratsberg et al., 2002).

⁶Here, I assume that immigrant and native workers belonging to a particular skill group (*i.e.*, immigrants and natives who are equally educated and have the same age) are interchangeable in production or, more precisely, “perfect substitutes”. In appendix, I show that this assumption is verified in my data. Similar results are also found by Edo and Toubal (2014a) for France over the period 1990-2010. Perfect substitutability implies that immigrants and natives of similar education and experience are equally productive – *i.e.*, one unit of immigrant labor produces the same amount of output as one unit of native labor. While immigrants and natives are equally productive (or perfect substitutes), immigrants are however more willing to accept lower wages and harder work conditions.

more attractive for firms.⁷

I use the “national skill-cell approach” by Borjas (2003) to investigate the labor market effects of immigration in France. This econometric strategy allows me to capture the own-effect of immigrants on the wages and employment of competing natives in the short-run. In the empirical analysis, I find that immigration does not affect the wages of competing native workers. This result is consistent with a wage structure that is rigid in France. However, since immigrants are relatively more attractive for firms, immigration decreases the employment of competing native workers – *i.e.*, immigrants replace native workers in production. The baseline estimate implies that a 10% increase in the share of immigrants relative to the native workforce in an education-experience cell decreases the employment rate of male natives by about 3%.⁸

The findings regarding the wage and employment responses to immigration support and generalize those of Glitz (2012) for Germany. Within the same regional residence and skill groups, he also finds no detrimental effects of immigration on native wages but adverse employment effect of immigration. The present study also echoes the results by Angrist and Kugler (2003), which show evidence of a negative effect of immigration on native employment for a panel of European countries, where labor market rigidities are prevalent. The present paper goes beyond these studies and contributes to the literature by extending the analysis to the underlying mechanisms behind the outcome reactions of natives – *i.e.* the insensitivity of wages and the negative employment effects induced by immigration.

On the one hand, I exploit an important source of (downward) wage rigidities in France, and I shed light on the crucial role played by the type of employment contract (short-term/permanent) in shaping the wage effects of immigration. The

⁷In the short run, the text book model of a competitive labor market suggests that higher levels of immigration should increase the level of unemployment in the economy (Saint-Paul and Cahuc, 2009). In this model, the effects of immigration on the employment of competing natives are unpredictable. In fact, it may be that the newcomers do not find jobs (increasing the level of unemployment) and thus do not depress the employment of competing native workers. Also, it could be that negative employment effects due to immigration fall on immigrants only, and none on natives.

⁸Interestingly, the estimated effect is of similar magnitude to that reported in Borjas (2003) who finds a wage adjustment to immigration by 3% to 4%.

decomposition by job contract is related to Babecký et al. (2010) who show for European countries that permanent contracts – which are characterized by high firing costs, strict employment protection legislation and indefinite-term – have a strong effect on downward wage rigidity. For France, I find that the population of natives under short-term contracts (*i.e.* a population who is less subject to downward wage rigidities) experiences huge wage losses due to immigration. This pattern is consistent with factor demand theory: when wages are not downwardly rigid, immigration lowers the wage of competing workers (at least in the short run). By contrast, the insensitivity of wages to immigration is even more striking for the population of native workers under permanent contracts. New to the literature, this asymmetric result supports the idea that immigration has (on average) no detrimental impact on the French wage structure because of downward wage rigidities.

On the other hand, I use the heterogeneity of migrants with respect to their citizenship status and show that the migrants who obtain French citizenship no longer depress native employment.⁹ Instead, the previous negative effects on native employment are completely attributable to the presence of non-naturalized immigrants. This second set of results supports the idea that the replacement mechanism operating between immigrants and natives lies in important differences between these two groups in terms of outside options and cultural norms. Indeed, the migrants who became French citizens tend to have similar behaviors to natives, since the naturalization leads to higher outside options, such as superior employment opportunities (Bratsberg et al., 2002; Fougere and Safi, 2009) or equal access to social benefits with natives (Math, 2011). Moreover, since the French citizenship acquisition depends on the integration level of migrants, it is very likely that the naturalized immigrants adopt the norms of natives because of higher levels of integration (compared to the non-naturalized migrants). Thus, naturalization should improve the position of immigrants in the bargaining process with respect to firms,¹⁰ leading the naturalized immigrants to become

⁹Notice that immigrants can become naturalized (through citizenship acquisition) or stay non-naturalized.

¹⁰This explains why naturalization also leads to higher earnings (Bratsberg et al., 2002; Steinhart, 2012).

as profitable as comparably skilled natives. As a result, firms no longer have incentives to replace native workers by the naturalized immigrants.

Finally, I divide the non-naturalized immigrants into EU citizens and non-EU citizens. The reason for this disaggregation is that European immigrants enjoy more privileges due to the single-market and they are coming from countries that are geographically, economically, and culturally close to France. I find that the negative employment effects are mainly driven by the non-European immigrants – those immigrants with the poorest outside options. This finding is consistent with the former results.

The remainder of this paper proceeds as follows. Section 2 presents information on the French institutions which might affect the adjustment of wages, and discusses the expected effects of an immigration shock on the French labor market. The third section describes the data and methodologies used in the paper. Section 4 investigates immigrant-native dissimilarities in wages and working conditions. This section also reports the estimated impact of immigration on native outcomes. Section 5 and 6 go beyond the average impact of immigration and underline the importance of job contracts and migrants' nationality in shaping the immigration impact. The last section concludes.

2 Theoretical Effects of Immigration and Wage Rigidities

2.1 The French Institutional Setting

This section discusses the French institutional features that may affect downward wage rigidities, and *in fine* the responsiveness of wages to labor supply shocks.

2.1.1 Minimum Wage, Unemployment Benefits and Bargaining Institutions

In comparison to the United States, Card et al. (1999) show that France has three main institutional features that should prevent wage adjustment: minimum wage laws, generous unemployment benefits and high collective bargaining coverage.

First, France is characterized by the prevalence of a high minimum wage at the national level which applies to all workers. In France, the minimum wage

relative to average wages of workers represents 50% over the 1990s, whereas it is equal to 35% in the United States (Card et al., 1999). The proportion of French employees paid at the minimum wage was around 10% over the 1990-2002 period (DARES, 2013b). An alternative set of institutions that may reinforce downward wage rigidities in France is the high levels of unemployment benefits and income support programs for non-workers (Nickell, 1997). As indicated in Cohen et al. (1997), generous welfare state benefits should increase the reservation wage of French workers. Thus, some workers may not accept pay cuts or to be paid less than what they could receive from unemployment insurance or welfare payments (Saint-Paul and Cahuc, 2009).

Third, collective bargaining institutions and the wage setting structure are important factors in the determination of downward wage rigidity (see, *e.g.* Dickens et al. (2007); Babecký et al. (2010)). In European countries where the dominant level of wage bargaining takes place outside the firm (at the sector, province, or national level),¹¹ wages tend to be downwardly rigid and they do not respond to economic shocks (Babecký et al., 2010, 2012; Messina et al., 2010). By contrast, Babecký et al. (2012) show that firm-level collective agreements tend to enhance downward wage flexibility (providing firms with additional flexibility). In fact, at the firm-level, unions (and employees) are more willing to accept wage cuts because they better understand the negative effects of wage rigidity on firm level profitability and future employment (Du Caju et al., 2009; Babecký et al., 2012).

In France, wage bargaining takes place primarily at the industry-level. Industry-level bargaining sets minimum pay scales for more than two thirds of the labor force, while firm-level agreements cover about one-fifth of workers (Avouyi-Dovi et al., 2009).¹² Given the predominant role of sector-level collective wage bargaining in wage setting practices in France, wages are likely to be downwardly rigid. Moreover, France is characterized by the existence of extension procedures and a high level of collective bargaining coverage – *i.e.* agreements negotiated by unions

¹¹The United Kingdom and the United States are characterized by highly decentralized wage bargaining systems, where negotiations are made at the firm-level (Cahuc and Zylberberg, 2004).

¹²Notice that the “effective” wage received by employees is generally higher than the minimum wage which is negotiated at the industry-level. If the negotiated minimum wage is lower than the national minimum wage, then the latter applies.

and employer associations cover most the workforce.¹³ As shown by Babecký et al. (2010, 2012); Messina et al. (2010) for a large panel of European countries, the wage bargaining coverage is positively associated with downward wage rigidity. The wide coverage of collective agreements in France should therefore reinforce wage rigidity.

2.1.2 Job Contracts

Another institutional aspect that influences wage rigidity is related to how difficult it is for firms to terminate a match with an employee (Nickell, 1997). In fact, when it is very costly to terminate a match, workers have more leeway in wage negotiations, which in turn lead to greater wage rigidity. In this regard, Babecký et al. (2010) show for European countries that permanent contracts – which are characterized by high firing costs, strict employment protection legislation and indefinite-term – have a strong effect on downward wage rigidity. Given that 90% of the stock of French employees has permanent contracts, the rigidity of the French wage structure should be therefore strengthened.

As in other European countries, French firms are allowed to hire workers on two types of employment contracts (Cahuc and Postel-Vinay, 2002): the CDI, *Contrat à Durée Indéterminée* (permanent contract) and the CDD, *Contrat à Durée Déterminée* (short-term contract). The CDI is an indefinite-term contract with no end-date, representing the normal form of contract in France. The CDD is a fixed-term contract for a specific duration of employment.

In principle, a CDD can be signed for a temporary and precise task (replacement in case of absence, temporary or seasonal demand shock).¹⁴ Short-term contracts are characterized by limited duration as well as limited renewal possibilities. They can only be renewed once and its length, including renewal, cannot exceed 18 months (24 months for youth employment programs). Employers can transform short-term contracts into a permanent contract – the rest of short-term contracts being terminated at no cost.¹⁵

¹³The fact that workers are covered by wage agreements without being members of trade unions may explain why France has a proportion of unionized workers lower than 10%.

¹⁴Moreover, selection and testing of future permanent employees is allowed under such contracts.

¹⁵At the beginning of the 1990s, one-third of all short-term employment contracts were con-

Two other dimensions of these contracts are relevant. First, the French laws stipulate that a worker under a CDD has to be paid equally than a worker under a CDI for the same job. However, “this is obviously difficult to verify and enforce, and it appears not to be satisfied in practice” (Blanchard and Landier (2002), p. 230). This fact is supported by Edo and Toubal (2014b). Controlling for a wide set of observables and more than 300 occupations, they find that a worker’s wage under a CDD is, on average, 7% below a comparable worker’s wage under a CDI.

Second, inasmuch short-term contracts have a fixed duration (with a mean duration of one year and a median duration of seven months),¹⁶ termination of a CDD is not an issue. By contrast, permanent contracts have an indefinite-term and the termination of a CDI is a complex process inducing high bureaucratic and financial costs (Gash and McGinnity, 2007; Kramarz and Michaud, 2010). Permanent contracts are thus subject to strict employment protection (Blanchard and Landier, 2002). Employer-initiated termination of a permanent employee can take several forms.¹⁷ Firing for “serious misconduct” and voluntary quits exempt the employer from making a severance payment. For all other types of terminations (layoff, retirement), the employer has to make a severance payment (see Goux et al. (2001); Abowd and Kramarz (2003) for details).¹⁸

While it is difficult and costly to terminate a CDI, the termination of a CDD is not an issue. This explains why firms mainly use short-term contracts to adjust their production level (Goux et al., 2001). The asymmetry between job contracts in termination cost also explains why the entry and exit of workers on short-term contracts is a main driver of job turnover in France (Abowd et al., 1999).¹⁹

Moreover, thanks to the limited length of short-term contracts, firms are able to constantly adjust their wage bills through job turnover when hiring new employees (*i.e.* when a new CDD starts) or after one renewal. More specifically, firms

verted to permanent contracts at their termination (Abowd et al., 1999).

¹⁶In the French LFS (1990-2002), 10.3% of (full-time male) native workers had a CDD and out of these 10.3%, 75% had a contract duration of less than 1 year. Over the same period, the data indicate that 12.6% of the stock of male immigrants is on CDD.

¹⁷The termination of a CDI can be also initiated by employees.

¹⁸In the case of a lay off, firms must prove the needs to reduce their employment. In France, employees can challenge the legality of their dismissal bringing their cases to court (Gash and McGinnity, 2007).

¹⁹Each year, two-thirds of all hiring is on short term contracts.

should use the turnover of workers under short-term contracts as a tool to achieve labor cost flexibility.²⁰ For instance, a negative economic shock may lead firms to hire new employees at lower wages than those who terminated their job contract. Consequently, the population of workers under short-term contracts (high turnover) should be less subject to downward wage rigidities than the population of workers under permanent contracts (low turnover).

The fact that permanent workers tend to be protected from wage cuts is also consistent with different labor market theories (*e.g.*, efficiency wage, insider-outsider, and contract theories – see Babecký et al. (2010) for details). Furthermore, the wages of permanent workers should be more rigid because they have more power in the wage-setting process than temporary employees. In fact, workers under permanent contracts are more protected by labor unions (Amossé and Pignoni, 2006). Also, these workers tend to have higher reservation wages because they are eligible to higher amounts of unemployment benefits (Ortega and Rioux, 2002).

Finally, I use my data to examine the degree of wage rigidity for the population of native workers under permanent and short-term contracts.²¹ In the appendix, Figure 1.2 shows that the wage variations experienced by the subsample of native workers under short-term contracts are much more (*i*) pronounced and (*ii*) negative than the subsample of native workers under permanent contracts. This result is perfectly consistent with the fact that workers under short-term contracts are less subject to downward wage rigidities than those under permanent contracts.

By affecting the degree of wage rigidity, the type of job contracts (short-run/permanent) should therefore affect the responsiveness of wages to immigration-induced labor supply shocks. Thus, immigration should affect differently the wages of competing natives according to whether they have permanent or short-term contracts. This is tested in section 5.

²⁰This is supported by Babecký et al. (2012) who show that the main strategy used by French firms to adjust their labor costs is through labor turnover.

²¹Another type of contracts is governed by the same rules as the CDD: the temporary work contract. The main difference is that in the case of a temporary work contract, there are three parties involved: the employee, the employment agency and the employing company. Companies can only use a temporary employee to perform short-term activities. In the empirical analysis, I thus define a short-term contract as a traditional CDD or a temporary job contract.

2.2 The Theoretical Effects of Immigration

The impact of migrations on the labor market is usually studied within the framework of a competitive model of labor demand where wages are perfectly flexible. In the short run, a competitive model suggests that higher levels of immigration should lower the outcomes of competing workers and increase those of complementary workers. In the long-run, these models predict that the host country's wage is independent of migration. The physical capital response to immigration offsets the fall of the capital-labor ratio. The economy therefore returns to its pre-immigration equilibrium, where wage and employment levels are exactly the same as they were prior to the immigrant influx.

These theoretical results are unlikely to apply to France due to labor market frictions. In fact, French firms may be unable to lower wages when marginal productivity drops due to immigration shocks. Within the framework of downward inflexible wages, if natives and immigrants are complements, an immigration shock should increase native wages and employment (as predicted by the standard competitive model). In fact, if institutional factors resist the downward wage pressure, it is very likely that they allow for upward adjustments. However, if natives and immigrants are substitutes, immigration should not affect wages, but increase the level of unemployment in the economy (Saint-Paul and Cahuc, 2009).

For France, Edo and Toubal (2014a) show that immigrants and natives with similar education-experience profiles are perfect substitutes in the production process.^{22,23} Therefore, an immigration supply shock is expected to have a very limited impact on the French wage structure. An inflow of migrants should thus be translated into an equal rise in the number of unemployed people. Yet, if immigration increases the level of unemployment, the short-term impact of migrants on native employment is unpredictable here. Two scenarii are possible. New migrants could (i) directly become unemployed or (ii) hurt native employment.²⁴

²²In appendix (section 8.1), I use the same estimation strategy as in Ottaviano and Peri (2012); Edo and Toubal (2014a) to estimate the substitution elasticity between natives and immigrants for my period of interest (1990-2002). I find that similarly skilled immigrants and natives are perfect substitutes.

²³Prior empirical studies have reached mixed conclusions about the degree of substitutability between natives and immigrants (Aydemir and Borjas, 2007; Borjas et al., 2012; Ottaviano and Peri, 2012; Manacorda et al., 2012).

²⁴First, notice that these scenarii are not exclusive to each other. Second, in both cases, new-

As suggested by scenario (i), the non-adjustment of wages might prevent the newcomers from finding a job. Immigrants would thus become mechanically unemployed and would not affect native employment. As suggested by scenario (ii), immigration could also induce short-run depressive impacts on native employment through displacement effects. Especially, this possibility may arise if immigrants exhibit some attractive characteristics for firms (while they are identical to natives in all other respects), so immigrants are substituted for natives in the production process. In this regard, section 4.1 is devoted to show that the immigrant population differs from the native population in important ways. In particular, natives and immigrants tend to have different outside options, cultural norms and therefore different labor market behaviors: immigrants are more inclined to accept lower wages and harder work conditions than equally productive natives.²⁵ This dissimilarity between natives and immigrants leads immigration to depress the employment of equally skilled natives through a displacement mechanism.²⁶

3 Data and Methodologies

3.1 Data, Variables and Sample Description

The empirical study is based on the French annual labor force survey (LFS) covering the period 1990 through 2002. This survey is carried out by the French National Institute for Statistics and Economic Studies (INSEE).²⁷ This section describes the data and sample used to perform the study. Then, it presents the two sets of variables used to investigate (i) immigrant-native dissimilarities in employment conditions and (ii) the labor market effects of immigration.

comers impose a cost on society in terms of foregone output. But in scenario (ii), immigration leads to an additional cost in terms of unemployment benefits (D'Amuri et al., 2010).

²⁵Immigrants and natives of similar skills are equally productive (or perfect substitutes), but immigrants are more profitable for firms than similar natives.

²⁶The negative effect of immigration on native employment may be mitigated by incentives among firms to create jobs in order to increase their probability to hire immigrants (who work at lower wages) – as predicted by search and matching models (Battisti et al., 2014; Chassamboulli and Palivos, 2014). In fact, firms may be encouraged to open vacancies because they anticipate more profit as they will be able to pay lower wages to immigrants. Thus, immigration should lead firms to create jobs which, in turn, may increase native employment (especially when firms cannot discriminate between immigrants and natives before the match).

²⁷Institut National de la Statistique et des Etudes Economiques.

3.1.1 Data and Sample Selection

The French LFS records much information about a random sample of around 150,000 individuals per year.²⁸ Constructed from repeated cross sections carried out in the same way over 13 years, this pseudo panel includes demographic characteristics (nationality, age, gender, and marital status), social characteristics (educational attainment, age of completion of schooling, and family background), as well as employment status, occupation, earnings, number of hours worked a week, etc.

In accordance with the literature on migration, I define an immigrant as a person who is foreign-born outside France to parents who are not French citizens. Some foreign-born individuals may thus have become French through citizenship acquisition while others have remained non-French (or non-naturalized).²⁹ The data provide detailed information on individual nationality (more than 80 countries) and distinguish naturalized immigrants from others.

The employment survey gives human capital characteristics for each respondent, such as their education level, their age, and the age when they completed their studies. The education level is divided into six categories: college graduate, some college, high school graduate, some high school, just before high school, no education. According to the International Standard Classification of Education (ISCED), those levels of education respectively correspond to (1) a second stage of tertiary education, (2) first stage of tertiary education, (3) post-secondary non-tertiary education, (4) (upper) secondary education, (5) lower secondary education and (6) a primary or pre-primary education.

Individuals with the same education, but a different age or experience are unlikely to be perfect substitutes (Card and Lemieux, 2001). Hence, I distinguish individuals in terms of their labor market experience. Following Mincer (1974), work experience is computed by subtracting for each individual the age of com-

²⁸I use an individual weight (computed by the INSEE) to make the sample representative of the French population. For each observation the weight indicates the number of individuals each observation represents in the total population.

²⁹French nationality law is historically based on the principles of *jus soli* – i.e. transmission of citizenship on the basis of birth in the country – for children born to parents who are permanent residents.

pletion of schooling from reported age.³⁰ This measure differs from the one used in the migration literature since the age of completion of schooling is usually unavailable.³¹

Finally, I follow most empirical studies and restrict my attention to men³² in the labor force (employed and unemployed individuals) aged from 16 to 64, who are neither enrolled at school nor self-employed (farmers and entrepreneurs), and who have between 1 and 40 years of labor market experience.

3.1.2 First Set of Variables

A first set of variables is used to investigate immigrant-native dissimilarities in employment conditions. For each worker, the survey reports the monthly wage net of employee payroll tax contributions adjusted for non-response, as well as the number of hours worked per week. I use this information and compute the hourly wage for each worker to investigate wage inequalities.³³ Wages are adjusted for inflation, by using the French Consumer Price Index computed by the INSEE, with 2000 as the reference base period.

The French LFS also provides original information on the working conditions experienced by workers in their current job. It records whether employed individuals work at night (from midnight to 5am), at late hours (from 8pm to midnight), on Saturdays and Sundays. More precisely, the survey provides the frequency of those specific working conditions whether they are usual, occasional or never realized. I use these variables to build three dummies indicating if an employee

³⁰The age of completion of schooling is usually considered as a proxy for the entry age into the labor market – *i.e.* the starting point from which an individual begins to accumulate work experience. For a few surveyed individuals, the age of completion of schooling is very low, between 0 and 11 inclusive. Since individuals cannot start accumulating experience when they are too young, I have raised the age of completion of schooling for each surveyed individual to 12 if it is lower.

³¹Empirical works rather assign a particular entry age into the labor market to the corresponding educational category.

³²Women are generally excluded from samples for two reasons. First, they have to face more frequent periods of inactivity or unemployment, so that the correspondence between their potential and effective experience tends to collapse. It is therefore difficult to make any sensible inference based on these grouped data. Second, “the inclusion of working women in the analysis introduces selection issues that are difficult to address and resolve” (Borjas (2014), p. 82). These issues have been widely emphasized and studied by the literature on labor supply (see, *e.g.*, Heckman, 1993).

³³For 11% of workers (for whom hours worked are not regular and constant from one week to another), I use the number of hours worked during the previous week to compute their hourly wage.

usually works at night, at late hours or on the weekend (Saturdays or Sundays).

The richness of the French micro-level data allows to control for many variables that should affect immigrant-native inequalities. In addition to human capital information, the survey contains job characteristics. For each worker, the type of employment (public/private), the working time structure (full-time/part time) and the type of contract (short-term/permanent) are given. The data also provide an original variable indicating the entry year into a firm for each worker. I use this variable to compute the job tenure of workers. Occupations and regions of residence are also provided for each individual. The French LFS has the advantage to record 360 occupations. Finally, the LFS also reports family and social characteristics related to the number of children in the household, the marital status (single/couple) and the occupational category (over 29) of the respondent's father.

3.1.3 Second Set of Variables

This paper uses the skill-cell methodology from Borjas (2003) to investigate the labor market impact of immigration. This methodology aims at dividing out the national labor market into skill-cells. The cells are built in terms of educational attainment j , experience level k , and calendar year t , each of them defines a skill group at a point in time for a given labor market. Individuals are then clustered into these skill-cells according to their education-experience profile.

This paper uses four different labor market outcomes: the average monthly and hourly wages, the employment rate to population and the employment rate to labor force. These variables are computed using the individual weight provided by the INSEE. In order to have a homogeneous population of workers, we compute these four dependent variables on the basis of full-time employment.³⁴

Both monthly and hourly wages are adjusted for inflation. To compute the average hourly wage in the cell (j, k, t) , I independently calculate the average monthly wage and the total amount of hours worked in each skill-group.³⁵ The

³⁴Notice that the econometric results are totally robust to the inclusion of part-time workers in the sample used to compute the dependent variables.

³⁵This procedure reduces the loss of observations. Although some workers do not report their wage income, they always state their number of hours worked.

employment rates are respectively equal to the employment of full-time native workers as a percentage of the overall native population aged from 16 to 64 (employed, unemployed and inactive) and as a percentage of the native labor force (employed and unemployed). Even if the second ratio is a better proxy for labor market opportunities, the comparison of these ratios should inform us on how immigration affects the participation rate of natives (equals to the employment rate to population divided by the employment rate to labor force).³⁶

Following Borjas (2003), the immigrant supply shock experienced in a particular skill-cell with educational attainment j , experience level k at year t is measured by p_{jkt} , the percentage of total labor supply in a skill group coming from immigrant workers:

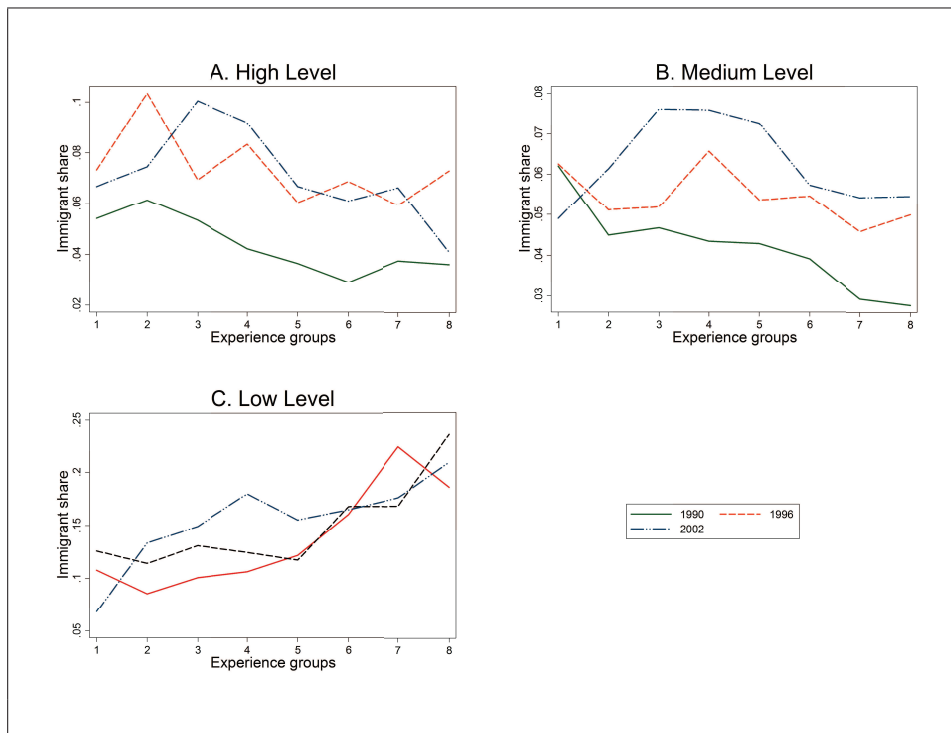
$$p_{jkt} = M_{jkt} / (N_{jkt} + M_{jkt}), \quad (1.1)$$

with N_{jkt} and M_{jkt} respectively the number of male natives and immigrants in the labor force located in the *education-experience-time* cell (j, k, t) . As well as native outcomes, the immigrant share is computed using an individual weight. The immigrant supply shock for each skill-cell is computed on the basis of 31,309 to 34,994 individual observations per year, of which between 8.0% and 8.8% represent immigrants.

The graphs in Figure 1.1 illustrate the share of foreign-born workers for three education levels (high, medium and low – these education levels respectively correspond to college education, high school education and below than high school education) and three years (1990, 1996 and 2002).³⁷ Eight experience groups are defined, each spanning an interval of 5 years. The figure shows that immigration increased the supply of the high and medium educated populations. These supply shifts did not affect all age groups within these populations equally. The immigrant supply shock experienced in the highly and medium educated

³⁶The content and trend of the four dependent variables are reported in the appendix (section 8.2, see Tables 1.7 and 1.8). For each year, I provide the number of observations which was used to compute the dependent variables. For Table 1.8, I give the number of full-time native workers which was used to compute the numerator of both employment ratios. Both Tables 1.7 and 1.8 show consistent numbers: the levels of wages and employment increase with education and experience, except for the oldest workers who are systematically disadvantaged on the French labor market (d'Autume et al., 2005).

³⁷In the appendix, Table 1.9 supplements Figure 1.1 by providing the distribution of male natives and immigrants in the labor force per group of education over time.

Figure 1.1: Immigrant Share per Cell in 1990, 1996 and 2002

Notes. The Figure illustrates the supply shocks experienced by the different skill-cells between 1990 and 2002. Experience groups denoted 1, 2, 3,..., 8 correspond respectively to an experience level equal to 1-5, 6-10, 11-15, ..., 36-40 years. The population used to compute the immigrant share includes men participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

groups particularly increased in cells with more than 10 years of experience. The figure also indicates that immigrants are overrepresented in the low educated segment of the labor market. However, this schooling group did not experience important supply shocks due to immigration between 1990 and 2002.

3.2 Empirical Strategies

This paper highlights a new source of heterogeneity between immigrants and natives to understand how immigration may depress the outcomes of equally skilled natives. I first exploit Mincer equations to examine the labor market dissimilarities in employment conditions between natives and immigrants. Second, I use the “national skill-cell approach,” introduced by Borjas (2003), to measure the labor market impact of immigration.

3.2.1 Extended Mincer Equations

The study of labor market inequalities requires focusing on a non-randomly selected sample, that of workers. Yet, the productivity and behavior of workers may be different from individuals who are not included in this specific sample. Thus, the estimates of wage and work conditions inequalities may be biased due to a selectivity problem (Heckman, 1979; Blackaby et al., 2002). The Heckman two-stage estimation procedure is undertaken to address this potential issue. The vector of selection variables has to contain at least one element that is excluded from the second-stage regressions (Sartori, 2003). Satisfactory identification requires data on factors that affect the labor market participation but do not directly wages. Following Glewwe (1996), I use marital status and family size as identifying instruments. In order to run the first-stage Heckman procedure, I thus use five covariates: the number of children under 18-year-olds in the household, a dummy variable indicating whether the individual is single or not, education, experience and its square.³⁸

In order to capture the (unexplained) wage differential between natives and immigrants, I pool the cross-section observations over time and I estimate the following equation:

$$\ln(w_{iort}) = \alpha_0 + \alpha_1 I_i + \alpha_2 H_i + \alpha_3 J_i + \zeta_o + \zeta_r + \zeta_t + \xi_{iort}. \quad (1.2)$$

The dependent variable is the log hourly wage for each individual i , in occupation o and region r at time t . The immigrant status of an individual is captured by the term I_i which is a dummy variable indicating if the employee is an immigrant. The term H_i is a vector of control variables containing the human capital characteristics for individual i such as the age of completion of schooling, the labor market experience and its square. Job characteristics J_i control for job tenure and its square, part-time employment, the type of job contract, public sector jobs and

³⁸The first stage aims at estimating a selection equation by maximum likelihood as an independent probit model to determine the decision to enter the labor market, in order to generate a vector of inverse Mills ratios from the parameter estimates. The second step of the procedure then reruns the (benchmark) regression with the inverse Mills ratios included as an extra explanatory variable, removing the part of the error term correlated with the explanatory variable and avoiding the selection bias.

types of work (nights and weekends). In order to control for occupation-specific factors, I also add a vector of occupational dummies ζ_o . I also include region and time dummy variables, respectively denoted ζ_r and ζ_t , as geography and cyclical effects might affect individual wages. ξ_{jkt} is the error term.

However, the prevalence of a high minimum wage in France should lead to a censoring problem and bias the estimates of α_1 . The discontinuity of the hourly wage distribution is addressed using Tobit estimation. For each year of the survey, different censoring values for the hourly minimum wage are thus used.

In order to investigate immigrant-native disparities in work conditions, three dummies indicating if an employee works (i) at night, (ii) at late hours or (iii) on the weekend are used as dependent variables. Then, I can estimate three probit equations to examine whether those specific working conditions are, *ceteris paribus*, more widespread among immigrant workers. I use the same set of regressors than in Equation (1.2).

3.2.2 The Skill-Cell Methodology

I use the skill-cell methodology to examine the immigration impact on native outcomes. This methodology is the most suitable to investigate how the outcomes of natives can react due to an increase in the number of comparably skilled immigrants.

The skill-cell methodology is based on the following equation:

$$y_{jkt} = \alpha + \beta(p_{jkt}) + \delta_j + \delta_k + \delta_t + \delta_j \times \delta_t + \delta_k \times \delta_t + \delta_j \times \delta_k + \xi_{jkt}, \quad (1.3)$$

where y_{jkt} is the labor market outcome at period t for native men with education j and experience k and p_{jkt} is the immigrant share. In addition to including the vectors of fixed effects for schooling δ_j , experience δ_k and time δ_t , this model also contains a full set of second-order interactions for schooling by time, experience by time and schooling by experience. The linear fixed effects in equation (1.3) control for differences in labor market outcomes across schooling groups, experience groups, and over time. Interactions $\delta_j \times \delta_t$ and $\delta_k \times \delta_t$ control for the possibility that the impact of education and experience on outcomes changed over time,

whereas $\delta_j \times \delta_k$ control for differences in the experience profile by schooling group. The standard errors will be corrected for heteroscedasticity and clustered around education-experience groups to adjust for possible serial correlation.

The skill-cell approach identifies the labor market impact of immigration by examining how the evolution of outcomes within skill-cells has been affected by differences in the size of the supply shocks induced by immigration. The fact that migrants may not be randomly distributed across skill-cells would lead to biased estimates of β . Suppose that the labor market may attract foreign-born workers mainly in those skill-cells where wages and employment are relatively high. There would be a spurious positive correlation between p_{jkt} and the labor market outcomes of natives (Borjas, 2003). As a result, an instrumentation strategy would be necessary if the OLS estimates from the skill-cell approach indicate that $\hat{\beta} > 0$. If the estimates rather indicate that $\hat{\beta} < 0$, the correction of the (upward) bias would induce the true immigration impact to be more negative. Within that case, the endogeneity of the immigrant share is therefore less problematic. In the remaining of this paper, I will use the fact that when the estimates of β are negative, they have to be interpreted as lower bounds of the true impact of immigration to reinforce the empirical results.

On the other hand, the estimates from the skill-cell approach are very likely to be sensitive to how skill groups are defined. Especially, a small sample size per skill-cell tends to attenuate the impact of immigration because of sampling error in the measure of the immigrant supply shift p_{jkt} (Aydemir and Borjas, 2011). In order to correct for this potential attenuation bias, the paper follows two strategies. First, I build alternative samples with different structures of education-experience cells, so that one sample only contains 12 skill-cells per year. Second, in addition to using all years of the sample separately to compute our variables, I will also merge years by pair (*i.e.*, I drop the year 1990 and merge 1991/1992, 1993/1994, 1995/1996, 1997/1998, 1999/2000 and 2001/2002) to substantially increase the sample size per cell.

Our baseline sample combines three categories of educational attainment $j = 3$ and eight experience groups $k = 8$, so that the labor market is divided into

24 segments.³⁹ In order to build the three education groups, I merge the two highest levels of education [Second stage of tertiary education - First stage of tertiary education], the two medium ones [Post-secondary non-tertiary education - (Upper) secondary education] and the two lowest ones [Lower secondary - Primary education and Pre-primary education].⁴⁰ I also use eight groups of experience (Borjas, 2003; Aydemir and Borjas, 2007; D'Amuri et al., 2010; Ottaviano and Peri, 2012), each spanning an interval of 5 years of experience [1-5; 6-10; 11-15; 16-20; 21-25; 26-30; 31-35; 36-40].

The two alternative samples make up four experience groups $k = 4$ (as in Felbermayr et al. (2010); Gerfin and Kaiser (2010); Elsner (2013b)), each spanning an interval of 10 years of experience. The first alternative sample contains three education classes $j = 3$ while the other contains six $j = 6$. The sample with 12 skill-cells (three education groups and four experience groups) should correct for the attenuation bias my estimates may suffer (Aydemir and Borjas, 2011). Also, it allows to attenuate the impact of any potential bias regarding the experience measure, and in particular, the fact that employers may evaluate the experience of immigrants differently from that of natives.

The sample with six rather narrower education levels is built to test the possibility of an educational downgrading among immigrants. Indeed, immigrants could accept jobs requiring a lower level of education than they have (see, *e.g.*, Dustmann et al. (2013) for the United Kingdom, Cohen-Goldner and Paserman (2011) for Israel as well as Mattoo et al. (2008) for the United States). Therefore, within a broad education group, immigrant workers could compete with the less educated natives of the cell. In this case, the labor market segmentation along three (broad) education levels could fail to appropriately identify groups of workers competing for the same jobs. Hence, a more detailed education partition with six education groups should allow to deal with the impact of immigrants on equally educated native workers. In particular, if immigrants downgrade upon arrival, the estimated effect on native outcomes should differ from a sample with

³⁹In their empirical study, D'Amuri et al. (2010); Gerfin and Kaiser (2010); Elsner (2013a) also use three education groups.

⁴⁰While the high level of education regroups individuals with some college or more, both medium and low education levels respectively refer to individuals with high school education and less than a high school education.

six education groups to a sample with only three.

To sum up, the baseline sample divides the labor market into 24 ($j = 3 \times k = 8$) skill-cells, while the two alternative samples divide it into 12 ($j = 3 \times k = 4$) and 24 ($j = 6 \times k = 4$) segments.

4 The Econometric Analysis

4.1 Labor Market Conditions between Natives and Immigrants

This section is devoted to shed light on a new type of heterogeneity between natives and immigrants: immigrants are more inclined to accept lower wages and harder working conditions than equally skilled natives. The main reason is that immigrants have lower outside options and different cultural norms.

4.1.1 Econometric Results

Table 1.1 examines the level of inequalities in wages and work condition between natives and immigrants. The sample used is the pooled cross-section from 1990 to 2002. The left-hand side (first two columns) of Table 1.1 reports the estimates of α_1 from equation (1.2) for two specifications: one correcting for selection and the other for censoring (around 15,000 observations are left-censored). The estimates indicate a negative wage premium of 2-3% for immigrants, while controlling for a wide set of socioeconomic variables (*i.e.* education, experience, job tenure, region of residence, occupation, etc.). This is in accordance with other findings for France (Algan et al., 2010).

It is worth noting that the inverse Mills ratio is negative and statistically significant in column 1. Similar results are reported by Blackaby et al. (2002) who examine the wage differential between white and black for the United Kingdom. The significance of the inverse mills ratio highlights a selectivity into employment. Unobserved factors which affect the decision to work also affect wages.⁴¹ The negative selectivity term suggests that if unemployed people were to find a job, they would have higher earnings as compared to individuals with similar

⁴¹This implies that the characteristics of the employed population in the labor force does not mirror the active population (employed and unemployed) – *i.e.* (male) workers are not representative of the (male) population.

Table 1.1: Immigrant-Native Employment Condition Disparities (1990-2002)

	Dependent Variable				
	Log Hourly Wage		Night Work	Late Hours	Weekend
Immigrants	-0.02*** (-9.03)	-0.03*** (-11.92)	0.04** (2.15)	0.08*** (5.34)	0.07*** (6.09)
Inverse Mills Ratio	-0.05*** (-5.88)	-	0.16*** (3.51)	0.29*** (6.49)	0.05 (1.51)
Adj. R-squared	0.49	0.40	0.36	0.30	0.28
Observations	349,313	349,462	386,676	292,928	394,287
Control Variables					
Human Capital	Yes	Yes	Yes	Yes	Yes
Job Characteristics	Yes	Yes	Yes	Yes	Yes
Occupation Dummies	Yes	Yes	Yes	Yes	Yes
Region Dummies	Yes	Yes	Yes	Yes	Yes
Time Dummies	Yes	Yes	Yes	Yes	Yes
Estimation Procedures					
Heckman	Yes	No	Yes	Yes	Yes
Tobit Estimation	No	Yes	-	-	-

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. Estimations are conducted on workers who have between 1 and 40 years of experience. On the right-hand side, the dependent variables are dummies equal to one when the employee works at night, at late hours or on the weekend and to 0 otherwise. Human capital control variables include schooling, experience and its square. Job characteristics contain the job tenure, part-time, permanent contract and public sector dummies, as well as two additional dummies indicating if an employee works at night and on the weekend. T-statistics are derived from heteroscedastic-consistent estimates of the standard errors. Regressions are weighted using an individual weight computed by the INSEE.

characteristics already in jobs. “This result is compatible with such individuals setting higher reservation wages and is consistent with their lower employment probability” (Blackaby et al. (2002), p. 285).

Labor market disparities between natives and immigrants are also marked in terms of working conditions. The right-hand side of Table 1.1 reports the

likelihood of working at night, at late hours and on the weekend for migrants. Each specification corrects for sample selection bias. The estimated coefficients are always significantly positive, implying that migrant workers are more likely to do late hours, work at night or on the weekends than comparable native workers. The significant and positive selectivity terms (except for the last column) implies that the unobserved factors which affect the decision to work also affect the probability of having difficult working conditions. Those who select into employment endure harder working conditions than a random drawing from the population of unemployed with a comparable set of characteristics would endure. This is consistent with the idea that unemployed individuals are less willing to have difficult work conditions.

Our finding of immigrant-native disparities in work conditions is consistent with Giuntella (2012) for Italy and Coutrot and Waltisperger (2009) for France. While the first study finds that immigrants are more likely to work at non-standard hours (*i.e.* evenings, nights and Sundays), Coutrot and Waltisperger (2009) show with a subjective survey that, *ceteris paribus*, immigrants are more exposed to painful and tiring occupations than natives.

4.1.2 Interpretations and Implications

One important explanation behind the labor market disparities (in wages and work conditions) between natives and immigrants lies in a behavioral gap.⁴² *Ceteris paribus*, immigrant workers are more willing to accept lower wages and harder working conditions than native workers with similar human capital and job characteristics. This is supported by the fact that immigrants tend to have lower outside options than equally skilled natives (Wilson and Jaynes, 2000; Malchow-Møller et al., 2012; Battisti et al., 2014), as well as different cultural norms (Constant et al., 2010).

Two main reasons can explain why immigrants have lower outside options than natives (at least in the French context). On the one hand, the probability

⁴²The disparities in employment conditions between natives and immigrants are also very likely to be due to other factors. For instance, the component of the unexplained wage differentials between workers could be also related to discrimination (Kee, 1995; Blackaby et al., 2002; Weichselbaumer and Winter-Ebmer, 2005), or skill transferability problems where education and experience obtained in foreign countries have much lower returns (Chiswick et al., 2005).

of finding a job is lower for migrants. First, immigrants have a limited access to the labor market: a wide number of jobs in the public sector requires the French citizenship in order to be filled.⁴³ In this regard, Math and Spire (1999) have documented that immigrants have access to only 70% of all available jobs in France. Second, immigrants may have lower knowledge/information about the labor market due to cultural barriers and/or because they are newcomers (Erdmans, 1995).

On the other hand, the cost of being unemployed is higher for immigrants. First, the eligibility to social welfare benefits that ensures a minimum income (or “social minima”) is limited for immigrants in France (Math, 2011). Although five years of residence are required since 2003, the eligibility to “social minima” required three years over the period 1990-2002. Second, the conditions to renew work permits or obtain French citizenship strongly require a job (among immigrants) to attest to a high level of social and economic assimilation.⁴⁴

Immigrants and natives also differ in terms of their cultural norms. In general, immigrants come from countries with inferior labor market outcomes (lower wages or higher unemployment). Hence, their expectations about their wages and working conditions are lower because their reference is the prevailing employment conditions in their country of origin (Wilson and Jaynes, 2000). In addition, a sociological work by Sayad (1999) underlines the fact that immigrants are forced into a sort of “*social hyper-correctness*” which makes them less inclined to complain about their condition.

As a result, the immigrant population mainly differs from the native population because the former has lower outside options and different cultural norms. This gap between immigrants and natives is consistent with Constant et al. (2010),

⁴³These types of employment restrictions are also prevalent in many countries, such as Austria (Kogan, 2003), Belgium (Corluy et al., 2011), Canada (DeVoretz and Pivnenko, 2005), Germany (Euwals et al., 2010; Steinhardt, 2012), Netherlands (Bevelander and Veenman, 2006; Euwals et al., 2010), Norway (Hayfron, 2008; Bratsberg and Raaum, 2011), the United-States (Yang, 1994; Bratsberg et al., 2002) and Sweden (Scott, 2008).

⁴⁴The French Code Civil of 1993 (formerly the *Code de la nationalité*) does not provide a legal claim for naturalization. Even if the applicant fulfils all requirements, s/he can be refused by means of a discretionary decision. According to *Art. 21 of the Code Civil of 1993*, the actual requirements are a minimum residence time of 5 years, no criminal record, secured income, as well as societal and cultural integration. For complementary information on naturalization in France, see Hagedorn (2001); Rallu (2011).

who show for Germany that immigrants tend to have lower reservation wages (*i.e.*, the crucial wage above which an individual is willing to work) than equally skilled natives. As a result, immigrants should be more willing to accept lower wages, as well as to exert more effort in the production process than equally productive natives.⁴⁵

The differences between immigrants and natives in terms of outside options and cultural norms should therefore create a gap between the costs for firms of employing immigrants relative to employing natives. First, immigrants may allow firms to produce at lower labor costs. Second, immigrants may provide firms with additional flexibility they may need to adjust their production level. For instance, immigrants may be willing to accept last-minute changes. Third, immigrant workers may be relatively more attractive for employers because immigrants are less likely to be unionized, informed about the employment protection legislation and they are less likely to claim their rights compared to natives (Sa, 2011). This also implies that immigrants are less likely to disrupt the production process compared to natives with similar education.

Immigrants, being more profitable for firms than equally productive natives, should increase (or perhaps exacerbate) the labor market competition. As a result, immigration should (strongly) depress the outcomes of competing native workers (Friedberg, 2001). However, within a framework of downward wage rigidities, a displacement effect may arise after an influx of migrants within skill-cells – *i.e.*, a higher share of immigrants should lower the employment of natives who have similar skills.

4.2 Estimation of the Immigration Impact

Table 1.2 reports the estimated effects of immigration on native wages and employment for the main sample and various specifications. Since all the regressions are based on annual variations, the estimates capture the short-run effects of immigration. Having data from 1990 to 2002, setting $j = 3$ (education groups) and

⁴⁵Alternative mechanisms may also explain why immigrants are more willing to accept lower wages and non-standard hours than equally skilled natives. For instance, in Galor and Stark (1991), the possibility of returning to their (low-wage) country of origin creates strong incentives among immigrants to exert much more effort than natives.

$k = 8$ (experience groups), the estimates of Table 1.2 are based on a perfectly balanced sample of 312 observations.

In the appendix (section 8.3), I provide the estimated effects of immigration for both alternative samples (Table 1.11 and Table 1.12). Tables 1.11 and 1.12 respectively provide estimates from a balanced sample of 156 (3 education groups \times 4 experience groups \times 13 years) and 312 (6 education groups \times 4 experience groups \times 13 years) observations. I use four dependent variables: the log monthly wage (column 1), the log hourly wage (column 2), the log employment rate to population (column 3) and the log employment rate to labor force (column 4). As in Borjas (2003), regressions are weighted by the number of male natives used to calculate the dependent variable.

The estimates reported in Tables 1.2, 1.11 and 1.12 show a robust adverse impact of the immigrant share on the employment of natives, but not on their wages. First, the insensitivity of wages to immigration is consistent with the prevalence of downward wage rigidities in France.⁴⁶ Second, the estimates report evidence of a strong displacement effect. This corroborates the idea that immigrants are relatively more attractive for firms.

The first specification (row 1) reports the baseline estimates of β . For the three samples, the estimated wage effects of immigration are insignificant. Conversely, the estimated effects of immigration on the employment rates are significantly negative. The estimated coefficients in columns 3 and 4 are very close. This sug-

⁴⁶The estimated effects of immigration on wages are insignificant, although negative. The fact that I do not have an exhaustive dataset might affect the precision of my estimates, as explained in Aydemir and Borjas (2011), so that the true effect of immigration on wages might be actually negative. However, I reject this possibility for three reasons. First, the fact that immigration does not affect the French wage structure is consistent with the prevalence of strong downward wage rigidities in France (Section 2.1). In this regard, Card et al. (1999) find that negative economic shocks tend to have no detrimental effect on the wages of workers in France due to wage rigidities (as opposed to the United States). My results are also consistent with the study by Glitz (2012) who finds for Germany no wage reactions due to immigration on competing natives. Second, even when I use alternative samples where the sample size per cell becomes substantially higher (see specification 6 and Table 1.11), the estimated coefficients remain insignificant. Third, the decomposition of native workers (in section 5) according to whether they hold short-term or permanent contracts provides strong empirical evidence supporting the idea that French wages are insensitive to immigration because of wage rigidities. More specifically, when I focus on the native workers under permanent contracts (who are strongly affected by downward wage rigidities), the wage impact of immigration becomes even more insignificant. However, I find a strong and significant negative wage effect by focusing exclusively on the natives under short-term contracts, who are less subject to wage rigidities.

Table 1.2: The Impact of the Immigrant Share on Native Outcomes (Baseline Sample)

Specification	Dependent Variable			
	Monthly Wage	Hourly Wage	Employment to Population	Employment to Labor Force
1. Baseline Regression	-0.41 (-0.90)	-0.35 (-0.78)	-0.36** (-2.57)	-0.32** (-2.73)
2. Unweighted Regression	-0.52 (-1.12)	-0.50 (-1.02)	-0.46** (-2.61)	-0.34** (-2.55)
3. Include Log of Natives as Regressor	-0.42 (-0.89)	-0.34 (-0.75)	-0.34** (-2.50)	-0.31** (-2.65)
4. Experience $\in [5;35]$	-0.02 (-0.05)	0.07 (0.14)	-0.32* (-1.76)	-0.29* (-1.89)
5. $t = 6$	-0.55 (-0.98)	-0.41 (-0.72)	-0.36* (-1.86)	-0.34* (-1.90)
6. High Education	-0.03 (-0.05)	-0.40 (-0.62)	-0.16 (-1.10)	-0.16 (-1.58)
7. Medium and Low Education	-0.66 (-1.02)	-0.67 (-1.06)	-0.35* (-2.08)	-0.32* (-2.00)

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimated effects of the immigrant share on native outcomes. The first group of outcomes captures male native wages (columns 1 & 2), whereas the second group measures their labor market opportunities (columns 3 & 4). These variables are computed for each education-experience group at time t which composed the baseline sample (3 education groups \times 8 experience groups \times 13 years). Except for specification 6, all regressions include education, experience, and period fixed effects, as well as interactions between education and experience fixed effects, education and period fixed effects, and experience and period fixed effects. Specifications 1, 2 & 3 use 312 observations. Specifications 4 & 5 respectively use 234 and 144 observations. In specifications 6 & 7, I use 104 and 208 observations respectively. Unless otherwise specified, each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

gests that the share of immigrants has a very limited impact on the participation rate of natives. In other words, immigration does not discourage natives from seeking a job.

The estimates from the first specification (column 4) reported in Tables 1.2, 1.11 and 1.12 respectively imply that a 10% rise in the immigrant labor supply decreases the native employment rate to labor force by 2.7% (0.32×0.84), 5.9%

(0.70*0.84) and 3.8% (0.44*0.84).⁴⁷ The alternative samples (in appendix) indicate higher negative effects on native employment. The effect of the immigrant share doubles from Table 1.2 (3 education groups×8 experience groups×13 years) to Table 1.11 (3 education groups×4 experience groups×13 years). The gap between the estimated coefficients is consistent with the prevalence of measurement bias in the computation of the immigrant share (Aydemir and Borjas, 2011). Finally, the negative effect on native employment persists even when the sample with six education groups is used. This illustrates that the displacement mechanism is not driven by an educational downgrading among immigrants. This result is consistent with Docquier et al. (2013) who find that highly educated immigrants are as likely to be in highly skilled occupation as natives.

The remaining rows of the tables conduct several robustness tests to determine the sensitivity of the baseline result to alternative specifications. In the second specification, I do not weight regressions. In the third row, I include the log of the number of natives in the workforce as an additional regressor. This specification controls for the fact that the evolution of the immigrant share may be driven by the native labor supply (Bratsberg et al., 2014).

The levels of wages and employment for the youngest and the oldest workers are strongly volatile from one year to another (Tables 1.7 and 1.8). Thus, I run regressions without the first and last experience groups (specification 4). In Table 1.2, the wage effect of immigration on wages becomes totally insignificant. However, specification 4 is not suitable for the samples in appendix since they are composed of four experience groups only. For both samples, specification 4 thus leads to a huge decline in observations. This should explain why the estimated employment effects become insignificant.

Finally, specification 5 removes the year 1990 and merges the following pairs of years: 1991/1992, 1993/1994, 1995/1996, 1997/1998, 1999/2000 and 2001/2002. This leads to a substantial increase in the sample size per skill-cell, attenuating measurement errors (Aydemir and Borjas, 2011). While the variance tends to

⁴⁷In order to convert $\hat{\beta}$ to an elasticity, it has to be multiplied by $1/(1+m_{jkt})^2$, with $m_{jkt} = M_{jkt}/N_{jkt}$. The mean value of the relative number of immigrants m is about 9.1% over the period. See Borjas (2003); Aydemir and Borjas (2007) for further details and a formal derivation.

be higher, the results in row 5 suggest that the previous estimates are unlikely affected by attenuation bias.

The last two rows decompose the immigration impact by education group. Specifications 6 and 7 investigate the immigration impact within the high schooling group and within both the medium and low schooling groups, respectively.⁴⁸ However, the estimates from specifications 6 and 7 must be interpreted with caution. First, the number of observations to run regressions declined dramatically. Second, for the samples with three education groups (Tables 1.2 and 1.11), specification 6 cannot control for changes in the return to experience or education over time.

The results do not provide robust evidence of any detrimental effect on native wages. Moreover, the estimates show that highly educated immigrants do not depress the employment of comparably skilled natives. It seems that the sample of medium and low educated immigrants is the group that is driving much of the analysis.⁴⁹ These results suggest that the displacement mechanism tends to operate only within the group of medium and low educated individuals. This is consistent with the idea that high educated immigrants may have higher outside options and closer cultural norms than natives, as compared to the migrants with low level of education (Wilson and Jaynes, 2000).

All in all, the share of immigrants, and therefore immigration, does not affect the wages of competing native workers, but induces adverse employment effects. Already discussed, the potential endogenous selection of migrants into skill-cells would lead to upward biased estimates of β . Therefore, if this bias was addressed, the conclusions would be strengthened: the negative effect on native employment should be even stronger, implying a much more powerful displacement mechanism.

⁴⁸More precisely, Tables 1.2 and 1.11 (samples with three education groups) report the estimated impact of immigration within the highest education group (specification 6) and the two lowest (specification 7), while Table 1.12 (sample with six education groups) focuses on the two highest (specification 6) and the four lowest (specification 7).

⁴⁹The fact that the outcomes of low skilled native workers tend to be the most affected by immigration is consistent with Jaeger (1996); Camarota (1997); Borjas (2003). They show that immigration has particularly reduced the wages of low-skilled natives in the United States.

5 The Wage Effects of Immigration by Job Contracts

The previous results indicate that immigration does not affect the wages of competing workers. This result differs from Aydemir and Borjas (2007) who find a significant inverse relation between immigrant-induced shifts in labor supply and wages for Canada and the United states. The discrepancy in the wage reactions between France and North American countries is probably due to the prevalence of downward wage rigidities in France.

In order to show that the insensitivity of French wages to immigration is due to wage rigidities, this section uses the heterogeneity of native workers in terms of their employment contract. In fact, the type of employment contract is an important determinant of (downward) wage rigidity in France (Section 2.1). Thus, an immigrant-induced supply shift should have an asymmetric impact on the wages of competing native workers according to whether they have permanent or short-term contracts. While the insensitivity of French wages to immigration may be driven by the population of permanent workers, immigration should depress the wages of the natives under short-term contracts.⁵⁰

Table 1.3 provides the estimated immigration impact on the outcomes of native workers under permanent contracts (left-hand side) and short-term contracts (right-hand side) for the baseline sample. Two dependent variables are used: the log monthly wage and the log hourly wage. The variable of interest p_{jkt} is identical to the one used previously. The upper part of the table uses the main specifications from Table 1.2.

The left-hand side of Table 1.3 shows that an immigration-induced supply shift has no detrimental impact on the wages of competing native workers with permanent contracts (*i.e.* 91% of native workers). In Table 1.3, the estimated coefficients are smaller (in absolute value) and much more insignificant, compared

⁵⁰One limitation of this exercise is that workers of similar education and experience may (systematically) differ according to whether they are covered by permanent or short-term contracts. Within a skill-cell, both types of workers may compete for different types of jobs, and they might not be equally productive. I examine this precise issue by estimating the elasticity of substitution between workers under short-term and permanent contracts using a CES framework (Borjas, 2003; Ottaviano and Peri, 2012). Across a wide range of specifications, I find that they are perfect substitutes in production. Within a skill-cell, the workers under both contracts are therefore similar in terms of their productivity.

Table 1.3: The Immigration Impact on the wages of Natives with Short and Permanent Contracts

Specification	Permanent Contracts		Short-term Contracts	
	Monthly Wage	Hourly Wage	Monthly Wage	Hourly Wage
1. Baseline Regression	-0.17 (-0.38)	-0.12 (-0.27)	-3.21** (-2.42)	-2.98** (-2.22)
2. Unweighted Regression	-0.35 (-0.76)	-0.34 (-0.70)	-3.54* (-1.95)	-3.38* (-2.00)
3. Include Log of Natives as Regressor	-0.17 (-0.37)	-0.11 (-0.23)	-3.38** (-2.77)	-3.14* (-2.46)
4. Experience $\in]5;35]$	0.25 (0.50)	0.29 (0.59)	-4.43* (-2.08)	-4.48** (-2.17)
5. $t = 6$	-0.34 (-0.56)	-0.21 (-0.33)	-3.37* (-1.99)	-3.07* (-1.77)
6. Experience $\in]10;40]$	0.11 (0.22)	0.17 (0.34)	-5.70*** (-3.29)	-5.52*** (-3.28)
7. Experience $\in]10;40]$ & Private Sector Only	-0.08 (-0.13)	-0.06 (-0.10)	-6.42*** (-5.58)	-6.28*** (-5.04)

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimated impact of immigration on the wages of native workers who have permanent contracts (left-hand side) and short-term contracts (right-hand side). Specifications 1, 2 & 3 use 312 observations. Specifications 4 & 5 respectively use 234 and 144 observations. In specifications 6 & 7, I use 234 observations. Unless otherwise specified, each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

to my previous estimates. Having a permanent contract therefore protects from any downward wage pressure. This set of results supports the idea that the French wage structure is insensitive to immigration because of wage rigidities.

Instead, the estimated effects of immigration on the wages of competing native workers with short-term contracts are negative and significant. This is consistent with Section 2.1 and economic theory. When wages are flexible, immigration lowers the wage of native workers with similar skills.

The baseline estimate implies that a 1% increase in the immigrant share re-

duces the monthly wages of native workers with a short-term contract by 2.5%. Despite this magnitude is in line with Monras (2013),⁵¹ our point estimates might seem very large. Four considerations can be raised to understand why. First, the subsample of workers who hold short-term contracts is very specific: as suggested by Figure 1.2, the wages of workers under short-term contracts tends to be highly sensitive to economic shocks. This is consistent with the main goal of the introduction of short-term contracts which was to provide firms with the additional flexibility they needed to cope with higher demand uncertainty, accelerated technical change and fiercer international competition (Bentolila et al., 1994; Goux et al., 2001; Saint-Paul and Cahuc, 2009). Second, the wage effect due to immigration may be more detrimental when it is concentrated among a small proportion of workers (here, the workers under short-term contracts), rather than diffused to all the labor force. Third, as I use yearly data (in contrary to Borjas (2003) for instance, who use five waves of data from 1960 to 2000), my estimates capture the direct short-run effect of immigration on native wages. I thus omit potential labor market adjustments that might happen in the medium- and long-run through changes in the industry structure or the reallocation of native workers across occupations, two channels which should strongly attenuate the short-run immigration impact (Lewis, 2005; Glitz, 2012). Fourth, the decomposition by job contract induces a huge decline in the number of observations used to compute the dependent variables for the workers under short-term contracts. Thus, this decomposition may introduce some noise in the measure of wages for workers under short-term contracts, inducing identification problems.⁵² Although the estimated wage effect on temporary workers is probably not well identified, this set of results suggest that the native workers who are under short-term contracts represent a specific population which experiences wage losses due to immigration.

Finally, specifications 5 and 6 remove from the sample the native workers who

⁵¹For the United States, he shows evidence of a substantial decline of low-skilled wage due to Mexican immigrants at the state level. Whereas this work does not study the direct effect of immigration on the competing natives, it even though finds that a 1% labor supply shock to a local labor market decreases wages of low-skilled US natives by 1.5%.

⁵²However, this problem is very unlikely to affect the estimated impact of immigration on the wages of natives with permanent contracts since this subsample of workers is much more important.

tend to be affected by two other sources of wage rigidities: the high level of the minimum wage and the prominence of the public sector.⁵³ Specification 5 thus focuses on cells with more than 10 years of experience, excluding the groups most affected by the minimum wage. In addition, row 6 eliminates public workers from the sample. Interestingly, the insensitivity of wages to immigration is even more striking for the natives with permanent contracts. Moreover, the estimated immigration impact on the wages of native workers under short-term contracts is much more negative and significant.

All in all, the estimates show that when wages can be manipulated by firms, immigration causes wage losses. This reinforces the results presented in section 4.2: the insensitivity of French wages to immigration is due to downward wage rigidities. The estimates also support that the type of job contract is a main determinant of wage rigidity.

6 Migrant Heterogeneity and Native Employment

6.1 Naturalized and Non-naturalized Immigrants

The results in Section 4.2 report evidence of a detrimental average impact of immigration on native employment in the short-run. Until now, this paper has considered all migrants as a homogeneous population. But are they all the same?

Actually, immigrants are very likely to be heterogeneous based on their citizenship status (naturalized/non-naturalized). More specifically, the naturalized immigrants should differ from the others because of higher levels of outside options and integration. First, immigrants who obtain the French citizenship are henceforth treated in the same way as native-born citizens in terms of the law. Thus, contrary to the other migrants, the naturalized migrants are eligible to all the social benefits, they no longer have constraints to renew their work permits and they fill all the requirements to have access to public jobs.

Second, given the strong requirements to acquire the French citizenship (see footnote 44), the naturalized immigrants should exhibit higher level of integration. Hence, naturalized immigrants are likely to have reference standards in terms of

⁵³The public sector might be less competitive than the private sector. Over the period, the average share of native workers in the public sector was around 20%.

wages and work conditions which are very close to those of natives (Constant et al., 2010), as well as they might no longer be forced into a sort of “*social hyper-correctness*” (Sayad, 1999).

Finally, the economic literature on citizenship finds strong processes of self-selection within the immigrant workforce relative to citizenship acquisition (see, *e.g.*, Bratsberg et al. (2002); DeVoretz and Pivnenko (2005); Bratsberg and Raaum (2011); Steinhardt (2012)). Thus, the naturalized immigrants should also differ from the other migrants based on their unobservable characteristics; *e.g.*, they should have better language skills and higher potentials for assimilation (DeSipio, 1987; Portes and Curtis, 1987). The unobservable characteristics of the naturalized immigrants are very likely to be positively correlated with their reservation wages and their level of integration.

While the naturalized immigrants should strongly differ from the other migrants, they should also have very similar performance to natives. With higher levels of outside options and integration, the naturalized immigrants should adjust their labor market behaviors to those of natives.⁵⁴ Consequently, the naturalized immigrants should be less profitable for firms compared to the non-naturalized immigrants. Hence, if the aforementioned displacement effect is due to differences between natives and immigrants in terms of outside options, cultural norms and behaviors, the naturalized immigrants should have a very limited impact on native employment. Conversely, the negative immigration impact on employment should be exclusively driven by non-naturalized immigrants. I investigate this implication, and I divide the share of migrants between the share of naturalized immigrants p_{jkt}^{ned} and the share of non-naturalized immigrants $p_{jkt}^{non-ned}$.⁵⁵

⁵⁴This is consistent with Bratsberg et al. (2002) for the United States and Steinhardt (2012) for Germany who demonstrate an immediate positive naturalization effect on wages and an accelerated wage growth in the years after the naturalization event. Similarly, Coutrot and Waltisperger (2009) find evidence that the work conditions of naturalized immigrants tend to be closer to those of natives.

⁵⁵ $p_{jkt}^{ned} = \left(M_{jkt}^{ned} / (M_{jkt} + N_{jkt}) \right)$ and $p_{jkt}^{non-ned} = \left(M_{jkt}^{non-ned} / (M_{jkt} + N_{jkt}) \right)$, with M_{jkt}^{ned} and $M_{jkt}^{non-ned}$ respectively the number of naturalized immigrants and non-naturalized immigrants in the cell j, k at time t . Table 1.10 in the appendix reports the share of naturalized and non-naturalized individuals in the immigrant labor force over time (1990-2002). It shows a sufficient variation of the number of naturalized non-naturalized immigrants to identify the impact of each share on native employment.

However, the estimated impact of p_{jkt}^{ned} on native employment might prove to be spurious because of a selection problem based on *observable* characteristics.⁵⁶ In fact, immigrants who happen to be naturalized could systematically differ from the others in terms of education, experience, occupation, region of residence, etc. Thus, it might be that if naturalized immigrants do not affect native employment, this is not because they adopt the norms of natives, but because of these systematic differences. In order to address this selection problem, the study requires to compare the impact on native employment of two immigrant groups who have similar observable characteristics except in their citizenship status (naturalized/non-naturalized). In effect, a different estimated impact of these two groups on native employment would indicate that the levels of outside options and integration matter in shaping the labor market immigration impact.

In order to find a group of naturalized immigrants which does not differ from the non-naturalized in terms of observable characteristics, I use the propensity score matching (PSM) method.⁵⁷ It allows to decompose the naturalized population into two subsamples: (i) the naturalized individuals who have similar observable characteristics to the other migrants (SC) and (ii) the naturalized individuals who differ from the other migrants in terms of their observable characteristics (DC). Thus, the first group of naturalized immigrants (SC) should be similar to the non-naturalized immigrants in terms of education level, experience, occupation (etc.) except for their citizenship status. Then, so as to estimate (and compare) the impact of these different immigrant groups on native employment,

⁵⁶Immigrants' decision to acquire the citizenship is also related to their unobservable characteristics, such as their willingness to stay in the host country, their ability to learn the history of their host country, their language skills and potentials for assimilation. Because these unobservable characteristics are very likely to be positively correlated with their reservation wages and level of integration (DeSipio, 1987; Portes and Curtis, 1987), the naturalized immigrants should be close to natives in terms of their labor market performance. In particular, the naturalized immigrants should be less willing to accept lower wages and harder working conditions than the non-naturalized immigrants. As a result, the fact that naturalized immigrants differ systematically from the non-naturalized in terms of their unobservable characteristics supports the decomposition of immigrants by citizenship status.

⁵⁷The implementation of the PSM is detailed thoroughly in the appendix, section 8.5. First, I describe the PSM procedure and detail the variables used to compute the probability to be naturalized among immigrants. Then, I implement the matching procedure with tests for the matching quality. Finally, I explain why the limitations inherent to PSM techniques are unlikely to challenge my conclusions.

Table 1.4: The Impact of Naturalized and non-Naturalized Immigrants on Native Employment

Specification	Raw Estimates		Estimates after Matching		
	$p_{jkt}^{non-ned}$	p_{jkt}^{ned}	$p_{jkt}^{non-ned}$	$\left(p_{jkt}^{ned}\right)_{SC}$	$\left(p_{jkt}^{ned}\right)_{DC}$
1. Baseline Regression	-0.35*** (-2.86)	-0.02 (-0.07)	-0.35*** (-2.87)	0.00 (0.01)	-0.04 (-0.09)
2. Unweighted Regression	-0.40*** (-2.89)	0.08 (0.23)	-0.40*** (-2.86)	0.13 (0.31)	0.04 (0.09)
3. Include Log of Natives as Regressor	-0.34*** (-2.86)	0.04 (0.13)	-0.34*** (-2.92)	0.00 (0.00)	0.08 (0.17)
4. Experience $\in]5;35]$	-0.33** (0.88)	0.23 (-2.11)	-0.34** (-2.17)	0.08 (0.19)	0.32 (0.67)
5. $t = 6$	-0.37** (-2.11)	0.01 (-0.01)	-0.36** (-2.11)	0.14 (0.18)	-0.12 (-0.21)
6. $t > 1992$	-0.34** (-2.08)	-0.16 (-0.42)	-0.35** (-2.10)	-0.26 (-0.54)	-0.08 (-0.16)
7. $t = 4$	-0.53** (-2.25)	-0.05 (-0.06)	-0.51** (-2.16)	0.34 (0.28)	-0.32 (-0.39)

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimated impact of immigration on native employment. I use the log employment rate to labor force as dependent variable. Each row provides the estimates from two regressions, one before (left-hand side) and one after (right-hand side) the matching procedure. Specifications 1, 2 & 3 use 312 observations. Specifications 4 & 5 respectively use 234 and 144 observations. In specifications 6 & 7, I use 240 and 96 observations respectively. Unless otherwise specified, each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

I compute the following immigrant shares : $p_{jkt}^{non-ned}$, $\left(p_{jkt}^{ned}\right)_{SC}$ and $\left(p_{jkt}^{ned}\right)_{DC}$.⁵⁸

An identification problem due to measurement errors might still affect the estimates. As the immigrant population is divided into groups, the number of observations per cell tends to decrease. Yet, this may lead to an attenuation bias due to sampling error in the measure of the immigrant supply shift (Aydemir and

⁵⁸Over the 1990-2002 period, the number of immigrants is around 38,000. There is 9,000 naturalized and 29,000 non-naturalized individuals. Here, the PSM implementation leads to splitting the naturalized immigrants into 4,200 and 4,800 individuals to compute $\left(p_{jkt}^{ned}\right)_{SC}$ and $\left(p_{jkt}^{ned}\right)_{DC}$.

Borjas, 2011). In order to increase the number of naturalized immigrants per cell, and *in fine* limit the attenuation bias, two specifications are introduced. Since the number of naturalized immigrants increased significantly after 1992 (Table 1.10), specification 5 is added to focus on the 1993-2002 period. The second specification (row 6) removes the year 1990 and transforms the time span into four periods.⁵⁹

Table 1.4 shows the estimated impact of immigration on the native employment rate to labor force by decomposing the effect of naturalized and non-naturalized immigrants. It is divided into two parts: the left-hand side provides the raw estimates (with the raw immigrant shares: $p_{jkt}^{non-ned}$ and p_{jkt}^{ned}), while the right-hand side shows the estimates after the implementation of the matching procedure.

First, all the estimates find that native employment is totally insensitive to the share of naturalized immigrants. The second set of estimates (right-hand side) also indicates that immigrants who do not differ from the non-naturalized individuals in terms of observable characteristics do not hurt native employment. Second, the negative effect of $p_{jkt}^{non-ned}$ on native employment is slightly higher and more significant than in section 4.2. Thus, the adverse impact of immigration is mostly driven by the non-naturalized immigrants. Moreover, this result supports the fact that a labor supply shift induced by naturalized immigrants has no effect on native employment.⁶⁰

In the short-run, labor market competition mainly operates between workers with different level of outside options and different cultural norms – here, between natives and non-naturalized immigrants. Consequently, the native workers are only replaced by the non-naturalized immigrants.

6.2 European and Non-European Immigrants

By exploiting the heterogeneity of migrants by citizenship status, I find that non-naturalized immigrants lower the employment of competing native workers. The

⁵⁹I merge the following years together: 1991/1992/1993, 1994/1995/1996, 1997/1998/1999, 2000/2001/2003.

⁶⁰More generally, all the previous estimates presented in Tables 1.2, 1.11 and 1.12 are robust to the decomposition of the immigrant population into naturalized and non-naturalized individuals. Thus, both groups of naturalized and non-naturalized immigrants have no effect on the French wage structure.

previous estimates also indicate that a labor supply shift induced by naturalized immigrants has no detrimental impact on native employment. Actually, employers have an incentive to displace natives by the non-naturalized immigrants because the latter are relatively more attractive. They have lower outside opportunities and different cultural norms (as compared to both natives and naturalized immigrants).

This section is devoted to reinforce this result by going further into the decomposition of the immigrant population. In fact, the non-naturalized immigrants are composed of EU citizens and non-EU citizens; two immigrant groups that should also differ in terms of their outside options, cultural norms and labor market behaviors.⁶¹

First, the EU15⁶² plus Norway, Iceland, Liechtenstein (as members of the European Economic Area) and Switzerland (through a bilateral treaty) “prohibit any kind of discrimination between native-born and migrants, regarding labor market accessibility and welfare benefits eligibility” (Razin (2013), p. 552 – see also Razin et al. (2002, p. 12) who explain that “immigrants in Europe have access to the full menu of welfare benefits regardless of whether or not they are citizens.”⁶³ European immigrants should therefore have higher employment opportunity and higher reservation wages than non-European immigrants. Second, a free migration regime as in Europe provides immigrants the (additional) alternative to return to their home country anytime at lower cost.⁶⁴ Finally, European

⁶¹Another key segmentation in the immigrant labor force would have been between well-integrated (old arrivals) and poorly integrated (recent arrivals) immigrants. In fact, well-integrated immigrants are very likely to be similar to natives in terms of cultural norms and labor market behaviors, so the former should be less willing to accept lower wages than the other migrants. As a result, immigrants with a longer time spent in France may be less detrimental for native employment than recent waves of immigrants. Unfortunately, this implication cannot be investigated since the immigrants’ year of arrival is not provided by the data.

⁶²The EU15 countries regroup Austria (as of 1994), Belgium, Denmark, Finland (as of 1994), France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden (as of 1994), United Kingdom.

⁶³See the *Article 48* of the Rome Treaty (1957) which stipulates that “freedom of movement shall entail the abolition of any discrimination based on nationality between workers of the Member States as regards employment, remuneration and other conditions of work and employment.” However, although EU citizens have far more privileges than non-EU citizens, notice that the French laws do not grant EU citizens exactly the same rights as natives in terms of labor market accessibility and welfare benefits eligibility. Small restrictions still remain – e.g., some public jobs need a French diploma to be performed.

⁶⁴The freedom of movement and the ability to reside and work anywhere within the European Union are two of the fundamental rights which EU member states must recognize and this extends

immigrants come from countries that are economically and culturally closer to France than the non-European immigrants.

While the European immigrants should strongly differ from the non-European migrants, they should also have very similar characteristics to both natives and naturalized immigrants. As a result, if the depressive immigration impact on native employment stems from the fact that immigrants have poor outside opportunities and different cultural norms; the reaction of native employment to immigration is expected to differ according to whether the increase in immigrant supply comes from European or non-European migrants. Especially, the aforementioned negative employment effect due to non-naturalized immigrants should be mainly driven by the non-European immigrants.

In order to investigate this implication, I decompose the non-naturalized immigrant population into two groups: the European, and the non-European immigrants. The group of Europeans includes all non-naturalized immigrants coming from the EU15 countries plus Norway, Iceland, Liechtenstein and Switzerland. The group of non-European immigrants includes the non-naturalized immigrants coming from outside these 19 countries. Then, I compute the share of European immigrants in the labor force p_{jkt}^{eur} , as well as the share of non-European immigrants p_{jkt}^{oth} .⁶⁵ Over the period of analysis, p_{jkt}^{eur} goes from 39.2% in 1990 to 24.0% in 2002; while p_{jkt}^{oth} decreases from 54.4% in 1990 to 42.2 % in 2002. Moreover, as shown in Edo and Toubal (2014a), the educational distribution of European and non-European immigrants is very similar.

Table 1.5 reports the within-cell effect of p_{jkt}^{eur} , p_{jkt}^{oth} and p_{jkt}^{ned} (which is the share of naturalized immigrants) on native employment. The decomposition of the immigrant population into three sub-groups leads to a decline in the number of observations available to compute p_{jkt}^{eur} , p_{jkt}^{oth} and p_{jkt}^{ned} . As discussed above, a small sample size per cell (j, k, t) to compute immigrant shares may bias the estimates due to measurement errors (Aydemir and Borjas, 2011). In Table 1.5, I thus adopt two strategies to test the robustness of my results. First, in addition to using

to Norway, Iceland, Liechtenstein and Switzerland.

⁶⁵As earlier I compute both shares as follows: $p_{jkt}^{eur} = \left(M_{jkt}^{eur} / (M_{jkt} + N_{jkt}) \right)$ and $p_{jkt}^{oth} = \left(M_{jkt}^{oth} / (M_{jkt} + N_{jkt}) \right)$. By construction, $p_{jkt}^{eur} + p_{jkt}^{oth} = p_{jkt}^{non-ned}$.

Table 1.5: Immigration Impact on Native Employment by Immigrant Nationality Group

	3 × 8 Skill-cells			3 × 4 Skill-cells			6 × 4 Skill-cells		
	$t = 13$	$t = 6$	$t = 4$	$t = 13$	$t = 6$	$t = 4$	$t = 13$	$t = 6$	$t = 4$
$p_{jkt}^{non- eur}$	-0.34** (-2.14)	-0.42* (-2.03)	-0.66* (-1.96)	-0.76* (-2.12)	-0.81* (-1.87)	-0.82 (-1.44)	-0.65*** (-3.00)	-0.82*** (-3.21)	-0.90*** (-2.85)
p_{jkt}^{eur}	-0.36 (-1.33)	-0.30 (-0.79)	-0.34 (-0.72)	-0.74** (-2.22)	-0.62 (-1.25)	-0.84 (-1.00)	-0.26 (-1.05)	-0.20 (-0.55)	-0.49 (-0.73)
p_{jkt}^{ned}	-0.02 (-0.07)	0.01 (0.02)	-0.01 (-0.01)	-0.23 (-0.48)	-0.08 (-0.12)	-0.08 (-0.08)	-0.02 (-0.07)	-0.05 (-0.13)	-0.16 (-0.24)
Obs.	312	144	96	156	72	48	312	144	96

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated effects of immigration on the employment of competing natives by immigrant nationality group. I use the log employment rate to labor force as dependent variable. The interest variables are the share of the non-European immigrants, the share of the European immigrants and the share of the naturalized immigrants. Each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

the baseline sample (with three education groups and eight experience groups), I also use the alternative structure of 12 skill-cells only (three education groups and four experience groups). The last structure of education-experience cells (with six education groups and four experience groups) is included to show that the results are not driven by any potential downgrading among immigrants.

Second, for each skill-cell structure, I use three specifications. While columns 1, 4 and 7 considered all years of the sample ($t = 13$), the other specifications remove the year 1990 from the sample and transforms the time span into six ($t = 6$) and four ($t = 4$) periods (as in section 6.1). This allows to substantially increase the sample size per skill-cell (j, k) as I merge years together.

In Table 1.5, the estimates indicate a significant negative relation between native employment and the share of non-European immigrants (except in column 6). This negative relation is stronger when I use four periods only ($t = 4$) – this is consistent with Aydemir and Borjas (2011) who show that an increase in the

sample size per skill-cell (j, k) to compute the immigrant share allows to attenuate the bias of the immigration impact toward zero.

Although negative, the estimated coefficients on the share of European immigrants are mostly insignificant. This suggests that the employment of native workers tends to be insensitive to labor supply shifts induced by European immigrants. Finally, the estimated effects of naturalized immigrants on native employment are mostly negative but measured with very high imprecision, supporting that naturalized immigrants do not displace native workers. Taken together, the results presented in Table 1.5 indicate that the negative effect of immigration on native employment tends to be driven by the non-European immigrants – those immigrants with very low outside opportunities and different cultural norms.

7 Conclusion

This paper presents new evidence on the question of how immigration can decrease the wages and employment of competing native workers. The investigation focuses on the French labor market, which is characterized by rigid institutions.

In contrast with several studies which show a negative association between immigration and the wages of competing natives, I find no detrimental impact of immigration on wages. In order to show that the insensitivity of French wages to immigration is due to wage rigidities, I use the heterogeneity of native workers in terms of their employment contract. Contrary to permanent workers, I find that native workers under short-term contracts experience important wage losses due to immigration. This result is consistent with Babecký et al. (2010) who show that permanent contracts have a strong effect on downward wage rigidity.

While immigration has no detrimental effect on average wages, the empirical analysis finds that immigration depresses the employment of competing native workers. I explain that immigrants displace the native workers because the former are more willing to accept lower wages and to exert more effort in production than natives – *i.e.* immigrants are relatively more attractive for firms. The heterogeneous effects of immigration on native employment by immigrant nationality group support this interpretation. I show that immigrants who acquired the

French citizenship do not have any adverse impact on native employment. The detrimental employment effect of immigration is completely driven by the presence of non-naturalized immigrants (and especially, non-European immigrants). With higher levels of outside options and integration, naturalized immigrants are as attractive as natives for firms. Therefore, naturalized immigrants do not replace the native workers in the production process.

When migrants and natives share similar outside options and cultural norms, and more generally similar behaviors, immigration no longer affects native employment. This last result may have policy implications. Economic policies that affect the outside options of immigrants should play a role in shaping the immigration impact on native outcomes. More specifically, economic policies implemented to protect the natives, by limiting the access for immigrants to the labor market and to social benefits, should decrease their outside options and may prove to be counter-productive – *i.e.* in disfavor of natives' labor market outcomes.

While they aim at protecting natives, these restrictions may actually exacerbate the competition between immigrants and natives, and, *in fine*, enhance the negative effect of immigration on the level of employment of competing workers. As a result, a way to attenuate the negative (partial) immigration impact on native outcomes would be to increase the outside options of immigrants, as well as to foster their cultural integration.

8 Supplementary Material

8.1 Elasticity of Substitution between Natives and Immigrants

I use the CES framework developed in Borjas (2003); Manacorda et al. (2012); Ottaviano and Peri (2012) to estimate the degree of substitutability between native and immigrant workers within education-experience cells. I relate the relative average wages of natives to the relative productivity of immigrants and the relative number of immigrant.

$$\log \left(\frac{w_{jkt}^M}{w_{jkt}^N} \right) = \delta_{jkt} - \frac{1}{\sigma_I} \cdot \log \left(\frac{M_{jkt}}{N_{jkt}} \right) + \xi_{jkt}, \quad (1.4)$$

where w_{jkt}^M and w_{jkt}^N gives respectively the real average wage of immigrants and natives in a particular skill-cell with educational attainment j , experience level k , and observed in calendar year t . On the *right-hand side*, the first and second terms capture the relative productivity of immigrants and the relative number of immigrants, respectively. The parameter σ_I is the elasticity of substitution between immigrant and native workers. ξ_{jkt} is the error term.

In order to estimate $-1/\sigma_I$, I build three samples with different structures of education-experience cells. The baseline sample combines three educational categories and eight experience groups (each spanning an interval of 5 years). The two alternative samples make up four experience groups (each spanning an interval of 10 years), but one of them contain three education classes while the other contain six. Then, I follow most empirical studies and restrict my attention to men aged from 16 to 64, who are not enrolled at school, who are not self-employed (farmers and entrepreneurs), and have between 1 and 40 years of labor market experience.

The relative productivity of immigrants can be captured by a set of fixed effects. The identification assumption on the relative productivity term is debated (Borjas et al., 2012; Ottaviano and Peri, 2012).⁶⁶ I thus use a comprehensive set of

⁶⁶The estimated value of σ_I is also sensitive to the regression weights, as well as the measure of the log relative wage (Borjas et al. 2012). Here, I follow Ottaviano and Peri (2008, 2012). First, I weight regressions by total employment in an education-experience cell. Second, instead of using the mean log wage, I use the log mean wages to capture the log relative wage. However, notice that the results of perfect substitutability between workers are not sensitive to these choices.

Table 1.6: Estimates of $-1/\sigma_I$

	(1)	(2)	(3)	(4)	(5)
1. Baseline Regression	-0.03 (-0.90)	-0.05 (-1.01)	-0.00 (-0.07)	-0.03 (-0.34)	0.09 (0.84)
2. Monthly Wage	-0.04 (-1.02)	-0.06 (-1.18)	-0.00 (-0.07)	-0.03 (-0.38)	0.09 (0.83)
3. Sample [$3 \times 4 \times 13$]	-0.09 (-1.46)	-0.12 (-1.64)	-0.06 (-0.78)	-0.12 (-1.25)	-0.11 (-0.81)
4. Sample [$6 \times 4 \times 13$]	-0.04 (-0.93)	-0.07 (-1.36)	-0.03 (-0.60)	-0.10 (-1.20)	-0.06 (-0.52)
δ_j (education dummies)	Yes	Yes	Yes	Yes	Yes
δ_k (experience dummies)	Yes	Yes	Yes	Yes	Yes
δ_t (time dummies)	No	Yes	No	Yes	Yes
$\delta_j \times \delta_k$	No	No	Yes	Yes	Yes
$\delta_j \times \delta_t$	No	No	No	No	Yes
$\delta_k \times \delta_t$	No	No	No	No	Yes

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimates of the substitution elasticity between natives and immigrants. The main dependent variable is the relative log hourly average wage. The explanatory variable is the relative number of workers in each cell. For the specifications 1 and 2, I use the baseline sample (3 education groups \times 8 experience groups \times 13 years), *i.e.* 312 observations. For the two alternative samples (specifications 3 & 4), there are respectively 156 (3 education groups \times 4 experience groups \times 13 years) and 312 (6 education groups \times 4 experience groups \times 13 years) observations. Fixed effects are progressively added to test the sensitivity of the results. In order to estimate $-1/\sigma_I$, I weight each regression by the total number of workers in a skill-cell. Standard errors are adjusted for clustering within education-experience cells.

vector of fixed effects. Table 1.6 reports the estimated values of $-1/\sigma_I$ for various specifications including an increasing set of control dummies. Unless otherwise specified, the dependent variable is the relative log hourly wage between groups of workers. Each regression uses the total number of observations used to calculate average wages as analytical weights (Ottaviano and Peri, 2012). Standard errors are heteroscedasticity-robust and clustered around education-experience groups.

While the first specification uses the relative log hourly wage as dependent variable, the second specification uses the relative log monthly average wage as an alternative. The two last specifications test the sensitivity of the baseline estimates to different structure of education-experience cells. The specification 3

uses the sample combining 12 cells per year with three education levels, whereas the specification 4 combines 24 cells per year with six education level.

For all specifications and samples, the estimated coefficients of the inverse elasticity of substitution are never significant pointing to a perfect elasticity of substitution between immigrants and natives. This indicates that immigrants and natives are perfect substitutes in the production process. Similar results are found in Jaeger (1996); Aydemir and Borjas (2007); Borjas et al. (2012); Edo and Toubal (2014a).⁶⁷

8.2 Descriptive Statistics

⁶⁷Note that the empirical literature has reached mixed conclusions regarding the degree of substitution between natives and immigrants (see the special issue of the Journal of European Economic Association (Volume 10, Issue 1, February 2012) for exhaustive details).

Table 1.7: Average Wage for Full-time Male Native Workers by Skill-Cell (*Constant Euros*)

Level of Education	Years of Experience	Monthly Wage		Hourly Wage	
		1990	2002	1990	2002
High Level	1 – 5	1511.9	1659.9	9.1	10.8
	6 – 10	1702.5	2035.0	9.9	12.6
	11 – 15	1989.8	2440.7	11.6	14.6
	16 – 20	2142.1	2880.9	12.9	16.5
	21 – 25	2492.1	3000.2	14.3	16.9
	26 – 30	2584.6	3137.1	15.2	18.0
	31 – 35	2565.7	3407.8	14.7	19.7
	36 – 40	2661.7	3373.9	14.6	19.1
Medium Level	1 – 5	849.4	1110.7	5.3	7.5
	6 – 10	974.8	1279.6	6.0	8.5
	11 – 15	1151.8	1405.9	7.0	9.1
	16 – 20	1301.1	1508.2	7.9	9.8
	21 – 25	1426.4	1651.7	8.7	10.6
	26 – 30	1550.4	1739.0	9.4	11.3
	31 – 35	1496.9	1797.3	9.1	11.6
	36 – 40	1480.9	1869.6	9.0	12.1
Low Level	1 – 5	714.2	963.5	4.7	6.7
	6 – 10	844.9	1115.6	5.3	7.5
	11 – 15	982.9	1214.5	6.0	8.1
	16 – 20	1100.9	1327.7	6.7	8.9
	21 – 25	1156.9	1407.4	7.1	9.3
	26 – 30	1204.9	1521.4	7.3	9.9
	31 – 35	1252.8	1541.7	7.7	10.1
	36 – 40	1213.3	1608.5	7.5	10.5
Observations		25,312	26,852	25,312	26,852

Table 1.8: Employment Rates for Full-time Male Native Workers by Skill-Cell (%)

Level of Education	Years of Experience	Employment to Population		Employment to Labor Force	
		1990	2002	1990	2002
High Level	1 – 5	84.6	82.3	91.0	86.2
	6 – 10	92.8	90.3	96.9	93.5
	11 – 15	92.7	91.5	95.4	93.8
	16 – 20	95.9	90.5	98.3	92.2
	21 – 25	95.9	92.8	97.3	94.4
	26 – 30	91.6	91.4	94.9	94.2
	31 – 35	81.8	76.7	92.6	87.9
	36 – 40	53.9	48.1	87.2	87.1
Medium Level	1 – 5	73.7	72.7	81.5	81.6
	6 – 10	88.1	86.3	91.0	89.4
	11 – 15	91.4	89.2	93.0	91.8
	16 – 20	93.5	90.8	95.1	93.1
	21 – 25	93.2	89.6	95.0	92.0
	26 – 30	92.8	88.8	95.2	92.9
	31 – 35	88.0	87.6	94.3	94.3
	36 – 40	71.3	68.6	90.7	88.4
Low Level	1 – 5	38.5	36.7	59.0	56.0
	6 – 10	72.4	61.6	77.8	70.2
	11 – 15	82.5	73.0	86.3	80.2
	16 – 20	85.4	76.4	89.9	83.0
	21 – 25	86.1	79.6	91.5	87.4
	26 – 30	85.2	80.6	91.0	88.9
	31 – 35	84.7	77.2	93.1	88.8
	36 – 40	74.7	68.1	91.4	87.0
Observations		26,060	27,552	26,060	27,552

Table 1.9: Educational Distribution of the Male Native and Immigrant Population in the Labor Force

Level of Education	1990	1993	1996	1999	2002
A. Natives					
High Level	17.3 %	19.9 %	21.6 %	24.0 %	26.4 %
Medium Level	45.4 %	46.1 %	46.3 %	46.8 %	47.3 %
Low Level	37.3 %	34.0 %	32.1 %	29.2 %	26.3 %
Total	100 %	100 %	100 %	100 %	100 %
B. Immigrants					
High Level	9.7 %	14.4 %	17.6 %	19.0 %	20.4 %
Medium Level	23.5 %	24.4 %	26.6 %	30.0 %	30.8 %
Low Level	66.9 %	61.1 %	55.7 %	50.1 %	48.8 %
Total	100 %	100 %	100 %	100 %	100 %

Table 1.10: Distribution of Male Immigrants in the Labor Force by Citizenship Status

	1990	1993	1996	1999	2002
Naturalized Immigrants	6.5 %	19.5 %	24.9 %	29.0 %	31.7 %
Non-Naturalized Immigrants	93.5 %	80.5 %	75.1 %	71.0 %	68.3 %
Total	100 %	100 %	100 %	100 %	100 %

8.3 Alternative OLS Estimates

Table 1.11: Impact of the Immigrant Share on Native Outcomes [$3 \times 4 \times 13$]

Specification	Dependent Variable			
	Monthly Wage	Hourly Wage	Employment to Population	Employment to Labor Force
1. Baseline Regression	-0.38 (-0.62)	-0.33 (-0.54)	-0.62** (-2.72)	-0.70*** (-4.52)
2. Unweighted Regression	-0.11 (-0.14)	-0.04 (-0.05)	-0.59 (-1.37)	-0.70** (-2.49)
3. Include Log of Natives as Regressor	-0.35 (-0.71)	-0.31 (-0.59)	-0.63** (-2.76)	-0.70*** (-4.52)
4. Experience $\in [5; 35]$	0.68 (0.53)	1.09 (0.76)	-1.04 (-1.68)	-0.75 (-1.51)
5. $t = 6$	-1.16 (-1.49)	-1.04 (-1.31)	-0.52* (-1.89)	-0.67*** (-3.32)
6. High Education	0.70 (1.51)	0.01 (0.02)	-0.40 (-0.92)	-0.39 (-1.92)
7. Medium and Low Education	-1.03* (-2.34)	-0.99** (-2.39)	-0.50** (-2.38)	-0.64*** (-4.20)

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimated effects of the immigrant share on native outcomes. The first group of outcomes captures male native wages (columns 1 & 2), whereas the second group measures their labor market opportunities (columns 3 & 4). These variables are computed for each education-experience group at time t which composed the baseline sample (3 education groups \times 4 experience groups \times 13 years). Except for specification 6, all regressions include education, experience, and period fixed effects, as well as interactions between education and experience fixed effects, education and period fixed effects, and experience and period fixed effects. Specifications 1, 2 & 3 use 156 observations. Specifications 4 & 5 respectively use 78 and 72 observations. In specifications 6 & 7, I use 52 and 104 observations respectively. Unless otherwise specified, each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

Table 1.12: Impact of the Immigrant Share on Native Outcomes [$6 \times 4 \times 13$]

Specification	Dependent Variable			
	Monthly Wage	Hourly Wage	Employment to Population	Employment to Labor Force
1. Baseline Regression	-0.19 (-0.38)	-0.21 (-0.42)	-0.45** (-2.60)	-0.45*** (-3.04)
2. Unweighted Regression	-0.68 (-1.23)	-0.70 (-1.25)	-0.32 (-1.63)	-0.32* (-1.96)
3. Include Log of Natives as Regressor	-0.40 (-0.72)	-0.39 (-0.69)	-0.28 (-1.67)	-0.37** (-2.52)
4. Experience $\in [5; 35]$	1.36** (2.78)	1.68*** (3.08)	-0.45 (-1.45)	-0.37 (-1.42)
5. $t = 6$	-0.49 (-0.79)	-0.45 (-0.80)	-0.51* (-1.96)	-0.55*** (-3.03)
6. High Education	-1.03 (-1.40)	-1.30 (-1.45)	0.10 (0.62)	-0.06 (-0.64)
7. Medium and Low Education	-0.38 (-0.71)	-0.40 (-0.74)	-0.46** (-2.41)	-0.41** (-2.72)

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimated effects of the immigrant share on native outcomes. The first group of outcomes captures male native wages (columns 1 & 2), whereas the second group measures their labor market opportunities (columns 3 & 4). These variables are computed for each education-experience group at time t which composed the baseline sample (6 education groups \times 4 experience groups \times 13 years). Except for specification 6, all regressions include education, experience, and period fixed effects, as well as interactions between education and experience fixed effects, education and period fixed effects, and experience and period fixed effects. Specifications 1, 2 & 3 use 312 observations. Specifications 4 & 5 respectively use 156 and 144 observations. In specifications 6 & 7, I use 104 and 208 observations respectively. Unless otherwise specified, each regression is weighted by the number of male natives used to compute the dependent variable. Standard errors are adjusted for clustering within education-experience cells.

8.4 Downward Wage Rigidities based on the Type of Employment Contract

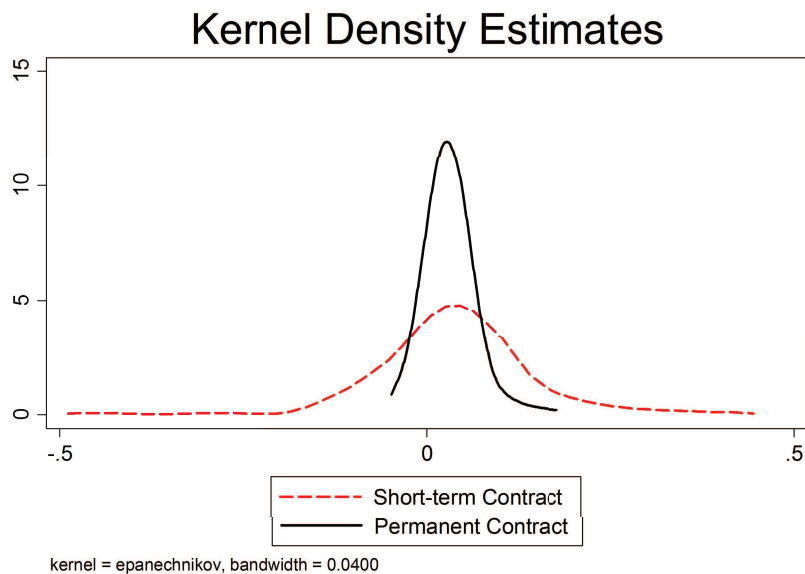
I follow the literature on (nominal) wage rigidity to show that the wages of workers with permanent contracts tend to be downwardly rigid, as opposed to those with short-term contracts. This literature indicates that wages are very likely

to be downwardly rigid when the shape of the wage change distribution respects two conditions (see *e.g.*, Kahn (1997); Kuroda and Yamamoto (2003); Lebow et al. (2003); Dickens et al. (2007); Knoppik and Beissinger (2009)). First, the distribution of wage changes has to show a spike near the zero point. This would mean that wages of workers remain broadly unchanged. Second, the estimated density of wage changes is expected to have an asymmetric shape. In particular, the right-hand side of the spike near the zero point should be bigger than the left-hand side. This comes from the idea that wage increases must be more frequently observed than decreases when there is downward rigidity in wages – *i.e.* the wage change distribution is skewed to the right.

In order to present the distribution of wage changes by employment contract, I first compute the average monthly wage of full-time native workers under permanent and short-term contracts for each skill-cell (j, k) at time t . I use the baseline sample with three education groups ($j = 3$) and four experience groups ($k = 8$), and I merge years by pairs to attenuate potential measurement errors. Then, I compute the change in the monthly wage for each skill group from one year to another.

Figure 1.2 displays the distribution of the monthly wage changes for male natives according to whether they have a permanent contract (black line) or a short-term contract (red dash-line). The wage change distribution of workers with permanent contracts presents a spike near the zero point and it is skewed to the right, with only 11.8% of negative observations. On the other hand, the red dash-line tends to show a quasi-symmetric distribution of wage changes on both sides of the median. Here, the number of negative observations is larger and equals 25.0%.

Taken together, this set of results suggests that the degree of downward wage rigidity is higher for the population of workers under permanent contracts. This is supported by Babecký et al. (2010). Therefore, a labor supply shock (induced by immigration) is very likely to depress the wages of competing natives with short-term contracts, contrary to those with permanent job contracts.

Figure 1.2: Distribution of Percentage Wage Changes of Male Natives (1990-2002)

Notes. The Figure reports the estimated density function for the wage changes of full-time male native workers under permanent contracts (black line) or short-term contracts (red dash-line). I categorize workers into skill-cells (using three education groups and eight experience groups) to compute the average monthly wages per cell. In order to limit measurement errors, we remove the year 1990 and merge years by pair. As a result, we compute the wage changes on the basis of 144 observations.

8.5 Propensity Score Matching Procedure

The estimates of the impact of naturalized immigrants on native employment could potentially be biased due to systematic (observable) differences between the naturalized and non-naturalized groups. In order to address this selection problem into citizenship acquisition, a matching procedure is implemented. By excluding the naturalized individuals who are too dissimilar to non-naturalized immigrants, this procedure aims at creating two homogeneous groups which have the same observable characteristics except in their citizenship status.

8.5.1 Propensity Score Estimation

The first step of PSM techniques is to estimate the probability of being naturalized for each immigrant (*i.e.*, the propensity score). I thus use a binary probit model and a vector of covariates x to capture the most relevant differences between naturalized and non-naturalized immigrants that affect the naturalization decision.

The sample used is the pooled cross-section from 1990 to 2002. The propensity score is computed from the following equation:

$$\mathbb{P}(N_{icfirt} = 1) = \Phi(\rho_0 + \rho_1 H_i + \rho_2 E_i + \rho_3 F_i + \rho_4 P_{rt} + \zeta_c + \zeta_f + \zeta_r + \zeta_t + \xi_{icfirt}) \quad (1.5)$$

where $\Phi(\cdot)$ is the cumulative normal distribution. The dependent variable N_{icfirt} is a dummy variable indicating whether the immigrant i is naturalized ($N_{icfirt} = 1$) or non-naturalized ($N_{icfirt} = 0$). The term H_i is a vector of control variables containing human capital characteristics of individual i , such as education, labor market experience and its square. The dummy E_i indicates whether the individual is employed or unemployed. The family characteristics are captured by the vector F_i which contains the number of children in the household and a dummy variable indicating whether the individual is single or not. Moreover, the naturalization decision may be influenced by the overall number of naturalized and non-naturalized immigrants in the region of residence (Fougere and Safi, 2009). Hence, both shares of naturalized and non-naturalized immigrants in population P_{rt} are included. Occupational category dummies ζ_c are also added to capture specific effects related to the 30 broad job categories.⁶⁸ The term ζ_f is a vector of fixed effects containing the occupational categories of each individual's father. Finally, regional and time dummies are added since the naturalization decision may be affected by region- and year-specific factors.

These explanatory variables should capture the most relevant differences between naturalized and non-naturalized immigrants. Notice that I do not include the origin country of immigrants as additional regressor (because of unavailability), although this characteristic may affect the naturalization decision. However, this omission is very unlikely to challenge the quality of the matching procedure, as well as the main conclusion drawn in Section 6.1. In fact, the distribution of naturalized and non-naturalized immigrants by region of origin is very similar (Table 1.13). In other words, the naturalized and the non-naturalized immigrants do not differ systematically along this dimension.

The estimated propensity score $e(x)$, is the conditional probability of being

⁶⁸For unemployed individuals, the survey gives the last occupational category.

Table 1.13: Distribution of Male Immigrants by Citizenship status and Country of origin in 2009

	Naturalized Immigrants	Non-Naturalized Immigrants
European Countries	37 %	40%
South Europe	26 %	22 %
Others	11 %	17 %
African Countries	45 %	44 %
North-African	33 %	31 %
Others	12 %	13 %
Asian Countries	15 %	13 %
Other Countries	3 %	3 %
Total	100 %	100 %

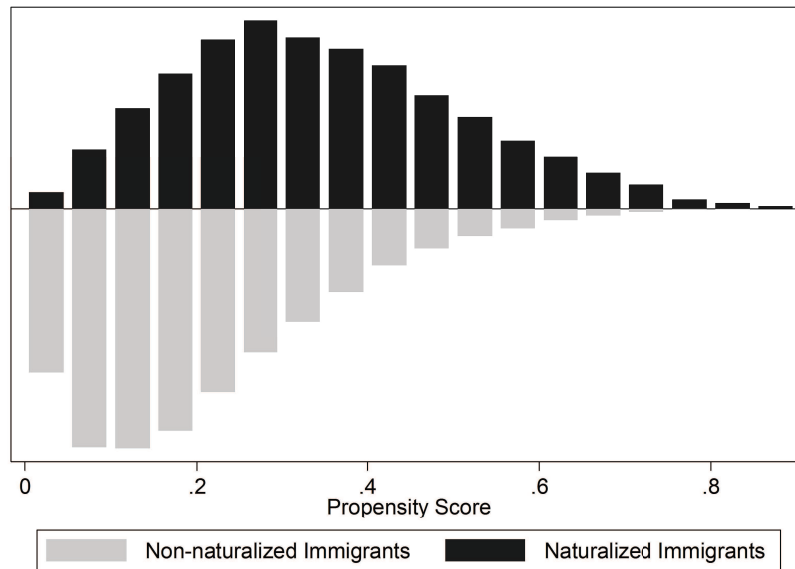
Source. Ministry of Interior: <http://www.interieur.gouv.fr/Le-secretariat-general-a-l-immigration-et-a-l-integration-SGII>.

Notes. Southern Europe countries are Italy, Portugal and Spain. North-African Countries are Algeria, Morocco and Tunisia.

naturalized given the covariates – $e(x) = \mathbb{P}(N = 1|x)$. Naturalized and non-naturalized immigrants selected to have the same $e(x)$ value will have the same distributions of x . Exact matching on $e(x)$ therefore tends to balance the x distributions in the two groups.

The propensity score distribution obtained from the probit estimation is represented in Figure 1.3. It indicates that the propensity score distribution differs considerably between the two groups of immigrants. As expected, it shows that non-naturalized (naturalized) immigrants exhibit a lower (higher) probability to be naturalized. The propensity score intervals of naturalized and non-naturalized immigrants lie respectively within the intervals $[0.005 - 0.890]$ and $[0.001 - 0.863]$. Hence, the common support (based on the MinMax criterion which consists in discarding all observations outside the common support region from the analysis) is given by $[0.001 - 0.890]$, resulting in a loss of six naturalized immigrants (over 8,578) and 53 non-naturalized immigrants (over 26,927).

Figure 1.3: Propensity Score Distribution among both Naturalized and non-Naturalized Immigrants



Notes. The population used is men participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

8.5.2 Matching Process

The second step is to implement a matching procedure to select the naturalized immigrants whose propensity scores are very close to those of non-naturalized immigrants. To do so, I use the most straightforward matching estimator: the nearest neighbor matching with replacement.⁶⁹ In this respect, an individual from the naturalized group is chosen as a matching partner for a non-naturalized immigrant who is the closest in terms of propensity score.

Since I do not condition on all the covariates, but on the propensity score, it is necessary to check whether the matching procedure can balance the distribution of the relevant variables in both groups of immigrants. The idea is to compare the situation before and after matching and to check whether some differences remain

⁶⁹Figure 1.3 suggests that the nearest neighbor matching algorithm without replacement would create poor matches due to the high score individuals from the naturalized population, who would likely get matched to low score individuals from the non-naturalized one. Therefore, the nearest neighbor matching is used with replacement so as to ensure the smallest propensity score distance between the naturalized and non-naturalized individuals.

after conditioning on the propensity score. One suitable indicator to assess the distance in the marginal distributions of the covariates is the standardized bias (Rosenbaum and Rubin, 1985).⁷⁰ The standardized bias measure shows that the difference in the propensity score of unmatched immigrants is close to 7.5%. After matching, the bias significantly decreases and it is equal to 1.2%. Although there is no clear indication of the success of the matching procedure, in most empirical studies a bias reduction below 3% or 5% is considered as sufficient (Caliendo and Kopeinig, 2008). In addition, the insignificant likelihood ratio tests and the very low pseudo R-squared (0.004) support the hypothesis that both groups have the same covariate distribution after matching. All these results therefore suggest that the sole difference between the two groups of immigrants lies in the fact that one of them is composed of individuals who have been naturalized.

However, the matching procedure was not completely successful for certain matching pairs, so that all the relevant differences between the two groups of immigrants may not have been captured by the covariates. Consequently, I restrict the subsample of matched individuals, by excluding the naturalized individuals matched with a propensity score distance higher than the mean distance. This leads to disregarding half of the 8,578 naturalized immigrants. Thus, I keep only the naturalized individuals who are strictly similar to the non-naturalized in their probability of being naturalized. As a result, the two groups of immigrants may be identical in terms of observable characteristics, while they differ in terms of citizenship status.

8.5.3 Limitations

Two main limitations may be raised to challenge the matching procedure, as well as the econometric results presented in Table 1.4. On the one hand, all individuals in both (naturalized and non-naturalized) groups must be able to participate in all states to fill the common support condition. In this analysis, the number of observations deleted because of the common support requirement across different subsamples is low, so that this hypothesis tends to be satisfied.

⁷⁰For each covariate, it is defined as the difference of sample means in the two groups as a percentage of the square root of the average of sample variances in both groups.

On the other hand, the validity of the matching technique is based on the assumption that all relevant differences between the two groups of immigrants are captured by the covariates. In my case, I have to control for all the characteristics affecting the naturalization decision and the labor market performance of immigrants. Otherwise, the insensitivity of native employment to an increase in the supply of naturalized immigrants may be due to other factors than citizenship.

In order to have two homogeneous groups of migrants that differ only in their citizenship status, I have already restricted the sample of naturalized immigrants to individuals with very close propensity scores to non-naturalized. Despite this restriction, the insensitivity of native employment to p_{jkt}^{ned} may still be due to other factors than citizenship.

First, I do not include (to estimate the propensity score) any proxy capturing the level of integration of migrants, such as the number of years since migration (because of unavailability). Thus, this might be because naturalized immigrants are, on average, more integrated that they do not depress native employment. Second, PSM techniques rely on observable characteristics only. Yet, the naturalization decision may be due to unobservable characteristics (*e.g.*, ability to learn the history of their host country, their language skills and potentials for assimilation) which, in turn, may affect the labor market performance of immigrants. Therefore, the insensitivity of native employment to an increase in the supply of naturalized immigrants may be because the naturalized immigrants have some specific unobservable characteristics.

As a result, it may be wrong to conclude that the naturalized immigrants do not affect native employment because they acquired the French citizenship. However, the fact that the naturalized immigrants may (systematically) differ from the non-naturalized immigrants based on their level of integration and unobservable characteristics does not challenge my explanations regarding the causes of the displacement mechanism. Since well-integrated immigrants are very likely to have outside options, cultural norms and behaviors close to those of natives, firms should not have any incentive to replace them. In addition, well-integrated immigrants are likely to be less attractive for firms (than recent immigrants) because they are more informed about the labor market legislation

(Sa, 2011). Similarly, the unobservable characteristics of naturalized immigrants are very likely to be positively correlated with their reservation wages and their level of integration. Thus, the naturalized immigrants should be as profitable as natives in the production process.

Given the limitation of the PSM techniques, I do not suggest that this is because immigrants have the French citizenship that they do not depress native employment. The naturalized immigrants do not displace native workers because they tend to have similar characteristics to natives in terms of outside options, cultural norms and labor market behaviors. This interpretation is supported by Section 6.2 which shows that the European immigrants (who have similar outside options and cultural norms to natives) have a negligible impact on the employment of competing natives.

CHAPTER 2

The Wage Effects of Immigration by Occupation and Origin

⁰This chapter results from a joint work with Farid Toubal (ENS de Cachan, Paris School of Economics, CEPII).

1 Introduction

The literature on the effects of immigration on the labor market grew explosively since the 1990's.¹ Focusing on the direct partial effects of immigration on native outcomes, some studies have shown that native workers tend to suffer from the competition with equally skilled immigrants. A set of empirical works actually report evidence of detrimental immigration effects on the wages of native workers who have similar skills (see, *e.g.*, Borjas (2003, 2008b); Orrenius and Zavadny (2007) for the United-States and Puerto-Rico; Aydemir and Borjas (2007) for Canada; New and Zimmermann (1994); Steinhardt (2011) for Germany; Bratsberg and Raaum (2012); Bratsberg et al. (2014) for Norway).

These findings are generally rationalized with a simple supply and demand framework (Borjas, 2013). Given a downward-sloping labor demand curve, an increase in the supply of one type of skill (due to immigration) lowers the wage of workers with similar skills.² A recent literature in economics goes beyond this Walrasian market-clearing determination of wages in order to highlight alternative channels through which immigration may impact wages (Fuest and Thum, 2000; Sasaki, 2007; Malchow-Møller et al., 2012; Chassamboulli and Palivos, 2014). By using some aspects of search and bargaining models, these studies show that immigration may also affect the nature of the bargaining between workers and employers, and thus, contribute to affect wage formation. The first study on this question is Winter-Ebmer and Zweimüller (1996). They introduce a theoretical model where a high share of foreign workers (within a firm) weakens the bargaining power of natives by improving the firm's outside option and, in turn, "hamper wage concessions reached in negotiations with the management" (p. 489).

This strand of the migration literature is, more generally, related to the literature on the consequences of globalization on collective bargaining outcomes (Bhagwati, 1995). The intensification of international activities, such as imports, outsourcing or foreign direct investment, by the firm are actually viewed as po-

¹See, *e.g.*, surveys of the literature by Friedberg and Hunt (1995); Longhi et al. (2005); Okkerse (2008).

²At the same time, immigration should raise the wage of workers with skills that complement those of immigrants (Borjas, 2003; Manacorda et al., 2012; Ottaviano and Peri, 2012).

tential threats which discipline workers' wage demand (Skaksen, 2004; Kramarz, 2008; Eckel and Egger, 2009; Dumont et al., 2012).³ As for international activities, immigration may affect wage formation. Immigration may weaken the bargaining position of competing natives *vis-à-vis* the firms, and *in fine* decrease their wages.

The present paper takes a fresh look at the immigration impact by investigating the relationships between immigration, the bargaining power of natives and their wages. In the matching model proposed by Cahuc and Zylberberg (2004), wage formation is described by a bargaining process between employers and workers, where wages depend positively on the bargaining power of workers through the "exit rate of unemployment" – *i.e.*, the probability to transit from unemployment to employment. The matching model thus predicts that lower employment probabilities deteriorate the position of workers in the bargaining process, and *in fine* reduces the level of bargained wages. This idea is similar to that of McDonald and Solow (1981, p. 899) who explain that wages depends on "the expected value of alternative employment opportunities and this should have a strong procyclical fluctuation through changes in the probability of finding alternative jobs."

Based on this prediction, we use the probability of being employed as a proxy for the bargaining power. According to McDonald and Solow (1981); Cahuc and Zylberberg (2004), higher employment probabilities are expected to increase the bargaining power of workers, and therefore their (bargained) wages. We thus investigate the effects of immigration on both employment probabilities and wages of competing natives. We use individual-level regressions to estimate the effects of immigration (Friedberg, 2001).

As in Borjas (2003), our approach measures the immigrant supply as the share of immigrants in the labor force for a given education-experience cell. The "national skill-cell approach" has two main advantages. First, the skill-cell dimension allows to examine the impact of immigrants on the outcomes of natives who compete with them in the short-run.⁴ This is perfectly consistent with our purpose,

³The possibility to outsource a part of the production chain to foreign affiliates reduces the bargaining position of employees by improving the firm's fallback profit in case of disagreement during wage negotiations.

⁴The present paper is thus devoted to only estimate the direct partial effect of an immigrant-

devoted to study how the outcomes of natives can be shaped by an increasing competition due to immigration. Second, the “national skill-cell approach” allows to circumvent inherent issues in the measure of the wage immigration impact. By focusing on the entire economy, this approach addresses the limitation according to which the natives may respond to immigrant supply shocks by moving their labor to another region, city, or industry, thereby re-equilibrating the national economy (Borjas et al., 1997; Card and Lemieux, 2001; Dustmann et al., 2005).

An important feature of this study is to focus on France, a country which is characterized by a wage structure that is rigid (Card et al., 1999; Biscourp et al., 2005; Edo, 2013). The French labor market institutions actually combine high minimum wages, generous welfare benefits, extremely high coverage of collective bargaining agreements and strong employment protection. These institutional dimensions affect the wage-setting mechanism, the reservation wage and the scope for bargaining, which in turn generate downward wage rigidity and affect the responsiveness of wages to immigration-induced labor supply shocks (Brücker et al., 2014). Another important feature of the French institutional setup is to be a country with a dominance of sector level wage bargaining (Cahuc and Zylberberg, 2004; Avouyi-Dovi et al., 2009). This characteristic should reinforce downward wage rigidity (Babeckÿ et al., 2012).

This paper exploits very rich micro-level data to control for individual characteristics that may affect the probability to be employed, as well as the level of wages. Our yearly data covers a long time period from 1990 to 2010 about a sample of around 210,000 individuals per year. Over this period, the share of immigrants in the labor force climbed from 7% to 10%.

This paper makes three major contributions to the literature. First, we are the first to examine both effects of immigration on the (i) employment probability and (ii) wages of competing native workers. This is moreover the first paper which study the direct competitive effect of immigration on native employment probability.⁵ For France, we find that immigration reduces the probability of being

induced increase in labor supply on native outcomes in short-run. See Edo and Toubal (2014a) for a complement study on the overall impact of immigration on native wages for France in the short- and long-run.

⁵Mühleisen and Zimmermann (1994); Winter-Ebmer and Zweimüller (1999) investigate the

employed for competing natives: a 10% increase in immigrant supply reduces the probability of being in work by around 0.6 percentage points. We also show that a 10% increase in the immigrant share due to an influx of immigrants is associated with a 0.5-1% fall in the monthly earnings of natives in that skill-cell.^{6,7} By decreasing the bargaining power of natives (through their probability of being employed), an inflow of foreign-born workers therefore decreases the wages of competing natives. We also show that our results are not driven by educational downgrading among immigrants;⁸ and, for the first time, we provide evidence of positive cross-cell effects between the immigrant share and native outcomes (with a non-structural framework).

The second important contribution of the paper is to extend our analysis by investigating the labor market effects of immigration along a wide range of 22 occupations. The studies generally decompose the immigration wage effect by using at most three occupational groups (see, *e.g.*, Orrenius and Zavodny (2007); Steinhardt (2011)). We find strong heterogeneous effects of immigration on native outcomes across occupations. Our results indicate that immigration neither affects employment probabilities nor wages of competing native workers in highly skilled (white-collar) occupations. However, we find strong adverse effects of immigration on both employment probabilities and wages of natives in low-skilled (blue-collar) occupations. These asymmetric effects across occupations are

impact of immigration (for the late eighties) on the probability of unemployment entry in Germany and Austria, respectively. They use both industry and region variations of immigration as an indicator for job competition, and they find no detrimental impact of immigration on the incidence of unemployment. The main explanation for this result, given by Winter-Ebmer and Zweimüller (1999, p. 338), is that “native workers can escape immigrant competition in specific sectors or regions of the economy by moving to other industries or regions.” Since we follow the skill-cell approach by Borjas (2003), this strong limitation is very unlikely to bias our results. See, also, the contributions by Peri and Sparber (2011); Cattaneo et al. (2013); Foged and Peri (2013) who study the occupational mobility among natives in response to immigration.

⁶This finding is consistent with the predictions of a text book model of competitive labor markets, which suggests that higher levels of immigration should lower the wage of competing workers (within skill-cells) and increase the wage of complementary workers (across skill-cells). This result is also consistent Edo (2013); Edo and Toubal (2014a) who find for France that, within skill-cells, immigrants and natives are perfect substitutes in production.

⁷To isolate the causal within-cell effect of immigration on native outcomes, we use historic immigration patterns as instruments for migrant inflows. As compared to Borjas (2003) who find a wage adjustment by 3-4%, our estimate points to the dampening effect of wage rigidities in France.

⁸In fact, our results may be biased if immigrants with intermediate and high education tend to find jobs in occupations typically staffed by natives with lower level of schooling (Dustmann et al., 2013).

consistent with Jaeger (1996); Camarota (1997); Card (2001); Borjas (2003) who mainly find negative immigration effects among the low-skilled natives, as well as Orrenius and Zavodny (2007); Steinhardt (2011) who report detrimental wage effects of immigration in blue-collar occupations only. One explanation for this asymmetric effect across occupations is that the degree of substitution between immigrants and natives may vary across skill levels (Orrenius and Zavodny, 2007; Peri and Sparber, 2011; Chassamboulli and Palivos, 2013).

The most intriguing finding concerns the medium skilled (white-collar) workers. While immigration tends to decrease the employment probability of natives who work in medium skilled occupations, immigration does not affect their wages. The decline in the bargaining power of natives due to immigration does not lead to downward wage adjustment. We interpret this result as evidence for downward wage rigidities. Our interpretation is consistent with the literature on wage rigidity (see, *e.g.*, Campbell III and Kamlani (1997); Babecký et al. (2010)), which reports that white-collar wages are much more rigid (and much less responsive to economic shocks) than blue-collar wages. One explanation is that firms are reluctant to cut the wages of white-collar workers because their effort are difficult to monitor and more valuable (in terms of value-added).

The third contribution of the paper is to examine how native employment opportunities and wages react to immigration by accounting for the differences in national origins among immigrants. We use a three-way breakdown of the immigrant population: European immigrants, non-European immigrants and naturalized immigrants (*i.e.*, the migrants who ascend the French citizenship). We find that the labor market adjustment caused by influx of migrants is masking important country distinctions. More specifically, the average negative effect of immigration on native employment probability and wages is completely driven by the supply of non-European immigrants, as compared to European and naturalized immigrants.

This result is consistent with the fact that the non-European immigrants have

the lowest outside options among the immigrant population.^{9,10} As explained by Winter-Ebmer and Zweimüller (1996); Malchow-Møller et al. (2012), the bargaining power of native workers, and therefore their wages, should be depressed if immigrants have lower outside options than natives.¹¹ In particular, a higher share of immigrants may weaken the bargaining position of natives since firms have another and cheaper source of labor to draw from. In sum, our results suggest that the average effects of immigration on the outcomes of competing natives are mostly negative because immigrants have lower outside options (compared to equally productive natives).¹²

The remaining of the paper is organized as follows. The two next sections respectively describe the main characteristics of the French wage setting procedures and the underlying empirical methodology of our analysis. Section 4 describes the data and provides descriptive statistics. Section 5 provides the within-cell effects of immigration on native employment probability and wages. This section also shows that our results are not driven by any skill downgrading among immigrants. Section 6 and 7 breakdown our main results by occupation and nationality group, respectively. The last section concludes.

2 French Institutional Framework

The French system combines three levels of wage bargaining: national, sector and firm-level. At the national level, a binding minimum wage is set by the government. It applies to all workers and to all types of firms. In France, 14% of workers were paid the national minimum wage over the past two decades. In most countries where a minimum wage exists, less than 5% of workers are paid the minimum wage (Du Caju et al., 2008).

⁹Actually, in France, the non-European immigrants face strong institutional discrimination regarding labor market accessibility (Math and Spire, 1999) and welfare state benefits eligibility (Math, 2011); whereas the naturalized and European immigrants are treated in the same way as native-born citizens in terms of the law.

¹⁰By following the literature (Borjas et al., 2012; Ottaviano and Peri, 2012), we find that natives, naturalized immigrants, European immigrants and non-European immigrants are perfect substitutes in production.

¹¹Or, because, immigrants are less strike-prone than natives (as explained by Winter-Ebmer and Zweimüller (1996) and shown by Sa (2011)).

¹²Edo (2013) also finds for France that employers tend to replace native workers by those migrants who only have very low outside options.

Sector-level bargaining is organized by branches.¹³ A “branch” is a bargaining unit regrouping workers in a sector, an occupation or a group of sectors. However, a “branch” does not exactly match industries, sectors or occupations (see Avouyi-Dovi et al. (2013) for details). The trade unions and the employers’ organizations negotiate pay scales and wages “branch” by “branch.” These agreements define the minimum wages to be paid for different tenure levels for a range of different “branches”. No employee in a given occupation (or “branch”) can be paid less than this “agreed” minimum wage. If the “agreed” minimum wage is less than the national minimum wage, then the latter applies. On average, the “effective” wages paid to workers exceed the negotiated minimum wages by about 6.5% (Montornès and Sauner-Leroy, 2009).¹⁴

The Ministry of Labor generally extends sector-level agreement to all firms (whether or not they belong to the employers’ organization) as well as to all employees in the relevant “branch.” This extension procedure is quasi systematic and explains that most the workforce is covered by “branch” agreements. For instance, sector-level bargaining sets minimum pay scales for 75% of the labor force (Avouyi-Dovi et al., 2009).

Sector-level collective bargaining agreements can be supplemented with agreements concluded at the firm level. Since 1982, collective bargaining has to take place each year in firms where there is one representative union.¹⁵ This obligation to negotiate is however not an obligation to obtain an agreement. According to the favorability principle in hierarchical wage bargaining, firm-level agreements can only improve the “branch” minimum wage and must be above the national minimum wage. Agreements at sector-level are not systematically binding and firms may also have specific wage policies. Firm-level agreements cover around 20% of workers. According to Meurs and Skalli (1997), however, sector-level agreements have the major influence on the wage hierarchy and the effect of firm-

¹³The French bargaining system is composed of about 700 “branches” (Poisson and des Yvelines, 2009). Among these 700 “branches”, 175 cover more than 5,000 employees in 2012. This represents more than one half of the private sector employment.

¹⁴The gap between the “effective” and negotiated wage sheds light on the role of firm negotiation.

¹⁵When there is no representative union, the employer is subject only to sectoral level agreement.

level wage bargaining is very limited because the majority of firms do not have a representative union.

For our purposes, the institutional settings of wage determination in France have two main implications. On the one hand, the coexistence of a binding minimum wage at the national or at the sectoral/occupational level covering most the workforce may affect the responsiveness of wages to economic shocks (Brücker et al., 2014). Moreover, the fact that the dominant level of wage negotiations in France is outside the firm should reinforce (downward) wage rigidity (Babeckÿ et al., 2010, 2012). In fact, sector-level collective agreements do not take account of firm-specific situations in wage determination, while some degree of decentralization may allow firms to adjust wages downwards after negative economic shocks. In France, the prevalence of high unemployment benefits and strict employment protection (Nickell, 1997) should reinforce the bargaining position of workers (Cohen et al., 1997), which in turn should have an impact on the adjustment of wages to economic shocks. As a result, a positive labor supply shock induced by immigration may lead to lower wage adjustment in France, as compared to the United Kingdom and the United States characterized by more flexible wages.

On the other hand, the fact that French wages are mainly negotiated by “branch” may generate some heterogeneity across occupations in terms of downward wage rigidity. In particular, the negotiated minimum wage may be higher for some occupations, reducing the leverage for firms to cut wages. In addition, firms may have different wage policies than those negotiated at the occupational level – *i.e.*, wages paid by firms can be higher than negotiated wages resulting from sector-level collective agreements. As a result, the wage sensitivity to (negative) economic shocks may differ across occupations.¹⁶

Moreover, in accordance with the literature on wage rigidity (Campbell III, 1997; Babeckÿ et al., 2010), we may find evidence of an inverse relationship between the skill level of an occupation and the wage reactions to economic shocks. More specifically, the wages of workers in high-skilled occupations may be more

¹⁶French firms generally use labor turnover to adjust labor cost: they hire new employees at lower wages than those who left (Babeckÿ et al., 2012). An employee may leave a firm because of early retirement, retirement, voluntary quit, layoff; or because its job contract ends. Therefore, any downward wage adjustment (*e.g.*, due to immigration) is unlikely to be implemented on existing workers. Instead, wage adjustment should be implemented through job turnover.

rigid than the wages of workers in low-skilled occupations. This is supported by the predictions of standard labor market theories (*e.g.*, efficiency wage theories, turnover model and adverse selection model). According to efficiency wage theories (Akerlof, 1982; Shapiro and Stiglitz, 1984; Akerlof and Yellen, 1990), workers' productivity (effort) depends positively on their wage, and hence firms might refrain from cutting wages because it could reduce profits. Because the effort of workers in high-skilled occupations is difficult to monitor and more valuable (in terms of value-added), firms may not reduce the wages of incumbent workers (or new hired) to avoid them reducing their effort.

3 Empirical Methodology

3.1 Econometric Equations

This paper is devoted to investigate the effects of immigration on the employment probability and wages of comparably skilled natives. For both investigations, we use individual-level regressions.¹⁷

Based on bargaining models (McDonald and Solow (1981); Cahuc and Zylberberg (2004)), the present study uses the probability of being employed as an indicator for the bargaining power of natives. This assumes that the employment probability of workers is positively correlated with their bargaining power. We estimate the following probit equation to examine how the probability of being employed is affected by the supply of migrants:

$$\mathbb{P}(N_{ijkt} = 1) = \Phi(\alpha_0 + \alpha_1 \ln(p_{jkt}) + \alpha_2 X_{it} + \delta_t + \eta_{ijkt}), \quad (2.1)$$

where $\Phi(\cdot)$ is the standard normal cumulative distribution. The dependent variable N_{ijkt} is a binary variable indicating whether the individual i in cell j, k

¹⁷Individual-level regressions are also used in Mühleisen and Zimmermann (1994); Winter-Ebmer and Zweimüller (1999) to measure the immigration impact on native unemployment probability, as well as in New and Zimmermann (1994); Friedberg (2001); Kifle (2009); Bratsberg and Raaum (2012); Bauer et al. (2013); Bratsberg et al. (2014) to examine the wage reactions of natives to immigration. Except Bratsberg et al. (2014), these studies measure immigrants' penetration in industry branch or occupation groups; while our study uses the "national skill-cell approach" (introduced by Borjas (2003)) to gauge the immigration impact at the individual level. Mishra (2006) also combines the skill-cell approach and individual-level regressions to investigate the impact of emigration (rather than immigration) on wages.

at time t is employed ($N_{ijkt} = 1$) or unemployed ($N_{ijkt} = 0$). Following Borjas (2003), the immigrant supply shock experienced in a particular skill-cell with educational attainment j , experience level k at year t is measured by p_{jkt} .¹⁸ This is the percentage of the total labor force in a skill group coming from immigrant workers:

$$p_{jkt} = M_{jkt} / (N_{jkt} + M_{jkt}), \quad (2.2)$$

with N_{jkt} and M_{jkt} respectively the number of natives and immigrants in the labor force located in the schooling-experience-time cell (j, k, t) . The vector of control variables X_{it} represents time-varying individual characteristics. We also include time dummies δ_t in the regression. The error term is denoted η_{ijkt} .

In order to examine the impact of immigration on native wages, we rely on Equation (2.1) and we use individual-level wage regressions (Friedberg, 2001). In light of Equation (2.1), the other part of the empirical analysis is based on estimates from the following equations:

$$\ln(w_{ijkt}) = \beta_0 + \beta_1 \ln(p_{jkt}) + \beta_2 Z_{it} + \delta_t + \varepsilon_{ijkt}, \quad (2.3)$$

where the dependent variable is the log wage of the individual i clustered in the skill-cell j, k at time t . The vector of control variables Z_{it} (which differs from X_{it}) contains time-variant individual effects that influence individual wages. The wage regression also includes time dummies δ_t as additional regressors, and an error term ε_{ijkt} .

In Equations (2.1) and (2.3), since the variable of interest p_{jkt} varies only at the skill-cell level, the standard errors need to be adjusted for clustering within education-experience cells. In fact, when analyzing the effects of aggregate variables on micro units, we have to account for the possibility of a within-group correlation of random disturbances by clustering standard errors at the group level. Since individuals in the same skill-cell share the same observable characteristics, they may also share unobservable characteristics that lead to correlated

¹⁸In order to facilitate the interpretation of the coefficient on the immigrant share, we take the log of the immigrant share. This is possible since the share of immigrants is never equal to zero.

errors. As a result, the standard errors of our parameter estimates may be biased downward and they have to be clustered at the skill-cell level (Moulton, 1990).

However, with only $j \times k$ clusters, we may have too few clusters to get unbiased standard errors (Angrist and Pischke, 2008). In particular, with a small number of clusters (or very unbalanced cluster sizes), it is very likely that inference using the cluster-robust estimators provides lower standard errors than using OLS estimates. However, in the present paper, the estimates of p_{jkt} on native outcomes are always less precise (*i.e.*, less significant) using clustering techniques. In particular, the standard errors are between three and ten times higher when they are not adjusted for clustering within education-experience cell. This indicates that the standard errors of our parameter estimates are biased downward, and therefore, they need to be adjusted for clustering.¹⁹

3.2 Endogeneity of the Immigrant Share

The main econometric issue in this setting is the endogeneity of the immigrant share. The fact that migrants may not be randomly distributed across skill-cells would lead to upwardly biased the estimates of our parameter of interest β . In effect, the labor market may attract foreign-born workers mainly in those skill-cells where wages and employment are relatively high (Borjas, 2003).

The endogeneity bias of the immigrant share can be remedied by using instrumental variables. In the present paper, we follow Borjas (2003) and we use the lag immigrant share to capture the immigrants stock which prevailed before the current period t .²⁰ The validity of such instrument (or some variation thereof) is based on two conditions. First, the settlement decision of immigrants has to be determined by the presence of earlier immigrants. Second, the past immigrant share does not have to be correlated with the contemporary labor market outcomes. While the first condition tends to be verified (Bartel, 1989),²¹ the second

¹⁹Following Cameron and Miller (2010), a concrete solution for this problem is to bootstrap the standard errors. Unfortunately, this solution is beyond computational capacities for our estimates, due to the large number of dummy variables we introduce in our equations.

²⁰Similar types of instruments have also been used by Altonji and Card (1991); Card and Lemieux (2001); Cortes (2008); Peri (2012); Dustmann et al. (2013) to instrument the regional shares of immigrants.

²¹The reason for cultural clustering of immigrants may be network externalities (Gross and Schmitt, 2003; Epstein and Gang, 2010). Co-ethnics may actually provide new immigrants with

condition is not necessarily filled since the locational choice of previous wave of immigrants may not be random (Borjas, 1999; Dustmann et al., 2005). Indeed, the past immigrants were probably attracted in those skill-cells with higher wages. Yet, it is very likely that wages are correlated over time at the skill-cell level, such that the use of the settlement patterns of previous immigrants as an instrument can be invalid.

A way to limit the problem of serial correlation in wages is to use a sufficient time lag of the immigrant share to compute our instrument. In fact, “pre-existing immigrant concentrations are unlikely to be correlated with current economic shocks if measured with a sufficient time lag” (Dustmann et al. (2005), p. 328). Although this strategy leads to a dramatic loss of observations, this drawback is less problematic in our case since we have a very long time period data: 1990-2010. In particular, we use ten lags to compute our baseline instrument – *i.e.* $\ln(p_{jkt-10})$.

As explained in Dustmann et al. (2005, p. 328): “the assumption that lagged values of immigrant stocks are correlated with outcome changes only through their relation with immigrant inflows is an identifying assumption that is not testable.” However, we can check the robustness of our instrumentation technique by following a double strategy. On the one hand, we design two alternative instruments, by using four lags $\ln(p_{jkt-4})$ and six lags $\ln(p_{jkt-6})$. On the other hand, our empirical estimates have to verify two crucial expectations. First, the instrumental variable (IV) regressions have to provide lower estimates of the wage immigration impact than the OLS regressions (*i.e.*, $\hat{\beta}_{OLS} > \hat{\beta}_{IV}$, since the OLS estimates of β tend to be upward biased). Second, we expect that the more the time lag of the instrument, the lower the IV estimates. In fact, a sufficient lagged measure of the immigrant share should be less correlated with contemporary labor market outcomes (Dustmann et al., 2005).

Our first stage IV estimates are given by the following reduced form equation:

$$\ln(p_{jkt}) = \gamma_0 + \gamma_1 IV_{jkt-x} + \delta_j + \delta_k + \delta_t + \eta_{ijkt}, \quad (2.4)$$

Where IV_{jkt} is the log share of immigrants in a skill-cell j, k at calendar year t .
 information on labor and/or housing markets.

$t - x$, with x the time lag used to compute the instrument. We report the First stage estimates in appendix (Table 2.9, section 9.1) for three samples which combine different structures of education-experience cells. For each sample, we use two specifications. The first specification only uses the instrument as explanatory variable, whereas our preferred specification uses education, experience and time dummies as additional controls. Standard errors are adjusted for clustering within education-experience cells.

In accordance with other findings, our first stage estimates always indicate a strong positive correlation between each instrument and the log share of immigrants – the first stage is highly significant and the partial R^2 is always higher than 0.5, indicating that our IV estimates do not suffer from a weak instrument problem (Bound et al., 1995; Stock et al., 2002). As expected, the positive correlation is weaker when using an important time lag to compute our instrument. The coefficient values are also lower when a set of education, experience and time dummies are included. In order to implement the IV second stage estimates of immigration on native outcomes, we will use the predicted values from the specifications 2, 4 and 6, which include this set of dummies.

4 Data Description and Descriptive Statistics

4.1 Data and Variables

The empirical analysis uses data drawn from the French annual labor force survey (LFS) from 1990 to 2010. They are provided by the French National Institute for Statistics and Economic Studies (INSEE).²²

We merge two different waves of data. The first wave covers the period 1990-2002, while the other refers to the period 2003-2010. The French LFS provides a very rich set of information about a random sample of around 210,000 individuals per year, by including demographic characteristics (nationality, age, gender, and marital status), social characteristics (educational attainment, age of completion of schooling, and family background), as well as employment status, occupation, earnings, number of hours worked a week, etc.

²²Institut National de la Statistique et des Etudes Economiques.

Our methodology requires having accurate information on the levels of education and work experience for native- and foreign-born individuals. In this regard, the employment survey divides the education level into six narrow categories: college graduate, some college, high school graduate, some high school, just before high school, no education. According to the International Standard Classification of Education (ISCED), those levels of education respectively correspond to (1) a second stage of tertiary education, (2) first stage of tertiary education, (3) post-secondary non-tertiary education, (4) (upper) secondary education, (5) lower secondary education and (6) a primary or pre-primary education. On the other hand, we follow Mincer (1974) and compute work experience by subtracting for each individual the age of schooling completion from reported age.²³ This measure differs from the one used in the migration literature since the age of completion of schooling is usually unavailable.²⁴

The present paper follows most empirical studies and restrict its attention to men aged from 16 to 64, who are not enrolled at school, who are not self-employed (farmers and entrepreneurs), who are not in the military and the clergy, and have between 1 and 40 years of labor-market experience.

In order to make the results representative of the total French population, the sample statistics presented in the following sections as well as our regressions always use an individual weight computed by the INSEE. For each observation the weight indicates the number of individuals each observation represents in the total population.

4.1.1 Dependent Variable

We use monthly wages as our main dependent variable, instead of hourly wages. Our main concern is that native workers could adjust their labor supply after an immigration shock. In effect, they could increase their number of hours worked to avoid any drop in their monthly wages. Hence, immigration could not depress native hourly wages, although monthly wages are negatively affected. However,

²³For a few surveyed individuals, the age of completion of schooling is very low, between 0 and 11 inclusive. Since individuals cannot start accumulating experience when they are too young, we have raised the age of completion of schooling for each surveyed individual to 12 if it is lower.

²⁴Empirical works rather assign a particular entry age into the labor market to the corresponding educational category.

our empirical results are perfectly robust to the use of hourly wages as an alternative dependent variable – this may suggest that native workers do not respond to immigration by working more. Another important concern is that some respondents who report their wages do not report their hours worked in the survey. The computation of hourly wages thus induces a loss of observations.

The employment survey provides the monthly wage net of employee payroll tax contributions adjusted for non-response. For robustness tests, we compute hourly wage by dividing for each respondent monthly wage by the average number of hours worked per week.²⁵ We use the French Consumer Price Index computed by the INSEE to deflate all wages with 2000 as the reference base period.

Moreover, we restrict our attention to full-time native workers to get a homogeneous population, as well as to limit the possibility that native workers may adjust their labor supply to immigration by working more. Likewise, when investigating the effect of immigration on native employment probability, we also exclude part-time workers to construct our dependent variable. Thus, unless otherwise specified, our main dependent variable is equal to one when natives are employed in full-time jobs and zero if they are unemployed. However, notice that all our empirical results are robust to the inclusion of part-time workers in the sample.

4.1.2 The Immigrant Share and Trends by Skill-Cells

The aim of the skill-cell methodology (Borjas, 2003) is to divide the national labor market into skill-cells. The cells are built in terms of educational attainment j , experience level k , and calendar year t , each of them defines a skill group at a point in time for a given labor market. We cluster individuals into these cells according to their education-experience profile to compute the immigrant share in the labor force p_{jkt} . The immigrant supply shock for each skill-cell is computed on the basis of 31,309 to 90,897 male individual observations per year, of which between 8.0% and 9.7% represent immigrants.

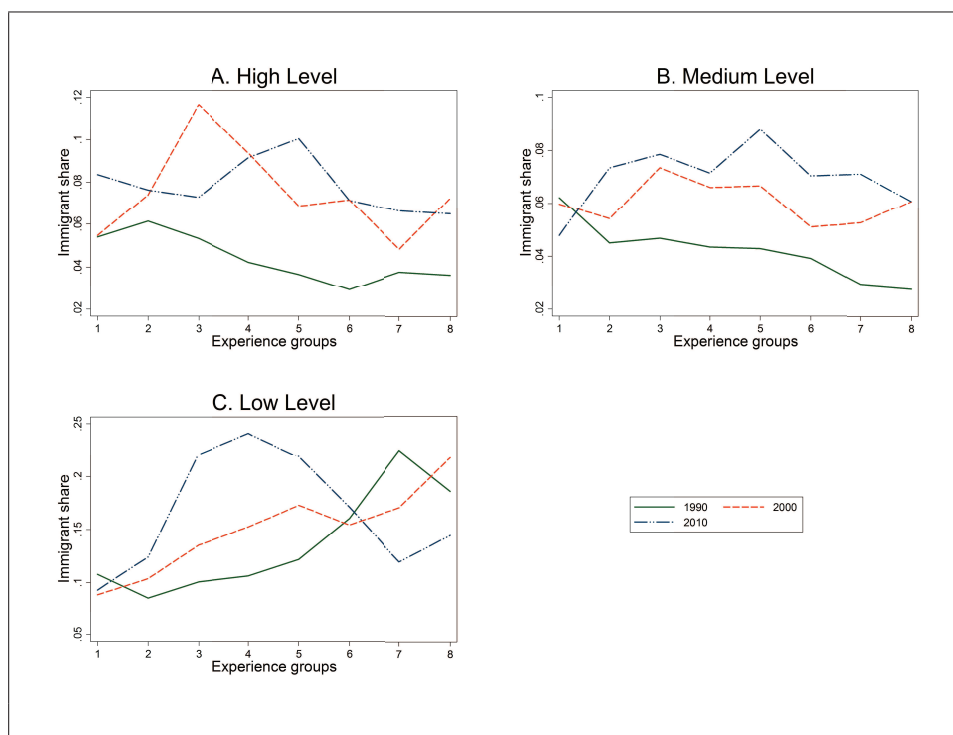
The estimated impact of p_{jkt} on native wages are very likely to be sensitive to

²⁵When the number of working hours per week is not reported, we use the number of hours worked during the previous week to compute the dependent variable.

how skill groups are defined (Aydemir and Borjas, 2011). This study thus relies on Edo (2013) and defines three different samples combining different structures of education-experience cells to compute the immigrant shares. The baseline sample is composed of three educational categories and eight experience groups, each spanning an interval of 5 years of experience [1-5; 6-10; 11-15; 16-20; 21-25; 26-30; 31-35; 36-40]. In order to create the three education classes, we merge the two highest level of education [Second stage of tertiary education - First stage of tertiary education], the two medium [Post-secondary non-tertiary education - (Upper) secondary education] and the two lowest [Lower secondary - Primary education and Pre-primary education]. While the second sample combines three education levels with four experience intervals of ten years, the third sample makes up six education levels and four experience groups. All in all, there are 24 ($j = 3 \times k = 8$) cells per year in the baseline sample, while there are 12 ($j = 3 \times k = 4$) and 24 ($j = 6 \times k = 4$) cells per year in the two alternative education-experience structures.

The sample with 12 skill-cells (three education groups and four experience groups) should correct for the potential attenuation bias our estimates might suffer (Aydemir and Borjas, 2011). Also, it allows to attenuate the impact of possible bias regarding the experience measure, and in particular, the fact that employers may evaluate the experience of immigrants differently from that of natives.

The last education-experience structure (with six narrow education groups) allows to test the sensitivity of our results to potential downgrading among immigrants. As explained by Dustmann and Preston (2012); Dustmann et al. (2013), the skill-cell methodology may provide biased estimates of the effect of immigration on the outcomes of competing natives due to skill downgrading among immigrants. Immigrants, in fact, may accept jobs requiring a lower level of qualification than they have (as found by Dustmann et al. (2013) for the United Kingdom, Cohen-Goldner and Paserman (2011) for Israel as well as Mattoo et al. (2008) for the United States). More specifically, immigrants with intermediate and high education may find jobs in occupations typically staffed by natives with lower level of schooling. Thus, the reported level of education can be a poor

Figure 2.1: Immigrant Share per Cell in 1990, 2000 and 2010

Notes. The Figure illustrates the supply shocks experienced by the different skill-cells between 1990 and 2010. Experience groups denoted 1, 2, 3,..., 8 correspond respectively to an experience level equal to 1-5, 6-10, 11-15, ..., 36-40 years. The population used to compute the immigrant share includes men participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

indicator of the labor market position of immigrants, decreasing the precision of our stratification of workers across education-experience cells.

In our case, the pre-assignment of natives and migrants to education-experience cells, based on their observed characteristics, may induce to a misleading interpretation of our econometric results. By using a skill-cell structure with six narrower education groups, we can therefore test the sensitivity of our main results to potential downgrading among immigrants. Especially, if immigrants downgrade their skills, we expect to find no detrimental effects on native outcomes by using the sample with six education and four experience groups (since immigrants and natives should not competing for the same type of jobs within such a narrow education cell, as discussed in Dustmann and Preston (2012)).

Figure 2.1 illustrates the evolution of the immigrant share by education-

experience cell over the 1990-2010 period for the baseline sample. In France, the immigrant share among workers with at least some college substantially increased. This shift towards a high skill immigrant influx is more pronounced for individuals between 15 and 30 years of work experience, where the immigrant share has more than doubled. At the same time, the immigrant share among workers who have a secondary education and more than 5 years of work experience doubled from 4% in 1990 to 8% in 2010. The low educated group stands in contrast, with negative and positive immigrant shocks. Although the immigrant share among the workers with more than 25 years of experience decreased, the low educated group experiences an increase in the immigrant share between 10 and 25 years of experience from around 12% in 1990 to 20% in 2010.

4.1.3 Control Variables

Our very detailed data allows to control for a large set of individual characteristics that affect the individuals' labor market outcomes. To control for factors that might affect the probability to be employed, we include a vector of control variables containing human capital characteristics: age of schooling completion, labor market experience and its square. As in Glewwe (1996), we also include three control variables related to marital status, family size and family background. More specifically, we use the number of children in the household, a variable indicating whether the individual is single or not and a vector of father's occupation. Finally, we include region and time dummy variables as geography and cyclical effects might affect the probability to find a job.

As for Equation (2.1), wage regressions include human capital characteristics, regional and time dummies as controls. Moreover, in wage regressions, we control for a large set of job characteristics: job tenure, its square, and a set of three dummy variables to control for the type of employment (public/private), the type of employment contract (short-term/permanent) and the type of work (work at night or not). We also control for occupation-specific factors by adding a vector of occupation dummies. The French LFS has the advantage to record 360 occupations.

4.2 Occupation Data and Methodological Issues

In this paper, we also investigate the labor market effects of immigration by occupation (section 6). We use the French classification of occupations to define 22 occupations. These occupations range from administrative executive workers (*e.g.*, professionals and managers in accounting or financial activities) to professionals in private companies (*e.g.*, business activity, accountant), skilled craft workers (*e.g.*, electricians, mechanics) or unskilled industrial workers (*e.g.*, movers, assembly workers).

For each of the 22 occupations, Table 2.1 reports the share of male native workers according to their level of education. We can classify these occupations into three broad groups: high educated occupations (upper-part), medium educated occupations (middle-part) and low educated occupations in primary services and manual jobs (lower-part). Table 2.1 shows important educational differences between native workers across and within occupations. For instance, 39% of the administrative executive workers are college graduates, while 90% of both skilled craft workers and unskilled industrial workers do not graduate high school. Moreover, within almost all occupations, native workers differ in terms of their education level.

The fact that the education level within occupations is heterogeneous across workers has strong implications from a methodological point of view. In fact, it is very unlikely that workers are perfect substitutes within an occupation.²⁶ As we want to study the effect of immigration on comparably skilled natives by occupation, we still follow Borjas (2003) and we use education-experience cells to capture immigration shocks (instead of using occupational group).²⁷

Second, the problem with the stratification along occupation groups is that “individuals can move between occupations, and they would be expected to do so if there is a relative oversupply of workers in a particular occupation” (Card (2001), p. 32). Yet, this should disperse the impact of immigration through the

²⁶Within occupations, workers should also differ in terms of work experience. This should reinforce their imperfect substitutability.

²⁷As pointed out by Steinhardt (2011); Dustmann et al. (2013), the skill-cell methodology (however) may lead to biased estimates if immigrants downgrade their skills. In section 5.2, we take this issue into account, and we show that the potential skill downgrading among immigrants does not bias our results.

Table 2.1: Educational Composition of Full-time Male Natives for the 22 Occupations

	College Graduate	Some College	HS Graduate	Some HS	HS Dropout	Primary Edu.
Professors, scientific profession	83.1	10.2	4.8	1.3	0.3	0.3
Executive civil servants	57.7	12.5	16.9	4.3	6.0	2.6
Engineers and Technicians	52.3	19.9	11.9	8.8	3.7	3.4
Occupation in information, art	39.0	19.4	21.0	6.7	7.4	6.4
Administrative executives	39.0	19.2	18.2	11.6	6.9	5.1
Teachers	27.0	37.7	19.2	9.9	3.5	2.7
Occupation health	7.5	45.6	16.1	18.6	6.4	5.8
Technicians	3.9	27.5	22.7	32.2	6.2	7.4
Professionals in private firms	8.1	20.0	22.4	27.1	10.6	11.8
Professional civil servants	8.5	12.9	28.9	18.9	20.8	10.0
Administrative employees	6.5	15.4	23.4	28.9	11.5	14.2
Foreman, supervisor	1.8	9.8	14.3	49.0	6.6	18.4
Commercial workers	2.7	8.8	18.8	37.1	9.9	22.7
Civil service agents	2.3	3.6	12.4	36.3	15.5	29.9
Personal services worker	1.4	3.0	11.8	42.7	8.1	32.9
Skilled industrial workers	0.2	1.9	7.7	55.2	4.6	30.4
Skilled craft workers	0.2	1.1	5.8	62.7	3.2	27.0
Skilled workers in transport	0.3	2.1	8.3	41.3	8.4	39.6
Drivers	0.2	0.9	4.6	44.2	7.2	43.0
Laborers	0.4	2.7	8.5	37.7	4.6	46.0
Unskilled industrial workers	0.2	1.7	7.3	36.1	6.8	47.9
Unskilled craft workers	0.2	1.2	4.3	38.6	5.4	50.3
Observations	56,262	50,459	60,850	165,977	31,007	100,076

Notes. This table reports the share of male natives in full-time employment for the 22 occupations according to their education level. We use six education levels: college graduate, some college, high school (HS) graduate, some high school, high school dropouts and primary education. According to the ISCED Classification, these six education levels correspond respectively to Second stage of tertiary education, First stage of tertiary education, Post-secondary non-tertiary education, (Upper) secondary education, Lower secondary, Primary education and Pre-primary education.

national economy and undermine the ability to identify the impact from looking at effects within occupations. Thus, the native response to immigration across occupations should bias the measured wage effect of immigration.²⁸ A way to

²⁸This point has been stressed in numerous contributions. See, *e.g.*, Borjas et al. (1997); Borjas (2003); Dustmann et al. (2005).

address this potential issue is to define broader occupation groups – *e.g.*, Card (2001) uses six different broad occupation groups. Although we compute the immigrant share at the skill-cell level, we are also concerned by this limitation. In order to test the robustness of our results, we will regroup the 22 narrow occupations into three broad occupational groups (Professionals and managers, Intermediate occupations and Primary service and manual jobs) corresponding to the three parts of Table 2.1.²⁹

Card (2001) also mentioned that another difficulty, for study devoted to examine the employment effects of immigration within occupations, is that occupations are only observed for those who work. Thus, it may be difficult to measure the population of individuals who could potentially work in an occupation. In order to address this limitation, Card (2001) estimates a set of multinomial logit models to compute the probabilities of working in one of the six broad occupation groups. This exercise might be even more complicated for the present study as we use 22 (narrow) occupations. However, our micro-data provide the last occupations of unemployed people. Thus, we are able to associate with precision an occupation to each unemployed native, rather than infer it (Card, 2001).³⁰ We use this information to have an accurate estimate on how immigration may affect the native probability of finding a job within occupations.

4.3 Immigrant Nationality Groups

The labor market adjustment caused by influx of migrants may be masking important country distinctions. In the empirical analysis, we therefore disaggregate the immigrant population into the European immigrants, the non-European immigrants and the naturalized immigrants (*i.e.*, who acquire the French citizenship).³¹

²⁹Here is the composition of the three broad occupational groups. **Professionals and managers:** Professors, scientific profession; Executive civil servants; Engineers and executive technicians; Occupation in information, art; Administrative executives. **Intermediate occupations:** Teachers; Occupation health; Technicians; Professionals in private firms; Professional civil servants; Administrative employees; Foreman, supervisor; Commercial workers. **Primary service and manual jobs:** Civil service agents; Personal services worker; Skilled industrial workers; Skilled craft workers; Skilled workers in transport, handling; Drivers; Laborers; Unskilled industrial workers; Unskilled craft workers.

³⁰While we use the last occupation of the non-employed natives, we exclude those who never worked.

³¹Borjas (1987) is the first study disaggregating the immigrant population into different groups of individuals with respect to their nationality. Then, some studies have examined the hetero-

The breakdown of the non-naturalized immigrant population between the European and the non-European immigrants is mainly based on the belonging of the European Economic Area (EEA).³² More specifically, we classify the non-naturalized migrants as European if they come from the EU15 countries plus Norway, Iceland and Liechtenstein (as members of the European Economic Area) and Switzerland (through a bilateral agreement). However, we consider the eastern European countries who became member of the EEA in 2004 and 2007 as non-EU countries due to data constraint. In fact, the confidentiality rule of our data does not allow us to have detailed information on the nationality of the migrants coming from Eastern European countries. In fact, these immigrants are grouped in a broad nationality group including Russia and other countries at the east of Europe with no link to the European Economic Area.

We express each of the three immigrant nationality groups as a percentage of the labor force in each cell (j, k) at time t , as follows:

$$p_{jkt}^{eur} = \left(M_{jkt}^{eur} / (M_{jkt} + N_{jkt}) \right), \quad (2.5)$$

$$p_{jkt}^{oth} = \left(M_{jkt}^{oth} / (M_{jkt} + N_{jkt}) \right), \quad (2.6)$$

$$p_{jkt}^{ned} = \left(M_{jkt}^{ned} / (M_{jkt} + N_{jkt}) \right). \quad (2.7)$$

p_{jkt}^{eur} , p_{jkt}^{oth} and p_{jkt}^{ned} respectively refer to the share of European immigrants, the share of non-European immigrants and the share of naturalized immigrants. By construction, $p_{jkt}^{ned} + p_{jkt}^{eur} + p_{jkt}^{oth} = p_{jkt}$.

geneous wage effects of immigration by nationality groups. Docquier et al. (2013) decompose migrant flows according to whether they come from OECD or non-OECD countries, but they use structural methods instead of agnostic approaches; while the study by Fogel and Peri (2013) only focuses on immigrants from non-European countries. Some other studies rather distinguish between old from new waves of migrants (see, *e.g.*, Card (2001); D'Amuri et al. (2010); Dustmann et al. (2013)), as well as between citizen and non-citizen immigrants (see, *e.g.*, Peri and Sparber (2011); Edo (2013)). Finally, Bratsberg et al. (2014) distinguish immigrants in Norway whether they come from neighboring Nordic countries, other high income countries and developing countries.

³²The European Economic Area is composed of the following countries: Austria (as of 1994), Belgium, Bulgaria (as of 2007), Cyprus (as of 2004), Czech Republic (as of 2004), Denmark, Estonia (as of 2004), Finland (as of 1994), France, Germany, Greece, Hungary (as of 2004), Iceland (as of 1994), Italy, Latvia (as of 2004), Liechtenstein (as of 1995), Lithuania (as of 2004), Luxembourg, Malta (as of 2004), Netherlands, Norway (as of 1995), Poland (as of 2004), Portugal, Romania (as of 2007), Slovakia (as of 2004), Slovenia (as of 2004), Spain, Sweden (as of 1994), Switzerland, United Kingdom.

Table 2.2: Distribution of the Male Immigrant population in the Labor Force by Nationality Group

Group of Immigrants	1990	1995	2000	2005	2010
European	39.2 %	28.9 %	25.0 %	22.5 %	21.7 %
Non-European	54.4 %	47.3 %	43.6 %	39.0 %	39.0 %
Naturalized	6.5 %	23.8 %	31.5 %	38.8 %	39.5 %
Total	100 %	100 %	100 %	100 %	100 %

Table 2.2 reports the evolution of the proportion of immigrants according to their nationality in the male immigrant labor force. It indicates that both shares of European and non-European immigrants in the male immigrant population decrease over time to reach 21.7% and 39.0% in 2010, respectively. These evolutions are mainly explained by the increasing number of immigrants ascending the French citizenship. In fact, the number of naturalized significantly goes up from 6.5% in 1990 to 39.5% in 2010.

Over our period of analysis, we find that the non-EU group is dominated by North-African countries (representing 26% of all immigrants), while the EU group is dominated by the Portugal (representing 16% of all immigrants). Finally, in 2009, the naturalized immigrants are mostly composed of North African immigrants (33%).³³

5 The Effects of Immigration on Native Outcomes

5.1 Preliminary Results

Tables 2.3 and 2.4 report both OLS and IV estimates from Equation (2.1) and (2.3) for three specifications. The IV estimates use the ten lag of the log immigrant share in the labor force as instrument. The baseline specification uses the immigrant share computed on the basis of three education groups and eight experience groups. In columns (3) and (4), we use 12 skill-cells per year to compute

³³Source: Ministry of Interior, <http://www.interieur.gouv.fr/Le-secretariat-general-a-l-immigration-et-a-l-integration-SGII>.

Table 2.3: Average Impact of Immigration on Native Employment Probability

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Immigrant Share	-0.03*** (-3.72) {-33.7}	-0.08*** (-5.23) {-37.4}	-0.04*** (-2.74) {-35.6}	-0.07*** (-3.71) {-35.4}	-0.03*** (-3.07) {-38.8}	-0.06*** (-4.16) {-35.4}
Education	0.01*** (6.41)	0.01*** (6.31)	0.01*** (5.17)	0.01*** (5.39)	0.01*** (6.45)	0.01*** (6.82)
Experience	0.01*** (5.19)	0.01*** (5.41)	0.01*** (4.24)	0.01*** (4.15)	0.01*** (5.27)	0.01*** (5.05)
Experience ²	-0.00*** (-4.28)	-0.00*** (-4.45)	-0.00*** (-3.52)	-0.00*** (-3.44)	-0.00*** (-4.25)	-0.00*** (-4.30)
Couple	-0.10*** (-22.94)	-0.12*** (-26.40)	-0.10*** (-17.30)	-0.12*** (-19.99)	-0.10*** (-22.24)	-0.12*** (-26.53)
Number of Children	-0.01*** (-2.73)	-0.01* (-1.93)	-0.01** (-2.12)	-0.01 (-1.46)	-0.01*** (-2.62)	-0.01* (-1.86)
Other Controls	Father's occupation Dummies, Region dummies, Time dummies,					
Pseudo R ²	0.132	0.151	0.132	0.150	0.133	0.150
Observations	511,296	244,630	511,296	244,630	511,296	244,630

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated impact of immigration on the employment probability of competing natives. The dependent variable is a dummy variable equal to one if the individual is employed and zero if s/he unemployed. The interest variable is the log share of immigrants computed for each skill-cell j, k at calendar year t . For each specification, we provide the marginal effect of the probit estimate. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

the immigrant share, combining four experience and three education groups; whereas specifications (5) and (6) use 24 skill-cells per year with four experience and six education levels. Unless otherwise specified, standard errors are heteroscedasticity-robust and clustered by education-experience groups.

5.1.1 Immigration and Employment Probability of Competing Natives

Table 2.3 indicates how the native probability of being employed is affected by the supply of migrants. The coefficients on the control variables have the expected sign. The probability of being employed is positively correlated with education

and experience; and negatively correlated with the number of children in the household. Our results also show that single individuals are more likely to work.

The probit estimates indicate that immigration reduces the probability for natives to be employed. The baseline OLS estimate implies that a 10% increase in immigrant supply reduces the probability of being in work by around 0.3 percentage points. Instrumenting for the immigrant share produces uniformly more negative effects (falling from -0.03 to -0.08 in our baseline specification). This is in line with the fact that the negative OLS estimates of β have to be interpreted as a lower bound of the true immigration impact. These results are robust to different structure of education-experience cells used to compute the share of migrants (specifications 2 and 3).

In curly brackets, we provide the t-statistics derived from the basic standard errors, which are not clustered at the skill-cell level. The t-statistics are much higher when clustering is not accounted for. This implies that the standard errors of our parameter estimates are biased downward, and therefore, they need to be adjusted for clustering.

We also conduct other robustness tests to examine the sensitivity of our main results (see Table 2.11 in Appendix, section 9.3.1). First, Table 2.11 shows that our baseline estimates are robust to different time lags to compute the instrument. Also, we find that the estimated coefficients on the immigrant share are all the more negative as the instrument is lagged. This is consistent with the fact that a sufficiently lagged instrument tends to attenuate the endogeneity problem of the immigrant share (Dustmann et al., 2005).

As explained in Borjas (2003); Bratsberg et al. (2014), the evolution of the immigrant share over time may be driven by changes in the native labor supply (as the number of natives in the workforce is at the denominator of the immigrant share). We thus control for this possibility and provide a robustness test where we include the log of the number of natives in the workforce (Table 2.11, column 4). Table 2.11 also shows that our main results are robust to the inclusion of females in the sample as well as part-time workers to construct our dependent variable.³⁴

³⁴For this last specification (Table 2.11, column 5), our dependent variable is equal to one when natives are employed in full- and part-time employment and zero if they are unemployed.

Table 2.4: The Immigration Impact on the Wages of Competing Native Workers

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Immigrant Share	-0.04*** (-3.73) {-33.4}	-0.05*** (-2.88) {-19.7}	-0.04** (-2.92) {-35.3}	-0.05** (-2.35) {-20.7}	-0.03** (-2.61) {-29.6}	-0.03 (-1.54) {-14.3}
Education	0.03*** (18.45)	0.02*** (14.01)	0.03*** (13.02)	0.02*** (9.81)	0.03*** (13.24)	0.02*** (11.05)
Experience	0.02*** (10.12)	0.02*** (8.65)	0.02*** (8.39)	0.02*** (7.10)	0.02*** (9.40)	0.02*** (8.35)
Experience ²	-0.00*** (-7.25)	-0.00*** (-6.40)	-0.00*** (-6.00)	-0.00*** (-5.23)	-0.00*** (-6.77)	-0.00*** (-6.00)
Job Tenure	0.01*** (11.36)	0.01*** (8.34)	0.01*** (8.53)	0.01*** (6.43)	0.01*** (9.95)	0.01*** (7.79)
(Job Tenure) ²	-0.00*** (-4.16)	-0.00** (-2.07)	-0.00** (-3.10)	-0.00 (-1.64)	-0.00*** (-3.52)	-0.00* (-1.89)
Public Sector	0.00 (0.53)	-0.00 (-0.58)	0.00 (0.39)	-0.00 (-0.47)	0.00 (0.44)	-0.00 (-0.44)
Permanent Contract	0.08*** (12.92)	0.09*** (14.58)	0.08*** (10.88)	0.09*** (11.99)	0.08*** (11.34)	0.09*** (11.77)
Work at Night	0.09*** (28.86)	0.10*** (25.35)	0.09*** (24.29)	0.10*** (20.00)	0.09*** (29.18)	0.10*** (22.83)
Other Controls	Occupation dummies, Region dummies, Time dummies					
Adj. R ²	0.589	0.552	0.589	0.552	0.588	0.551
Observations	457,280	209,693	457,280	209,693	457,280	209,693

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated impact of immigration on the wages of competing natives. The dependent is the log monthly wage of full-time male native workers. The interest variable is the log share of immigrants in the labor force computed at the skill-cell level. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

As a result, these evidence indicate that immigration alters the employment opportunity of competing natives. Under the assumption that the employment probability is positively correlated with the bargaining power of workers (McDonald and Solow, 1981; Cahuc and Zylberberg, 2004), our results imply that a

higher share of immigrants weakens the position of natives in the bargaining process. As a result, immigration is expected to affect negatively the average wage of natives who have similar skills.

5.1.2 Immigration and Wages of Competing Natives

Table 2.4 reports the average estimated impact of immigration on the wages of competing native workers. The coefficients on the control variables have the expected sign. Wages are positively correlated with education, experience, job tenure; and negatively correlated with the square of both experience and job tenure. Also, we find that natives under permanent contracts and working at night have higher earnings.

The OLS estimates of β implies that a 10% increase in the share of immigrants relative to the native workforce in an education-experience cell decreases the monthly wages of similar natives by about 0.4%. This point estimate is quite stable across specifications and estimation procedures. We provide in curly brackets the t-statistics derived from the basic standard errors, which are not clustered at the skill-cell level. The t-statistics are much higher when clustering is not accounted for. This implies that the standard errors of our parameter estimates are biased downward, and therefore, they need to be adjusted for clustering.

In column 6, the IV coefficient on the immigrant share is not significant, although negative. This estimate is however not robust to the inclusion of female workers in the sample, as well as to the use of the log of natives as additional regressor and the use of hourly wage as alternative dependent variable.³⁵ Moreover, this estimate only reports the average wage effect due to immigration. As shown below, this estimate turns to be highly significant when focusing on the sample of native workers in low-skilled occupations.

Our baseline results are robust to the inclusion of females and part-time workers in the sample, as well as to hourly wages used as an alternative dependent variable (see Table 2.12 in appendix, section 9.3.1). The estimated coefficient also increases when we include the log of natives as regressor in the main specification – the IV estimate of that specification implies that a 10% increase in the immigrant

³⁵The results are available upon request.

share due to an influx of immigrants is associated with a 1% fall in the monthly earnings of natives in that skill-cell.

In comparison with Borjas (2003); Aydemir and Borjas (2007) who shows a wage reduction by 3-4% for the United-States and Canada, our estimates indicate a modest negative impact of immigration on the wages of competing native workers. This sizeable contrast suggests that labor market institutions do play an important role in determining the wage effects of immigration. Our result points to the dampening effect of wage rigidities in France. This is in line with Card et al. (1999) who find that France has a variety of institutional features that prevent perfect wage adjustment. The relatively small impact of immigration on the French wage structure is also consistent with Edo (2013) who finds no wage reaction for France at a more aggregated level – *i.e.* using the skill-cell methodology.

5.2 The Immigration Effects on Native Outcomes across Skill-Cells

As explained in section 4.1, our econometric results might provide biased estimates due to skill downgrading among immigrants (Dustmann et al., 2013) – *i.e.* the fact that immigrants may work in occupations that do not correspond to their observed education-experience distribution. A first attempt to show that our aforementioned negative relationship between native outcomes and immigration is not driven by educational downgrading among migrants was to use the alternative skill-cell structure with six narrow education groups. In fact, it is very unlikely that “skill downgrading” happens within such narrow education groups.

In order to dig more deeply into the question of “skill downgrading”, we estimate the sensitivity of native outcomes to immigrants classified in upper education groups. The idea is to estimate the effect of immigration in a given cell $(j+1, k)$ on the outcomes of natives in another cell (j, k) . From the initial immigrant share p_{jkt} , we thus create p_{j+1kt} which captures the immigration shock experienced by upper education groups.³⁶ By regressing the outcomes of natives in the cell

³⁶The computation of p_{j+1kt} thus leads to a decline of observations. For the baseline cell-structure

Table 2.5: The Cross-cell Effects of Immigration on the Outcomes of Natives

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
A. Immigration Effect on Employment Probability						
(Immigrant Share) _{<i>j+1kt</i>}	0.06*** (3.40)	0.17*** (3.35)	0.08*** (3.18)	0.16*** (2.85)	0.01 (0.44)	0.01 (0.32)
Adj. R ²	0.134	0.156	0.135	0.156	0.129	0.147
Observations	398,301	182,377	398,301	182,377	451,857	211,508
B. Immigration Effect on Wages						
(Immigrant Share) _{<i>j+1kt</i>}	0.03** (2.83)	0.12*** (5.37)	0.04 (1.71)	0.08** (3.09)	-0.01 (-0.57)	-0.01 (-0.41)
Adj. R ²	0.499	0.446	0.499	0.445	0.522	0.471
Observations	351,644	152,840	351,644	152,840	401,479	179,434

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated effects of immigration in a given skill-cell on both employment probability (upper-part of the table) and wages (bottom part of the table) of natives in another cell. We use the same specifications and controls as in Tables 2.3 and 2.4. For probit regressions, we provide the marginal effects. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

(j, k, t) on the immigrant share computed in the cell ($j + 1, k, t$), we can test whether or not natives and immigrants compete within the same skill-cell.

Instead of reporting the within-cell effects of immigration, Table 2.5 thus reports the cross-cell effects for our three education-experience cell structures. We use the same controls as in Tables 2.3 and 2.4. While the upper-part of the Table shows the immigration effects on native employment probability, the bottom-part of the table shows how immigrants with higher education level than natives affect their wages.

First, the estimated effects of immigrants with higher education on native outcomes are never significantly negative. This suggests that migrants tend to compete with natives who have the same level of education (and who share

(with three education groups and eight experience groups), we now compute the immigrant share on the basis of 16 skill-cells; while for both alternative samples, with three and six education groups, the number of skill-cells turns respectively to 8 and 16.

the same skill-cell). This result is consistent with Docquier et al. (2013) who focus on high educated individuals and they find for France that highly educated immigrants are as likely to be in highly skilled occupation as natives.

Second, when we use the skill-cell structure with three education groups, we find that an immigration shock experienced in upper education groups has positive effects on native outcomes. This implies that an influx of highly educated migrants tends to increase the economic opportunities of the medium and low educated natives. More specifically, our IV estimated coefficient indicates that a 10% increase in p_{j+1kt} is associated with a 1.8% increase in the monthly earnings of natives in the skill-cell (j, k) .³⁷ Phrased differently, our findings show that the cross-cell effects of immigration on native outcomes are positive. This is perfectly consistent with the predictions of a model of competitive labor market about how wages and employment opportunities should adjust to labor supply shifts (at least in the short run). In fact, this model predicts that immigration not only lowers the outcomes of competing workers, immigration also increases the outcomes of complementary workers (who have different skills).³⁸

Third, the columns 5 and 6 show that p_{j+1kt} has no impact on the outcomes of natives. The fact that we do not find any significant negative impact for the sample with six narrow education groups reinforces the positive cross-cell effects find in columns 1 to 4. Indeed, the complementarity effects due to immigration only operate between workers with very different education levels (*e.g.*, between the high and the medium education groups and between the medium and low education groups). By using a sample with six education groups, the difference in education between groups is so small that no negative or positive effects are detected. The results presented in columns 5 and 6 also support the fact that immigrants actually compete with natives who share the same skill-cell (j, k) .

³⁷Here, we expect to have a (spurious) negative correlation between immigration and native outcomes across education cells – income-maximizing immigrants should avoid those education cells that offer the least economic opportunities. This is consistent with the fact that our IV estimated coefficients are higher than the OLS coefficients.

³⁸This theoretical argument is at the heart of the studies by Borjas (2003); Aydemir and Borjas (2007); Ottaviano and Peri (2012); Manacorda et al. (2012).

6 The Heterogeneous Impact of Immigration across Occupations

6.1 The Estimated Effects of Immigration Occupation by Occupation

Table 2.6 shows the estimated effects of the immigrant share (computed at the skill-cell level) on employment probabilities and wages of competing natives for only 4 occupations (out of the 22 occupations presented in Table 2.1, section 4.2). In appendix, we provide all the estimated effects of immigration occupation by occupation (Tables 2.13 and 2.14).

These four occupations have three important characteristics. First, we choose occupations that differ in terms of educational composition. The administrative executive workers are very highly educated (*e.g.*, professionals and managers in accounting or financial activities). The professionals in private firms have a medium level of education (*e.g.*, business activity, accountant). While skilled craft workers are mainly composed of low educated workers (*e.g.*, electricians, mechanics), the unskilled industrial workers (*e.g.*, movers, assembly workers) are characterized by a very low level of education (Table 2.1). Second, we choose occupations that combine (*i*) a relatively high number of native and immigrant employees and (*ii*) an important share of unemployment among the immigrant population (see Table 2.10, in appendix, section 9.2).

The left-hand side of Table 2.6 shows the estimated effects of immigration on native employment probability. We use similar controls as used above. The effect of immigrant flows varies importantly across occupation groups. For both OLS and IV estimations, immigration does not affect the employment probability of administrative executive natives, and more generally those natives who work in jobs requiring very high level of skills (see Table 2.13). Instead, we find that immigration reduces the employment opportunity of natives who are professionals in private firms, skilled craft workers and unskilled industrial workers. These results are robust to all occupations with medium and low levels of skills (Table 2.13).

In accordance with the fact that the OLS estimates of the immigrant share tend

Table 2.6: The Heterogeneous Effect of Immigration on Native Outcomes across (4/22) Occupations

	Employment Probability		Wages	
	OLS	IV	OLS	IV
Administrative executives	-0.00	-0.00	0.01	0.03
T-statistics	(-0.93)	(-0.23)	(0.71)	(0.85)
Adj. R^2	0.064	0.091	0.223	0.217
Observations	28,746	14,369	27,182	13,444
Professionals in Private Firms	-0.02**	-0.05***	-0.00	-0.01
T-statistics	(-2.46)	(-3.61)	(-0.32)	(-0.56)
Adj. R^2	0.063	0.082	0.207	0.170
Observations	34,373	16,668	31,307	14,818
Skilled Craft Workers	-0.03***	-0.07***	-0.05***	-0.06***
T-statistics	(-3.76)	(-5.99)	(-5.03)	(-4.46)
Adj. R^2	0.084	0.116	0.329	0.228
Observations	61,687	27,772	55,959	24,238
Unskilled Industrial Workers	-0.06***	-0.11***	-0.08***	-0.11***
T-statistics	(-3.62)	(-6.06)	(-7.62)	(-11.90)
Adj. R^2	0.087	0.113	0.303	0.246
Observations	40,482	19,128	29,556	12,108

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level.

Notes. This table reports the estimated effects of immigration on native employment probability (upper-part of the table) and native wages (bottom part of the table) for four representative occupations. We use our baseline specification, and we use the same controls as in Tables 2.3 and 2.4. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

to be upward biased, the IV estimates always indicate a higher negative impact on employment opportunity due to immigration. For professionals in private firms, a 10% increase in immigrant supply reduces the probability of being employed by around 0.5 percentage points. This negative impact is more severe within occupations that require lower levels of skills – *e.g.*, the value of the IV coefficient fall from -0.07 for skilled craft workers to -0.11 for unskilled industrial workers.

The right-hand side of Table 2.6 shows the estimated effects of immigration on the wages of competing natives across occupations. We find an asymmetric effect of immigration on wages according to whether natives are employed in high/medium educated or low educated occupations. While the immigrant share

does not alter the wages of competing natives in high and medium educated occupations (*e.g.*, administrative executive workers, professionals in private firms), it decreases the wages of natives in low educated occupations (*e.g.*, skilled craft workers and unskilled industrial workers). In appendix, Table 2.14 generalizes these results to all occupations.

For skilled craft workers, we find that a 10% increase in the immigrant share is associated with a -0.4% fall in the monthly earnings of natives. This negative effect becomes more severe (*i*) when we run IV estimations and (*ii*) for the lowest educated occupations – *e.g.*, for the unskilled industrial workers, the IV estimate implies that the wage reaction due to immigration is around -1%.

As explained above, our estimates (Tables 2.13 and 2.14) may be biased because natives could respond to immigration by moving their labor supply from one occupation to another, thereby re-equilibrating the national economy. We thus merge the 22 occupations into three broad occupational groups, and we re-estimate the labor market effects of immigration for each of these three groups (see Table 2.15 in appendix, section 9.3.2). The econometric results are consistent with the estimates obtained occupation by occupation. First, the negative effects of immigration on the outcomes of competing natives in high-skilled occupations are negligible.³⁹ Second, immigration lowers the employment probability of competing natives in medium and low-skilled occupations, whereas it induces wage losses only within low-skilled occupations.

6.2 Interpretation of the Results

From the estimated effects of immigration occupation by occupation, several important results emerge. First, our econometric results indicate that the estimated coefficients that capture the immigration effect on both employment probability and wages go together. More specifically, the detrimental effect of immigration on wages is all the more severe as the employment probability of natives is negatively affected (Table 2.6). By assuming that the bargaining power of workers is positively related to their employment probability, our result therefore indicates

³⁹In Table 2.15, I find that the effect of immigration on the employment probability of natives in high-skilled occupations is significantly negative. The magnitude is, however, very small.

that the wage effect of immigration is all the more detrimental as immigration lowers native's bargaining power. This result highlights an additional (and new) channel through which immigration may depress the wages of competing native workers.

Second, the reactions of native outcomes to immigration are strongly heterogeneous across occupations. Immigration does not affect the outcomes of competing native workers in jobs requiring very high levels of skills. However, immigration decreases both employment probabilities and wages within occupations requiring low education level (*e.g.*, skilled craft workers and unskilled industrial workers). This asymmetric effect across occupations is consistent with Orrenius and Zavodny (2007); Steinhardt (2011). They both find that an increase in the fraction of foreign-born workers does not affect the wages of natives in highly educated occupations (*e.g.* including jobs related to research and development, management, teaching, health care). In addition, they find significant negative wage effects of immigration in occupations related to primary services (*e.g.*, administrative workers, service workers, cleaning) and manufacturing (*e.g.*, craft, laborers, farm workers, and more generally skilled or unskilled blue-collar workers). A higher reduction in the earnings of low educated natives due to immigration as compared to high educated natives, is also documented by Jaeger (1996); Camarota (1997); Card (2001); Borjas (2003).

Taken together, these results suggest that the degree of substitution between immigrants and natives tends to vary across skill levels. This is supported by Orrenius and Zavodny (2007, p. 759) who explain that "substitution is likely to be easier in industries with less skilled workers because employees are more interchangeable and training costs are lower than in industries with skilled workers." Within the highly educated segment of the labor market Peri and Sparber (2011) find that native and foreign-born workers tend to be imperfect substitutes. They argue that the lack of interactive and communication skills among immigrants should make it difficult for employers to substitute immigrants for native workers. Another source of imperfect substitutability within the high educated segment of the labor market is the prevalence of institutional impediments⁴⁰ that may hinder

⁴⁰As explained in Math and Spire (1999), some high-skilled occupations are closed to immi-

highly educated immigrants finding jobs that match their qualification (Orrenius and Zavodny, 2007; Steinhardt, 2011).

Finally, within occupations that regroup medium educated workers (*e.g.*, professionals in private firms), we find that immigration reduces the employment opportunities of natives, with no detrimental effects on their wages. Although the bargaining power of natives declines due to immigration, they do not experience any wage losses. Our main interpretation for this result is that the degree of (downward) wage rigidity differs across occupations.

This interpretation is supported by the literature on wage rigidity. This literature reports that wages of high-skilled workers are substantially more rigid than those of low-skilled workers. In the United States Campbell III (1997) finds that wage flexibility is higher for blue-collar workers than for white-collar workers. “Blue-collar wages respond much more strongly to aggregate labor market conditions than do white-collar wages” (Campbell III (1997), p. 144). The same conclusion is reported by Franz and Pfeiffer (2006) for Germany and Du Caju et al. (2007, 2009) for Belgium. For a panel of European countries Babecký et al. (2010) moreover find that wages of white-collar workers are more rigid than those of blue-collar workers. One explanation is that firms are reluctant to cut the wages of white-collar workers because their effort are difficult to monitor and more valuable (in terms of value-added).

In this vein, Hall and Milgrom (2008) emphasize “the limited influence of unemployment on the wage bargain”. According to this study, it is costly for employers (and more generally for bargainers) to renegotiate contracts, especially for qualified workers. The result is to loosen the tight connection between the employment opportunities and wages – *i.e.*, changes in conditions in the outside labor market have much less influence on the wage bargain. Although the native workers in the medium educated occupations experience a small deterioration in their employment condition, this deterioration does not translate into wage losses.

grants such as (among others) doctors, lawyers, some engineers and chief accountants.

7 The Heterogeneous Impact of Immigration by Nationality Group

In this paper, we find evidence of a negative average immigration impact on the wages of competing natives. Based on a recent literature on the interaction between wage bargaining and labor or capital flows (see, *e.g.*, Eckel and Egger (2009); Kramarz (2008); Malchow-Møller et al. (2012)), we claim that an inflow of migrants tends to depress the bargaining position of natives (through a deterioration of their employment opportunities), and thus contribute to affect negatively their wages.

The deterioration of the outcomes of competing workers might be related to the fact that immigrants tend to have lower outside options relative to natives.⁴¹ In particular, if the average wage depends on the average outside market opportunities (McDonald and Solow, 1981), an increase in the number of workers with lower outside options – such as immigrants – is expected to decrease wages (as shown by Malchow-Møller et al. (2012)). Thus, a higher share of immigrants may decrease the wages of competing natives because immigrants have lower outside options. One possibility is that an increase in the supply of immigrants (who have lower outside options) weakens the bargaining position of natives and improve the firm's outside option, since firms have another and cheaper source of labor to draw from.⁴² Given the positive relationship between wages and the bargaining power of workers (Cahuc and Zylberberg, 2004), immigration should therefore push the (negotiated) wage of competing natives downward.

The fact that immigrants have worse outside options than natives is supported by the prevalence of institutional restrictions regarding labor market accessibility and welfare state benefits eligibility for immigrants. These restrictions are effective in several countries, such as France (Math and Spire, 1999; Math, 2011). For instance, in France, immigrants have a limited access to public sector jobs and need

⁴¹The notion that migrants have lower outside options than natives is also suggested by Wilson and Jaynes (2000); Sa (2011); Malchow-Møller et al. (2012); Foged and Peri (2013); Edo (2013); Chassamboulli and Palivos (2014).

⁴²Immigrants may also accept to work at lower wages because their reference is the prevailing wage in their country of origin (Wilson and Jaynes, 2000), which is generally lower than in host countries.

five years of permanent residence to be eligible to welfare benefits.⁴³ Therefore, immigrants have fewer alternatives compared to equally productive natives.

However, these institutional restrictions are not applied to all immigrants. Indeed, the immigrants who acquired the French citizenship (*i.e.*, those who are naturalized) are not concerned at all with these institutional restrictions. Also, the immigrants from the European Economic Area (including Switzerland) are almost not concerned by these limitations. In effect, the European Economic Area tends to prohibit any kind of discrimination between native-born and migrants in terms of labor market accessibility and welfare state benefits eligibility.⁴⁴ They just need three months of residence to be eligible to certain social benefits.⁴⁵ Hence, the restrictions faced by immigrants in terms of labor market accessibility and welfare benefits eligibility mainly concerned the non-European immigrants.

Moreover, the EEA is a free migration regime, where no restrictions are placed on migration by the policy makers. Contrary to European and Naturalized migrants, the non-European immigrants cannot freely move to another country and should have some (financial) difficulties to return to their home country. Among the immigrant population, the non-European immigrants tend to have the poorest outside options.

As a result, the labor market adjustment caused by influx of migrants may be masking important country distinctions. If the depressive immigration impact on native wages stems from the fact that immigrants have poor outside opportunities, the reaction of native wages to immigration is expected to differ according to whether the increase in immigrant supply comes from European, naturalized or non-European migrants. Especially, we expect that the average negative impact of

⁴³Immigrants needed three years of residence to be eligible to welfare benefits before 2003.

⁴⁴The Treaty on European Union actually guarantees free movement for all European Union (EU) citizens, meaning that every EU national has the right of employment in any EU member state on the same basis as a national of that country. See the *Article 39* of the Treaty on European Union (Consolidated version 2002; or the *Article 48* of the Rome Treaty in 1957) which recalls that the freedom of movement for workers “shall entail the abolition of any discrimination based on nationality between workers of the Member States as regards employment, remuneration and other conditions of work and employment.” This right is also mentioned in the Directive 2004/38/EC of the European parliament and of the Council in the *Article 24(1)* on equal treatment: “All Union citizens residing on the basis of this Directive in the territory of the host Member State shall enjoy equal treatment with the nationals of that Member State within the scope of the Treaty.”

⁴⁵See the Directive 2004/38/EC, *Article 24(2)*, which stipulates that “the host Member State shall not be obliged to confer entitlement to social assistance during the first three months of residence.”

Table 2.7: Immigration Impact on Native Wages by Immigrant Nationality Group

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Share of Non-European	-0.02*** (-3.01)	-0.14*** (-6.96)	-0.02 (-1.67)	-0.06** (-2.47)	-0.02** (-2.64)	-0.11*** (-3.68)
Share of European	-0.01 (-1.12)	0.13*** (3.26)	-0.02 (-1.21)	-0.03 (-0.52)	-0.01* (-1.72)	-0.02 (-0.87)
Share of Naturalized	0.01 (0.55)	0.02 (0.23)	0.02 (0.93)	0.20** (2.43)	0.03* (1.94)	0.27*** (5.15)
Adj. R^2	0.588	0.553	0.589	0.553	0.589	0.556
Observations	456,816	209,415	457,280	209,693	456,061	208,144

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated effects of immigration on the wages of competing natives by immigrant nationality group. The interest variables are the log share of the non-European immigrants, the log share of the European immigrants and the log share of the naturalized immigrants. We use the same specifications and controls as in Table 2.4. The IV estimates use the ten lag of the three immigrant shares as instruments. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

immigration on native wages is mainly driven by the non-European immigrants.

Table 2.7 shows the estimated changes in the wages of the native workers as the supplies of the three immigrant groups increase. We use different specifications and estimations, all already discussed. We simultaneously include in regressions the log share of European immigrants, the log share of non-European immigrants and the log share of naturalized immigrants. As in Table 2.4, we control for education, experience, job tenure, occupation, region and time. Standard errors are heteroscedasticity-robust and clustered by education-experience groups. In order to implement the IV estimates, we take the lag value of the three log immigrant shares to compute our instruments. We use ten lags.

Several important findings are worth stressing. First, our results confirm that the impact of immigrants on native wages is heterogeneous with respect to their country of origin. Second, the estimates show that the aforementioned negative relationship between wages and immigration is mainly driven by a change in the supply of immigrants coming from outside Europe. The estimates show no robust evidence that native-born outcomes have been adversely affected by naturalized

Table 2.8: Immigration Impact on Native Employment Probability by Immigrant Nationality Group

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Share of Non-European	-0.03*** (-3.89)	-0.09*** (-4.09)	-0.03*** (-2.69)	-0.09*** (-3.17)	-0.02*** (-3.18)	-0.06*** (-3.66)
Share of European	0.01 (0.92)	0.08** (2.31)	0.01 (0.54)	0.08* (1.72)	-0.00 (-0.25)	-0.04*** (-2.60)
Share of Naturalized	-0.00 (-0.06)	-0.11* (-1.77)	0.00 (0.01)	-0.10 (-1.37)	0.00 (0.07)	0.12*** (3.93)
Adj. R^2	0.132	0.154	0.133	0.153	0.133	0.154
Observations	510,791	244,335	511,296	244,630	509,911	242,986

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated effects of immigration on the employment probability of competing natives by immigrant nationality group. The interest variables are the log share of the non-European immigrants, the log share of the European immigrants and the log share of the naturalized immigrants. We use the same specifications and controls as in Table 2.3. The IV estimates use the ten lag of the three log immigrant shares as instruments. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

and European immigrants. Thus, the main competitors of native workers in the labor market are the non-European immigrants (who have the lowest outside options).

All these findings are supported by Table 2.8, which reports the effect of immigrants by nationality group on the employment probability of natives. This table indicates that the negative effect of immigration on employment probability is mainly driven by the non-European immigrants.

Taken together, our estimates suggest that the bargaining power of native workers is mainly affected by presence of immigrants coming outside Europe – *i.e.*, those who have the poorest outside options. By weakening the position of native workers in the bargaining process, the supply of non-European immigrants thus lowers native wages.

8 Conclusion

This paper examines an alternative channel through which immigration may affect the wages of competing native workers. Immigration may lower the wages of competing workers because the presence of immigrants alters their bargaining power. We use the employment probability of natives as a proxy for their bargaining power. We find detrimental effects of immigration on native employment probability and wages. This suggests that immigration affects the wage formation of workers through impacting their bargaining position with respect to the firms.

We find that a migration-induced shift of 10% in the supply of labor is associated with a 0.5-1% movement of wages in the opposite direction. As compared to studies for North American countries (Borjas, 2003; Aydemir and Borjas, 2007), our results shed light on the important role played by wage rigidities in France.

We also provide evidence of significant positive effects of immigration across education groups (using a non-structural framework). Especially, we find that the cross-cell effects of immigration on native outcomes are far from being negligible. New to the literature, this contribution is consistent with the idea that across skill-cells, the impact of immigration on native outcomes is positive (Friedberg and Hunt, 1995; Borjas, 2003; Manacorda et al., 2012; Ottaviano and Peri, 2012).

We exploit the richness of our data and we examine the labor market effects of immigration along a wide range of 22 occupations. We find important heterogeneous effects across occupations. First, the employment probability and wages of native workers in very high-skilled occupations are not affected by an increase in the number of equally productive immigrants. However, an increase in the fraction of foreign-born lowers the outcomes of natives in low skilled occupations. One explanation behind this asymmetric effect is that the degree of substitution between immigrants and natives varies across occupations (Orrenius and Zavodny, 2007; Peri and Sparber, 2011; Chassamboulli and Palivos, 2013).

Second, we find that immigration deteriorates the employment opportunities of natives in medium (white-collar) skilled occupations, without affecting their wages. This result is consistent with the prevalence of downward wage rigidities for white collars workers whose effort is difficult to monitor, giving them greater

ability to reduce their effort if they feel resentment towards the firm.

Finally, this paper examines how the heterogeneity of migrants in terms of nationality shapes the labor market impact of immigration. We show that the average negative effects of immigration on native employment probability and wages are exclusively driven by the supply of non-European immigrants. This result is consistent with the fact that non-European immigrants have the poorest outside options among the immigrant population. With few alternatives, the non-European immigrants are prepared to work at lower wages than equally productive natives. Being relatively more attractive for firms, the non-European immigrants are therefore the main driver behind the negative association between immigration *and* the labor market outcomes of competing native workers.

9 Supplementary Material

9.1 First Stage Estimates

Table 2.9: The Instruments and First Stage Estimates

	Baseline		3 × 4 Cells		6 × 4 Cells	
	(1)	(2)	(3)	(4)	(5)	(6)
(Immigrant Share)_{ikt-4}	0.78***	0.47***	0.73***	0.43***	0.63***	0.23**
	(22.63)	(6.23)	(16.31)	(5.61)	(9.71)	(2.73)
Partial R ²	0.741	0.842	0.708	0.842	0.564	0.832
Observations	408	408	204	204	408	408
(Immigrant Share)_{ikt-6}	0.82***	0.56***	0.76***	0.46***	0.67***	0.34**
	(19.10)	(5.76)	(12.77)	(4.54)	(7.90)	(3.10)
Partial R ²	0.835	0.911	0.797	0.906	0.702	0.909
Observations	360	360	180	180	360	360
(Immigrant Share)_{ikt-10}	0.78***	0.38***	0.73***	0.30***	0.65***	0.22***
	(18.38)	(4.10)	(14.33)	(3.41)	(9.44)	(2.83)
Partial R ²	0.718	0.836	0.671	0.834	0.573	0.853
Observations	204	204	132	132	204	204
Education dummy	No	Yes	No	Yes	No	Yes
Experience dummy	No	Yes	No	Yes	No	Yes
Time dummy	No	Yes	No	Yes	No	Yes

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the estimated effects of the log share of immigrants in the labor force computed at the skill-cell level at time $t-4$, $t-6$, and $t-10$ on the share of immigrants in the skill-cell j, k at time t . We thus use three different lags: four lags (upper-part), six lags (medium part) and ten lags (bottom part) to compute our instruments. We also use alternative structures of education-experience cell. The baseline sample uses 24 ($j = 3 \times k = 8$) skill-cells, while the two alternative samples use 12 ($j = 3 \times k = 4$) and 24 ($j = 6 \times k = 4$) skill-cells. Standard errors are adjusted for clustering within education-experience cells.

9.2 Characteristics of Occupations

Table 2.10: Employment and Unemployment Characteristics for the 22 Occupations

	Distribution of Employment		Share of Immigrants		Share of Unemployment			
	Natives %	N	Immigrants %	N	1990 %	2010 %	Natives %	Immigrants %
Professors, scientific profession	3.0	14,094	2.5	1,121	3.9	12.7	1.0	4.1
Executive civil servants	2.2	10,527	0.7	301	1.9	4.3	1.4	10.2
Engineers and executive technicians	6.7	30,412	4.9	1,910	4.4	6.2	5.0	10.4
Occupation in information, art	0.6	2,602	0.5	195	7.8	5.6	25.2	35.7
Administrative executives	6.1	27,365	3.4	1,333	3.4	6.8	7.5	13.3
Teachers	2.3	10,979	1.1	456	2.7	6.3	7.3	25.5
Occupation health	1.6	7,703	0.9	377	1.7	4.3	8.5	20.0
Technicians	8.5	39,127	4.7	1,916	2.5	6.9	5.2	11.3
Professionals in private firms	6.9	31,547	3.4	1,378	3.6	5.5	11.0	23.0
Professional civil servants	2.1	9,640	0.3	135	0.8	2.8	1.1	17.1
Administrative employees	3.4	14,616	2.3	851	3.8	6.8	17.8	38.1
Foreman, supervisor	5.1	23,587	4.0	1,590	5.1	9.9	4.8	10.0
Commercial workers	1.7	7,998	1.9	741	5.9	9.9	20.4	31.5
Civil service agents	4.1	19,328	1.6	721	1.6	5.9	7.6	18.7
Personal services worker	1.1	4,939	3.1	1,180	17.9	17.4	29.0	31.3
Skilled industrial workers	12.6	59,780	14.5	5,972	9.4	8.5	7.5	16.7
Skilled craft workers	12.3	56,853	20.1	7,918	11.9	14.4	11.7	19.6
Skilled workers in transport, handling	3.6	17,322	3.5	1,484	8.7	8.7	10.2	16.6
Drivers	5.3	24,835	5.1	2,024	6.6	10.6	10.8	19.6
Laborers	1.4	6,619	2.5	968	15.9	9.1	17.6	26.3
Unskilled industrial workers	6.6	31,248	11.0	4,491	15.0	11.9	26.3	32.5
Unskilled craft workers	2.8	13,510	8.0	3,199	22.6	23.0	26.9	31.0

Notes. This table is divided into three parts. The first part provides the distribution of male full-time employment across occupations. For each occupation, we provide the share of employment as well as the corresponding number of observations used to compute it. The middle part of the table shows the share of immigrants in male full-time employment for 1990 and 2010. The last part of the table displays the share of unemployment for male natives and for male immigrants for each occupation (here, we consider that the occupation of unemployed individuals corresponds to their last employment).

9.3 Robustness Tests

9.3.1 Average Impact of Immigration on Native Outcomes

Table 2.11: Sensitivity of the Immigration Impact on the Probability to be Employed

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	3 × 4 Cells	6 × 4 Cells	Log of Natives	Full- & Part-time	Male & Female
A. OLS Estimates						
Immigrant Share	-0.03*** (-3.72)	-0.04*** (-2.74)	-0.03*** (-3.07)	-0.02*** (-3.33)	-0.03*** (-3.76)	-0.05*** (-4.83)
Adj. R^2	0.132	0.132	0.133	0.136	0.125	0.120
Observations	511,296	511,296	511,296	511,296	528,979	907,530
B. IV Estimates – Four-period Lag						
Immigrant Share	-0.05*** (-4.23)	-0.05*** (-3.05)	-0.05*** (-3.62)	-0.03*** (-3.23)	-0.05*** (-4.25)	-0.07*** (-5.27)
Adj. R^2	0.136	0.135	0.136	0.139	0.128	0.122
Observations	408,411	408,411	408,411	408,411	423,680	726,147
C. IV Estimates – Six-period Lag						
Immigrant Share	-0.06*** (-4.31)	-0.06*** (-3.17)	-0.05*** (-3.74)	-0.03*** (-2.96)	-0.05*** (-4.32)	-0.07*** (-5.47)
Adj. R^2	0.140	0.140	0.141	0.144	0.133	0.125
Observations	353,304	353,304	353,304	353,304	366,668	629,084
D. IV Estimates – Ten-period Lag						
Immigrant Share	-0.08*** (-5.23)	-0.07*** (-3.71)	-0.06*** (-4.16)	-0.04*** (-3.13)	-0.07*** (-5.25)	-0.09*** (-5.92)
Adj. R^2	0.151	0.150	0.150	0.155	0.145	0.131
Observations	244,630	244,630	244,630	244,630	253,620	438,850

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the marginal effect of the immigrant share derived from OLS and IV estimates of equation (2.1) for different specifications and instruments. The dependent variable is a dummy variable equal to one if the individual is employed and zero if s/he unemployed. The interest variable is the log share of immigrants computed for each skill-cell j, k at calendar year t . Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

Table 2.12: Sensitivity of the Wage Immigration Impact

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	3 × 4 Cells	6 × 4 Cells	Log of Natives	Full- & Part-time	Male & Female	Hourly Wage
A. OLS Estimates							
Imm. Share	-0.04*** (-3.73)	-0.04** (-2.92)	-0.03** (-2.61)	-0.06*** (-4.82)	-0.04*** (-3.76)	-0.04*** (-4.55)	-0.04*** (-4.05)
Adj. R^2	0.589	0.589	0.588	0.591	0.608	0.589	0.537
Observations	457,280	457,280	457,280	457,280	475,473	778,171	429,598
B. IV Estimates – Four-period Lag							
Imm. Share	-0.04*** (-3.26)	-0.05** (-2.69)	-0.03* (-2.05)	-0.09*** (-5.29)	-0.05*** (-3.28)	-0.05*** (-3.90)	-0.04*** (-3.62)
Adj. R^2	0.572	0.572	0.572	0.575	0.596	0.571	0.511
Observations	360,505	360,505	360,505	360,505	376,175	614,489	342,056
C. IV Estimates – Six-period Lag							
Imm. Share	-0.05*** (-3.12)	-0.05** (-2.59)	-0.03* (-1.91)	-0.09*** (-5.31)	-0.05*** (-3.16)	-0.05*** (-3.73)	-0.04*** (-3.47)
Adj. R^2	0.569	0.569	0.569	0.573	0.593	0.569	0.502
Observations	309,871	309,871	309,871	309,871	323,541	529,051	296,445
D. IV Estimates – Ten-period Lag							
Imm. Share	-0.05*** (-2.88)	-0.05** (-2.35)	-0.03 (-1.54)	-0.12*** (-5.69)	-0.05*** (-3.01)	-0.05*** (-3.46)	-0.04*** (-3.25)
Adj. R^2	0.552	0.552	0.551	0.556	0.575	0.554	0.471
Observations	209,693	209,693	209,693	209,693	218,796	361,244	203,953

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. This table reports the coefficient on the immigrant share derived from OLS and IV estimates of equation (2.3) for different specifications and instruments. Unless otherwise specified, the dependent variable is the log monthly wage of full-time natives. The interest variable is the log share of immigrants in the labor force computed at the skill-cell level at calendar year t . Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

9.3.2 The Impact of Immigration on Native Outcomes across Occupations

Table 2.13: Immigration Impact on Native Employment Probability by Occupation

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Professors, scientific profession	-0.00*	-0.01*	-0.00*	-0.01*	-0.00	-0.01
Executive civil servants	-0.00	-0.01	-0.00	-0.01	-0.00	-0.00
Engineers and Technicians	-0.00	-0.02**	-0.00	-0.02**	0.00	-0.00
Occupation in information, art	-0.03	-0.07	-0.03	-0.06	-0.01	-0.06
Administrative executives	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01
Teachers	-0.02**	-0.05**	-0.03**	-0.04*	-0.02*	-0.02
Occupation health	-0.03**	-0.06***	-0.04***	-0.05***	-0.05***	-0.08***
Technicians	-0.01*	-0.03***	-0.01	-0.03**	-0.01*	-0.03**
Professionals in private firms	-0.02**	-0.05***	-0.01*	-0.05***	-0.02***	-0.05***
Professional civil servants	-0.00	-0.00	0.00	-0.00	0.00	0.00
Administrative employees	-0.06***	-0.13***	-0.07**	-0.12**	-0.08***	-0.08*
Foreman, supervisor	-0.01***	-0.03***	-0.01***	-0.03***	-0.01	-0.02***
Commercial workers	-0.05**	-0.11***	-0.06**	-0.10***	-0.05***	-0.08**
Civil service agents	-0.02**	-0.05***	-0.02*	-0.04**	-0.03***	-0.04***
Personal services worker	-0.09***	-0.12***	-0.09***	-0.11***	-0.07***	-0.09**
Skilled industrial workers	-0.01***	-0.03***	-0.01**	-0.03***	-0.01**	-0.02***
Skilled craft workers	-0.03***	-0.07***	-0.04***	-0.07***	-0.03***	-0.05***
Skilled workers in transport	-0.03***	-0.04***	-0.03***	-0.04***	-0.02***	-0.03***
Drivers	-0.03***	-0.05***	-0.03***	-0.05***	-0.03***	-0.03**
Laborers	-0.06***	-0.11***	-0.06***	-0.11***	-0.05***	-0.06**
Unskilled industrial workers	-0.06***	-0.11***	-0.06***	-0.10***	-0.06***	-0.08***
Unskilled craft workers	-0.06***	-0.11***	-0.07**	-0.11***	-0.06***	-0.06

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level.

Notes. This table reports the coefficient on the immigrant share derived from OLS and IV estimates of equation (2.1) for the 22 occupations. The dependent variable is a dummy variable equal to one if the individual is employed and zero if s/he unemployed. The interest variable is the log share of immigrants computed for each skill-cell j, k at calendar year t . For each specification, we provide the marginal effect of the probit estimate. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

Table 2.14: Immigration Impact on Native Wages by Occupation

	Baseline		3 × 4 Cells		6 × 4 Cells	
	OLS	IV	OLS	IV	OLS	IV
Professors, scientific profession	-0.00	0.03	-0.01	-0.01	0.08***	0.10***
Executive civil servants	-0.04	-0.09	-0.05	-0.07	0.07*	0.11*
Engineers and Technicians	0.02	0.02	0.02	0.02	0.10**	0.15***
Occupation in information, art	-0.05*	0.01	-0.07**	-0.03	-0.05	0.00
Administrative executives	0.01	0.03	0.01	0.02	0.09**	0.15***
Teachers	-0.03	-0.06	-0.03	-0.05	0.01	-0.00
Occupation health	-0.03	-0.02	-0.03	-0.02	-0.05**	-0.06*
Technicians	-0.02	-0.01	-0.02	-0.02	-0.03*	-0.04*
Professionals in private firms	-0.00	-0.01	-0.01	-0.01	-0.01	-0.02
Professional civil servants	-0.02**	-0.04**	-0.02	-0.03*	0.00	-0.01
Administrative employees	-0.01	-0.01	-0.02	-0.01	-0.01	0.01
Foreman, supervisor	-0.01	-0.01	-0.02*	-0.01	-0.02**	-0.02
Commercial workers	-0.04**	-0.04**	-0.04**	-0.05**	-0.04**	-0.04*
Civil service agents	-0.02***	-0.03***	-0.03***	-0.03***	-0.03***	-0.03***
Personal services worker	-0.09***	-0.12***	-0.09***	-0.12***	-0.09***	-0.10***
Skilled industrial workers	-0.04***	-0.05***	-0.04***	-0.05***	-0.04***	-0.04***
Skilled craft workers	-0.05***	-0.06***	-0.05***	-0.06***	-0.05***	-0.05***
Skilled workers in transport	-0.05***	-0.06***	-0.05***	-0.06***	-0.04***	-0.04***
Drivers	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
Laborers	-0.08***	-0.08***	-0.09***	-0.07**	-0.08***	-0.08***
Unskilled industrial workers	-0.08***	-0.11***	-0.09***	-0.11***	-0.08***	-0.09***
Unskilled craft workers	-0.10***	-0.11***	-0.10***	-0.11***	-0.09***	-0.09***

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level.

Notes. This table reports the coefficient on the immigrant share derived from OLS and IV estimates of equation (2.3) for the 22 occupations. Unless otherwise specified, the dependent variable is the log monthly wage of full-time natives. The interest variable is the log share of immigrants in the labor force computed at the skill-cell level at calendar year t . The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

Table 2.15: The Heterogeneous Effect of Immigration on Native Outcomes by Occupational Group

	Employment Probability		Wages	
	OLS	IV	OLS	IV
Professionals and Managers	-0.00 (-0.97)	-0.01** (-1.97)	0.00 (0.04)	0.01 (0.17)
Adj. R^2	0.136	0.159	0.285	0.281
Observations	87,529	44,959	84,455	42,762
Intermediate Occupations	-0.01*** (-3.01)	-0.04*** (-4.26)	-0.02 (-1.65)	-0.02 (-1.16)
Adj. R^2	0.102	0.112	0.270	0.234
Observations	127,179	60,106	121,505	56,280
Primary Service and Manual Jobs	-0.03*** (-3.92)	-0.07*** (-6.29)	-0.05*** (-6.12)	-0.06*** (-6.91)
Adj. R^2	0.127	0.151	0.368	0.283
Observations	288,071	133,865	251,320	110,651

Key. ***, **, * different from 0 at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate. **Professionals and managers:** Professors, scientific profession; Executive civil servants; Engineers and executive technicians; Occupation in information, art; Administrative executives. **Intermediate occupations:** Teachers; Occupation health; Technicians; Professionals in private firms; Professional civil servants; Administrative employees; Foreman, supervisor; Commercial workers. **Primary service and manual jobs:** Civil service agents; Personal services worker; Skilled industrial workers; Skilled craft workers; Skilled workers in transport, handling; Drivers; Laborers; Unskilled industrial workers; Unskilled craft workers.

Notes. This table reports the estimated effects of immigration on native employment probability (left-hand side of the table) and native wages (right-hand side of the table) for three broad occupational groups. We use our baseline specification, and we use the same controls as in Tables 2.3 and 2.4. The IV estimates use the ten lag of the log immigrant share as instrument. Standard errors are adjusted for clustering within education-experience cells. Regressions are weighted using an individual weight computed by the INSEE.

CHAPTER 3

Skill Composition of Immigrants, Selective Immigration Policies and Wages Inequality

⁰This chapter results from a joint work with Farid Toubal (ENS de Cachan, Paris School of Economics, CEPII).

1 Introduction

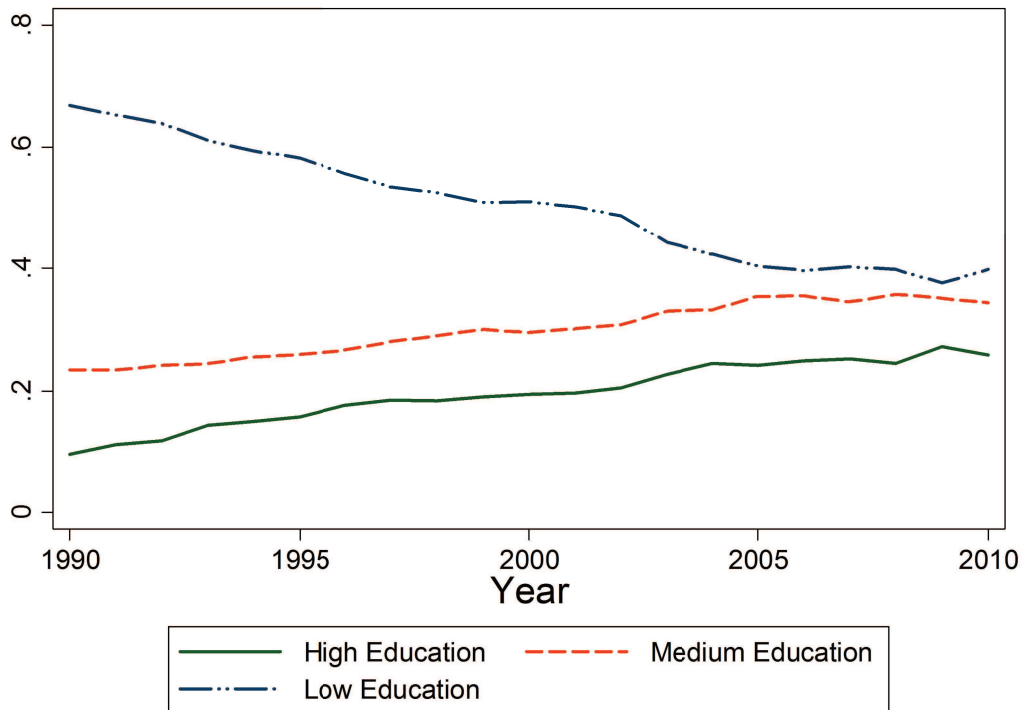
Over the past few years, the debate regarding the effects of immigration on wages of the native labor force has become highly controversial. One important issue concerns the degree of substitutability between native and immigrant workers. If both are perfect substitutes, an immigration shock should depress the average wage of all workers (migrants and natives) in the short-run. This is consistent with the results by Borjas (2003); Aydemir and Borjas (2007); Borjas and Katz (2007) who employ a structural labor market equilibrium approach and find an overall negative short-term impact on wages by 3% for the United States. However, by considering natives and immigrants as imperfect substitutes, the distributional effects of immigration are in favor of natives in the long-run. In this concern, Ottaviano and Peri (2008, 2012) show that immigrant influx raises average wage of US-born workers by 1% in the long-run.¹

The wage effects of immigration might be mitigated by labor market rigidities, in particular when wages are sticky downward. This is mostly the case for continental European countries.² The issue gains in complexity when one addresses the impact of immigration on different skilled categories of workers. Choosing the right immigration policy is of particular importance as it might be detrimental to some categories of workers. More specifically, skilled immigration should have favorable effects on the distribution of income – *i.e.* immigration should narrow income inequality in host countries (Constant and Zimmermann, 2005; Aydemir and Borjas, 2007). In effect, wages at the top of the financial ladder should be pulled down if talented newcomers are allowed in due to more job competition for high-skilled natives. From this point of view, it would seem that developed economies would be better off if immigrant flows were more skilled.

Although the selection of immigrants by education has been widely viewed as

¹Instead, they find a sizable adverse wage effect on previous waves of immigrants by 7%.

²Some studies have stressed the role of labor market rigidities in shaping the immigration impact on native outcomes. See, *e.g.*, Angrist and Kugler (2003) for a panel of European country, Glitz (2012) for Germany and Edo (2013) for France. Hence, some studies on the immigration impact in European countries have combined a structural approach with the possibility of wage rigidities (D'Amuri et al., 2010; Felbermayr et al., 2010; Brücker and Jahn, 2011; Brücker et al., 2014).

Figure 3.1: The Educational Distribution of Immigrants over Time

Notes. The Figure reports the shares of high, medium and low educated immigrants in the immigrant labor force between 1990 and 2010. The population used to compute these shares includes men participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

an instrument to ensure fiscal sustainability,³ very few studies examine how the selection of immigrants may impact the wage structure in host countries. In this regard, the purpose of the present chapter is twofold. First, it is devoted to show how the skill composition of immigrants matters in determining their impact on the wage distribution of native workers. Second, this chapter examines how selective immigration policies may affect wage inequality between low educated and high educated native workers.

An important feature of our investigation is to study the case of France. Wage inequality between high and low educated workers has decreased continuously

³See, *e.g.*, Auerbach and Oreopoulos (2000); Storesletten (2000) for the United States, Bonin et al. (2000) for Germany, Collado et al. (2004) for Spain, or Chojnicki (2011) for France. Also see Rowthorn (2008) for a review of the literature on the net fiscal impact of immigration.

in France since 1970 (Charnoz et al., 2013; Verdugo, 2014).⁴ At the same time, in France, the immigrant contribution to the supply of skills has become increasingly concentrated in the higher educational categories. Immigration has disproportionately increased the supply of college workers: the share of the highly educated immigrants (with a college education) in the immigrant labor force almost tripled over the period from 10% in 1990 to 26% in 2010 (Figure 3.1). By contrast, the share of immigrants with low levels of education (below high school) declined substantially. In order to provide a first look at the relationship between the skill composition of immigrants and wages inequality, we ask whether French immigration has contributed to the reduction of wage inequality between low educated and high educated workers.

We use a structural labor market equilibrium approach to (i) analyze the effects of immigration on the distribution of French native wages and (ii) investigate the role of selective immigration policies in shaping wages inequality. The structural approach allows us to capture the overall effect of immigration on native workers, *i.e.* taking also into account the impact on native workers that are not competing in the same skill-cell. The model which is borrowed from Borjas (2003) incorporates wage rigidities as in D'Amuri et al. (2010) to account for the sluggish adjustment of the French labor market. We apply the model to a rich dataset taken from the French labor survey that covers the period from 1990 to 2010. The dataset provides enough detailed information to investigate the impact of immigration on native wages along different important dimensions that have been mostly overlooked in the existing literature. In particular, it provides precise information on the level of education of natives and immigrants as well as on the citizenship and nationality of immigrants. The dataset has also information on the experience of migrants on the labor market and on their gender and ages.

One of our important findings is that immigrants and natives are perfect substitutes in our data. This finding is robust to different definition of the sample and specifications which cross the different information in the database. It is moreover robust to the implementation of an IV strategy.

⁴The decline in wage inequality between high and low educated workers in France is mainly explained by the increase in the educational attainment of the labor force (Charnoz et al., 2013; Verdugo, 2014).

Our short-run simulations indicate that immigration has decreased the wage of French natives by only 0.6% pointing to the dampening effect of wage rigidities in France. Also, there is on average no impact of immigration on native wages in the long run. Looking at the long run impact of immigration across groups of native workers, we find that immigration decreases the wage of highly educated native workers by about 1% and contributes to increase the wage of low educated ones by 0.5%. Thus, immigration has had the effect of reinforcing a labor market trend to lower wages inequality in France.⁵

Given the richness of our data, we decompose this effect into the impact of naturalized, European and non-European workers.⁶ This segmentation in the immigrant labor force is important as these groups have different schooling distribution, which may imply different wage effects.⁷ In our data, the naturalized immigrants have become relatively more educated than other immigrants, whereas the non-European immigrants have become relatively less educated. We find that almost half of the negative impact on highly educated native workers is due to the group of naturalized workers. The negative impact on highly educated workers is compensated by a positive impact on native workers with lower education. For the group of low educated native workers, this positive effect is also mainly due to naturalized immigrant workers.

Then, we create a first counterfactual scenario of immigration to show the important role played by the skill composition of immigrants on the wage distribution of natives.⁸ Especially, we use data on U.S. immigration to examine how

⁵The fact that high-skilled immigration tends to reduce the wage differential between more and less educated natives is supported by Aydemir and Borjas (2007); D'Amuri et al. (2010); Docquier et al. (2013). For instance, Aydemir and Borjas (2007) show that immigration has narrowed wage inequality in Canada, and increased it in the United States. This asymmetric effect lies in the fact that immigration has disproportionately increased the number of high-skilled workers in Canada, whereas immigrants to the United States have become disproportionately low-skilled.

⁶Immigrants are naturalized through the acquisition of the French citizenship. The process of naturalization is densely regulated in France. Immigrants must compel to a number of rules, including a maximum of 5 years of residence in France and informal tests toward language and civic knowledge (see, <http://eudo-citizenship.eu/docs/policy-brief-naturalisationrevised.pdf>).

⁷Such an asymmetric wage effect has been found by Docquier et al. (2013). While total immigration has a positive impact (1% to 3%) on the less educated native workers from OECD countries, non-OECD immigration has a slight negative wage effect between (-0.1% to -0.4%).

⁸This exercise can be related to the paper by Felbermayr et al. (2010) who numerically simulate a counterfactual scenario without restrictions for migration from new EU member countries in Germany. They find negative wage and employment effects for incumbent foreigners, but positive effects for natives.

the French wage structure would have been affected if France had experienced, over the past decades, the same type of low-skilled immigration than in the United States.⁹ Our simulation exercise indicates that if France would have experienced similar immigrant flows than in the United States, wage inequality between low educated and high educated French native workers would have increased.

This last result implies that an immigration policy designed to select immigrants based on their education and origin should affect the wage structure in host countries. We study this implication by simulating the impact of different policies with respect to migration, in particular, their effects on the distribution of wages across education. During the sample period, France has progressively departed from a migration policy in favor of family immigration to a policy that favors *economic* immigration. The so-called “*politique d’immigration choisie*” (policy of “chosen immigration”) aims at selecting migrants according to their skill.

Our model allows us to evaluate different immigration policies. We investigate two counterfactual scenarios: a selective migration policy toward highly educated workers and a selective migration policy toward low educated workers.¹⁰ We find that a selective policy in favor of high educated migrants reduces wage inequality between high and low educated native workers. The effect is twice as large under a scenario when we assume a flexible labor market.

We exploit the heterogeneity in immigrant’s citizenship and geographical origin to examine other types of immigration policies. In particular, we show that a policy favorable to naturalization decreases the wages of high educated native workers and increases the wages of low educated workers. This is mainly due to the fact that the naturalized immigrants are relatively highly educated.

This article contributes to the literature on the labor market impact of immigration in several respects. To the best of our knowledge, this is the first study that uses the structural estimation approach to investigate the full impact of immigration on the wage structure of natives in France.¹¹ This analysis also

⁹American immigration policy over the past decades has emphasized family reunification and resulted in a disproportionate number of low-skilled immigrants (Aydemir and Borjas, 2007).

¹⁰Previous studies never make use of their framework to simulate the immigration wage impact under different scenarios of immigration policy (Borjas, 2003; Aydemir and Borjas, 2007; Manacorda et al., 2012; Ottaviano and Peri, 2012; Docquier et al., 2013).

¹¹Former studies on the labor market impact of immigration on French native outcomes such

documents the role played by immigration in the reduction of wage inequality that occurred in France in the past decades. Moreover, we dig more deeply into the effect of immigration on native wage inequalities by decomposing the immigration impact according to important migrants characteristics, in particular their education, their nationality and citizenship.¹² Finally, our structural model allows us to evaluate the recent shift toward selective migration policies.

The remainder of this paper proceeds as follows. In section 2, we describe the theoretical framework used to simulate the full labor market impact of immigration. Section 3 provides information on immigrants in France. In section 4, we estimate the set of substitution elasticities between migrants and natives but also between different categories of workers. Section 5 simulates and decomposes the overall labor market effects of immigration. We also use various counterfactual scenarii to examine the role played by the skill composition of immigrants on the wage structure in host countries. The last section concludes.

2 Theoretical Framework

This paper uses the traditional “structural skill-cell approach” to evaluate the full impact of immigration on native wages. This method has been widely used to study the wage response to labor supply and demand shocks at the national level (Katz and Murphy, 1992; Card and Lemieux, 2001; Borjas, 2003; Ottaviano and Peri, 2012). In addition to estimating the “own” effect of a particular immigrant influx on the wage of competing native workers, this approach captures the “cross” effects on the wage of other native workers. We extend the structural approach by accounting for wage rigidities.

as Hunt (1992) who uses a “spatial correlation approach”, or Edo (2013); Ortega and Verdugo (2014) who exploit the “national skill-cell approach,” do not consider capital adjustment and/or estimate a *partial* elasticity of native wages to immigration.

¹²To our knowledge, two studies attempt to examine the overall immigration impact on native wages by splitting the immigrant population into different nationality groups. D’Amuri et al. (2010) investigate the impact of new immigration from Eastern Germany on the wages of old German immigrants, while the study by Docquier et al. (2013) focuses on the wage effects of immigration in OECD countries from non-OECD countries.

2.1 The Nested CES Framework

2.1.1 Production Function

The “structural skill-cell approach” is based on an aggregate production function with a nested CES structure of labor (*e.g.*, see Borjas (2003); Manacorda et al. (2012); Ottaviano and Peri (2012)). We assume a constant-return-to-scale aggregate production function that takes the Cobb-Douglas form (as in D’Amuri et al. (2010); Brücker and Jahn (2011); Ottaviano and Peri (2012)).¹³ This assumption allows us to study the short- and long-run effects of immigration on wages by considering the adjustment process of physical capital as a response to immigrant-induced labor supply shifts.

The aggregate production function is given by Equation (3.1). The physical capital K_t and a labor composite L_t are combined to produce output Y_t at time t .

$$Y_t = (A_t \cdot K_t^{1-\alpha} \cdot L_t^\alpha), \quad (3.1)$$

where A_t is exogenous total factor productivity (TFP) and $\alpha \in (0, 1)$ is the income share of labor. L_t is defined as a composite of different categories of workers who have different level of education, work experience and nativity. We follow the literature on the wage structure (Katz and Murphy, 1992; Autor et al., 2008; Goldin and Katz, 2009) or on migration (Card and Lemieux, 2001; Card, 2009; Ottaviano and Peri, 2012) by assuming L_t to have a nested CES structure, which combines the labor supply of two broad education groups $b \in \{H, L\}$. L_{Ht} and L_{Lt} are aggregate measures of the labor supply of high and low educated workers, respectively.

$$L_t = \left[\theta_{Ht} \cdot L_{Ht}^{\rho_{HL}} + \theta_{Lt} \cdot L_{Lt}^{\rho_{HL}} \right]^{1/\rho_{HL}}, \quad (3.2)$$

¹³The Cobb-Douglas functional form implies that the capital income share is assumed to be constant over time – an assumption supported by Piketty (2003) who emphasizes the stability of the capital income share over the last century for France. Moreover, this functional form assumes that physical capital has the same degree of substitutability with each type of worker. Yet, physical capital might substitute low educated workers and complement high educated workers; implying “that the income share of capital should have risen over time following the large increase in the supply and the income share of highly educated workers” (Ottaviano and Peri (2012), p. 157). The fact that the capital income share remains constant in France over time therefore supports the choice of a Cobb-Douglas production function.

The parameters θ_{Ht} and θ_{Lt} measure the relative efficiency of each category, with $\theta_{Ht} + \theta_{Lt} = 1$. $\rho_{HL} = (\sigma_{HL} - 1) / \sigma_{HL}$ with σ_{HL} being the degree of substitution between the group of high educated workers and the group of low educated workers.

The group of high educated workers is composed by workers who have more than a high school diploma (some college or a college degree). L_{Ht} regroups a small proportion of workers, about 25% to the total workforce. We assume therefore that it is composed of homogeneous individuals and do not split it into finer education groups (as in Card and Lemieux (2001); Card (2009)).¹⁴

The group of low educated workers is composed by high school dropouts and high school graduates. L_{Lt} represents 75% of the total number of workers. This category is composed of heterogeneous workers in terms of education: 62.6% of the workers in this category have a high school degree while 37.4% have a lower diploma or none. We therefore allow the possibility of imperfect substitution within the group of low educated workers.¹⁵ We define two subgroups. L_{L_1t} is composed by workers that have an educational attainment below the high school level. L_{L_2t} is composed by workers with high school education.

$$L_{Lt} = \left[\theta_{L_1t} \cdot L_{L_1t}^{\rho_L} + \theta_{L_2t} \cdot L_{L_2t}^{\rho_L} \right]^{1/\rho_L}. \quad (3.3)$$

where $\rho_L = (\sigma_L - 1) / \sigma_L$. σ_L is the degree of substitution between workers within the low education group. The parameters θ are the education-specific productivity levels with $\theta_{L_1t} + \theta_{L_2t} = 1$.

As a result, we use two broad education groups $b = H, L$, and three education classes¹⁶ grouping together workers with tertiary education L_{Ht} , secondary education L_{L_2t} and primary education L_{L_1t} . For ease of clarification, we note $\sigma_b \in \{\sigma_H, \sigma_L\}$ and $L_{bjt} \in \{L_{L_1t}, L_{L_2t}, L_{Ht}\}$.

Considering the experience level of workers, we divide the labor composite

¹⁴In section 4.2, the empirical estimates of the elasticity of substitution between workers within the education group L_{Ht} support this assumption.

¹⁵Using data for the United States, Goldin and Katz (2009); Borjas et al. (2012) show empirically that high school dropouts and high school graduates are imperfect substitutes. Ottaviano and Peri (2008, 2012) also disaggregate the group of high school equivalents into finer education categories.

¹⁶As in, e.g., D'Amuri et al. (2010); Gerfin and Kaiser (2010); Elsner (2013b)

L_{bjt} is into 8 experience intervals of five years [1-5 ; 6-10 ; 11-15 ; 16-20 ; 21-25 ; 26-30 ; 31-35 ; 36-40].¹⁷

$$L_{bjt} = \left[\sum_{k=1}^8 \theta_{bjkt} \cdot L_{bjkt}^{\rho_X} \right]^{1/\rho_X}, \quad (3.4)$$

L_{bjkt} is the number of workers with education bj and experience k at time t . We define $\rho_X = (\sigma_X - 1) / \sigma_X$, where σ_X measures the elasticity of substitution across the different experience classes and within a narrow education group. The parameters θ_{bjkt} capture the relative efficiency of workers within the education-experience group.

Turning to the nativity of workers, we follow Ottaviano and Peri (2008); Manacorda et al. (2012); Ottaviano and Peri (2012) and assume L_{bjkt} to be a CES aggregate of native-born N_{bjkt} and of foreign-born workers M_{bjkt} :

$$L_{bjkt} = \left[\theta_{Nb_{jkt}} \cdot N_{bjkt}^{\rho_I} + \theta_{Mb_{jkt}} \cdot M_{bjkt}^{\rho_I} \right]^{1/\rho_I}, \quad (3.5)$$

where $\rho_I = (\sigma_I - 1) / \sigma_I$ and σ_I captures the degree of substitution between natives and immigrants in an education-experience cell. The relative efficiency for each group of workers is given by the productivity parameters $\theta_{Nb_{jkt}}$ and $\theta_{Mb_{jkt}}$, with $\theta_{Nb_{jkt}} + \theta_{Mb_{jkt}} = 1$.

2.1.2 Equilibrium Wage of Native Workers

Using the nested CES production function, we can express the equilibrium wage of natives with broad education b , education j and experience k at time t as follows:¹⁸

$$\begin{aligned} \log(w_{bjkt}^N) &= \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \log(L_{bt}) \\ &\quad + \log(\theta_{bjt}) - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \log(L_{bjt}) + \log(\theta_{bjkt}) - \left[\frac{1}{\sigma_X} - \frac{1}{\sigma_I} \right] \log(L_{bjkt}) \\ &\quad + \log(\theta_{bjkt}^N) - \frac{1}{\sigma_I} \cdot \log(N_{bjkt}). \end{aligned} \quad (3.6)$$

¹⁷As in, e.g., Borjas (2003); Aydemir and Borjas (2007); D'Amuri et al. (2010); Ottaviano and Peri (2012).

¹⁸More specifically, this labor demand function is obtained by differentiating (3.1) with respect to N_{bjkt} .

$\kappa_t = (K_t/L_t)$ and the productivity parameters θ measure the specific productivity levels between workers with different education, experience and nativity. σ_{HL} , σ_b , σ_X and σ_I respectively measure the elasticities of substitution between the high and low education groups, within both education groups, between experience groups and between natives and immigrants. The right-hand side terms show how the components of the nested production function affect the marginal productivity of natives. The term $\frac{1}{\sigma_{HL}} \log(L_t)$ captures the (positive) effect of an increase in the labor supply. The terms $-\left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b}\right] \log(L_{bt})$ and $-\left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X}\right] \log(L_{bjt})$ capture the effect on native wages of the supply of immigrants in the same broad education group and in the finer education group, respectively. The impact of immigrants that have the same education and experience as natives is captured by $-\left[\frac{1}{\sigma_X} - \frac{1}{\sigma_I}\right] \log(L_{bjkt})$. This effect is the most negative when natives and immigrants are perfect substitutes – *i.e.* $\sigma_I \rightarrow \infty$. The last term, $-\frac{1}{\sigma_I} \log(N_{bjkt})$, indicates that an increase of the labor supply of natives depresses the equilibrium wage.

2.2 Wage Rigidities and Employment Effects

Labor market institutions in France, as well as in other continental European countries, are very likely to generate downward wage rigidities. In fact, France is characterized by strict employment protection, as well as a high minimum wage and generous welfare state benefits. France is also characterized by an extremely high coverage of collective bargaining agreements, with more than 90% of employees covered by collective bargaining contracts.

All these institutional dimensions tend to affect the wage-setting mechanism (Babeckÿ et al., 2010), the reservation wage (Cohen et al., 1997) and the scope for bargaining, which in turn may have an impact on the responsiveness of wages to labor supply shocks (as shown by D'Amuri et al., 2010; Felbermayr et al., 2010; Brücker and Jahn, 2011; Brücker et al., 2014). In this concern, Card et al. (1999) show that labor supply shocks have less impact on the adjustment of wages in France because of wage rigidities. Investigating the impact of immigration on the French labor market, Edo (2013) also finds that immigration increases the level of unemployment in the economy instead of affecting wages.

In order to model the important role of wage rigidities in shaping the immi-

gration impact, we follow Angrist and Kugler (2003); D'Amuri et al. (2010).¹⁹ We assume that the labor supply is not only determined by the level of wages, but also by the level of unemployment benefits. The labor supply function of native workers can thus be written as:²⁰

$$(N_{bjkt}) = [w_{bjkt}^N (1 - r)]^{\nu_N} \bar{N}_{bjkt}, \quad (3.7)$$

w_{bjkt}^N is the wage of native workers. \bar{N}_{bjkt} is the native labor force. $\nu_N > 0$ is the labor supply elasticity, and $r \in [0, 1]$ is the unemployment insurance replacement rate. Equation (3.7) indicates that the level of unemployment benefits affects the labor supply of natives due to a change in wages. A labor supply shock will thus cause an employment response for native workers. Using Equation (3.7), we express the changes in labor supply as:

$$\left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} = \nu_N \cdot \frac{\Delta w_{bjkt}^N}{w_{bjkt}^N}. \quad (3.8)$$

Equation (3.8) shows how a reduction in wages influences the labor supply of native workers. In particular, some workers will choose to become unemployed if wages are decreasing. Immigration might therefore cause (voluntary) unemployment for those native workers that experience a decrease in wage.

Immigration will therefore affect wages in a direct manner by affecting labor market competition. It has also an indirect effect on wages by impacting the labor supply of some native workers due to wage changes. Thus, the direct negative wage impact due to immigration is mitigated by the employment responses of native workers when the labor market is rigid.²¹

¹⁹Felbermayr et al. (2010); Brücker and Jahn (2011); Brücker et al. (2014) also combine the structural approach with the possibility of wage rigidities in order to allow immigration to impact the level of unemployment in the economy. However, while D'Amuri et al. (2010) estimate the employment effects separately from the wage effects in reduced-form equations, Felbermayr et al. (2010); Brücker and Jahn (2011); Brücker et al. (2014) apply a wage-setting framework to analyze the wage and employment effects of immigration simultaneously.

²⁰As in Borjas (2003); Manacorda et al. (2012); Ottaviano and Peri (2012) (among others), we do not model the labor supply of migrants and we assume that immigrant-induced supply shifts are exogenous. This assumption is discussed in section 4.

²¹This model assumes that wage rigidities is only shaped by the existence of income support programs for unemployed workers. There are other institutional features in France that prevent

2.3 Simulating the Effects of Immigration on Wages

The overall impact of immigration can be derived from the demand function (3.6). Since the TFP and productivity levels are assumed to be insensitive to immigration, the percentage wage change from 1990 to 2010 due to immigrants for natives is:

$$\begin{aligned}
 \left(\frac{\Delta w_{bjkt}^N}{w_{bjkt}^N} \right) = & \left[\frac{1}{\sigma_{HL}} \right] \sum_b \sum_j \sum_k \left(s_{bjkt}^M \cdot \frac{\Delta M_{bjkt}}{M_{bjkt}} + s_{bjkt}^N \left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} \right) \\
 & - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \left(\frac{1}{s_{bt}} \right) \sum_j \sum_k \left(s_{bjkt}^M \cdot \frac{\Delta M_{bjkt}}{M_{bjkt}} + s_{bjkt}^N \left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} \right) \\
 & - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \left(\frac{1}{s_{bjt}} \right) \sum_k \left(s_{bjkt}^M \cdot \frac{\Delta M_{bjkt}}{M_{bjkt}} + s_{bjkt}^N \left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} \right) \\
 & - \left[\frac{1}{\sigma_X} - \frac{1}{\sigma_I} \right] \left(\frac{1}{s_{bjkt}} \right) \left(s_{bjkt}^M \cdot \frac{\Delta M_{bjkt}}{M_{bjkt}} + s_{bjkt}^N \left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} \right) \\
 & - \left[\frac{1}{\sigma_I} \right] \left(\frac{\Delta N_{bjkt}}{N_{bjkt}} \right)_{response} + (1 - \alpha) \left(\frac{\Delta \kappa_t}{\kappa_t} \right), \tag{3.9}
 \end{aligned}$$

where s_{bt} , s_{bjt} , s_{bjkt} , s_{bjkt}^M and s_{bjkt}^N are the shares of the total wage income paid to the respective groups.²² The terms $(\Delta M_{bjkt}/M_{bjkt})$ and $(\Delta N_{bjkt}/N_{bjkt})_{response}$ are the changes in immigrant and native labor supply in the same respective groups over the corresponding period. The terms associated with the subscript “response” account for employment effects due to immigration. Notice that, the percentage wage changes due to immigration (*i.e.*, the predicted wage effects of an immigration-induced supply shift) depends on (*i*) the income shares accruing to the various factors, (*ii*) the size of the immigration supply shock and (*iii*) the various elasticities of substitution that lie at the core of the CES framework.

From Equation (3.9), we can obtain the total impact of immigration on wages by summing the direct and indirect effects. Some evidence from France indicate that the employment of natives is sensitive to immigration – *i.e.* $(\Delta N_{bjkt}/N_{bjkt})_{response} < 0$.

wages to adjust such as minimum wage or the labor unions (Card et al., 1999). In this case, immigration will have a direct effect on the employment of native workers. While D’Amuri et al. (2010) do not find evidence for such an effect for Germany, Edo (2013) shows that immigration tends to depress the employment of competing native workers in France.

²²For instance, $s_{bjkt}^M = (w_{bjkt}^M M_{bjkt}) / \sum_b \sum_j \sum_k (w_{bjkt}^M M_{bjkt} + w_{bjkt}^N N_{bjkt})$ is the share of total wage income in period t paid to migrant workers with education bj and experience k .

This negative employment response is consistent with our finding of perfect substitutability between natives and immigrants. In line with Edo (2013), we are going to assume that for an increase in immigrants equals to 1% of the cell employment, $(\Delta N_{bjkt}/N_{bjkt})_{response}$ is around -0.3%.²³ As in D'Amuri et al. (2010), the response of native employment in the group (bj, k, t) is obtained by multiplying 0.7 by the change in immigrants standardized by the initial employment – *i.e.* $(\Delta M_{bjkt}/M_{bjkt} + N_{bjkt})$.

3 Data & Facts

3.1 The Selected Sample & Variables

The analysis uses data from the French annual labor force survey (LFS) which covers 21 years of individual-level data for the period 1990 to 2010. The LFS is conducted by the French National Institute for Statistics and Economic Studies (INSEE).²⁴ It provides detailed information on the demographic and social characteristics of a random sample of around 210,000 individuals per year.²⁵ Our empirical analysis uses information on individuals aged from 16 to 64, who are not self-employed and who are in full-time jobs.²⁶ We also restrict the labor market experience to 40 years.

The LFS has information on nativity and citizenship. The French nationality law is based on the principal of *jus solis*. An immigrant is therefore a person who is foreign-born rather than a person with foreign nationality.²⁷ Immigrants that have acquired the French citizenship are identified in the data.

The dataset has also information about the individuals' level of education. In order to classify the workers in terms of their level of education, we use the International Standard Classification of Education (ISCED). The group of high educated workers, L_H , is composed by workers with tertiary education. The

²³The same magnitude is found by Glitz (2012) for Germany. He shows that for every 10 immigrants that find a job 3 unemployed native workers are displaced.

²⁴Institut National de la Statistique et des Etudes Economiques.

²⁵We use an individual weight (computed by the INSEE) to make our sample representative of the French population. For each observation the weight indicates the number of individuals each observation represents in the total population.

²⁶Unless otherwise specified, we deal with full-time workers. Note that all the results presented in the paper are not sensitive to the inclusion of part-time workers in the sample.

²⁷There are more than 40 nationalities in the sample.

group of low educated workers has two categories: workers with post-secondary non-tertiary education and (upper) secondary education (L_{L_2}) and workers with lower secondary education and a primary or pre-primary education (L_{L_1}).

Individuals with the same education, but a different age or experience are unlikely to be perfect substitutes (Card and Lemieux, 2001). Hence, individuals are distinguished in terms of their labor market experience. Following Mincer (1974), work experience is computed by subtracting for each individual the age of schooling completion from reported age. The age of completion of schooling is usually considered as a proxy for the entry age into the labor market. For a few surveyed individuals, the age of completion of schooling is very low, between 0 and 11 inclusive. Since individuals cannot start accumulating experience when they are too young, we have raised the age of completion of schooling for each surveyed individual to 12 if it is lower.

In order to estimate the set of substitution elasticities, we need a measure of the price of labor at the skill-cell level. We use the average hourly wage. The survey reports for each worker the monthly wage net of employee payroll tax contributions adjusted for non-response, as well as the number of hours worked a week. We compute the average hourly wage in each cell (bj, k, t) using individual weights. Since wages are reported in nominal terms, we also deflate the data using the French Consumer Price Index provided by the INSEE. We also have to capture the labor supply in each education-experience cell. From a theoretical point of view, the labor quantity in a specific cell stands for the number of “efficiency units” provided by all workers. Following Borjas et al. (2011); D’Amuri et al. (2010); Manacorda et al. (2012), we use population (rather than hours worked) as a measure of labor supply. More specifically, we express labor supply as the level of full-time employment in a specific cell.²⁸

3.2 Facts

Over the period 1990-2010, the share of immigrants in the labor force increases from 7% to 10%. In Table 3.1, we report the average share of natives and im-

²⁸We use the number of full-time workers to proxy labor supply because the French LFS is more precise on the number of workers than on their hours worked. However, as in Manacorda et al. (2012), this latter choice does not affect our simulation results.

Table 3.1: Labor Force Status of the Native and Immigrant Populations

Employment Status	Native	Total Immigrant	European	Non- European	Naturalized
A. Overall					
Employed	77.3 %	61.5 %	74.6 %	49.5 %	68.4 %
Unemployed	8.5 %	14.4 %	8.0 %	19.4 %	12.4 %
Inactive	14.2 %	24.1 %	17.4 %	31.1 %	19.2 %
Total	100 %	100 %	100 %	100 %	100 %
B. Male					
Employed	84.9 %	75.0 %	84.9 %	67.0 %	78.7 %
Unemployed	8.0 %	15.9 %	8.2 %	22.3 %	12.7 %
Inactive	7.1 %	9.1 %	6.9 %	10.7 %	8.6 %
Total	100 %	100 %	100 %	100 %	100 %
C. Female					
Employed	70.3 %	53.5 %	64.1 %	33.2 %	59.9 %
Unemployed	8.9 %	14.3 %	7.9 %	16.7 %	12.0 %
Inactive	20.8 %	41.2 %	28.0 %	50.2 %	28.0 %
Total	100 %	100 %	100 %	100 %	100 %

migrants along three labor force statuses: employed, unemployed and inactive. Table 3.1 shows several differences between natives and immigrants. First, native workers are relatively more employed, less unemployed and less inactive than immigrants. The gender decomposition shows that a large share of female immigrants is inactive. Moreover, the unemployment rate is much higher for foreign-born men than for native-born men.

Using the citizenship of immigrants, we investigate the labor status of immigrants with different origins and of those that are naturalized. We distinguish whether or not they are born in the European Economic Area (EEA).²⁹ The table

²⁹The European Economic Area is composed of the following countries: Austria (as of 1994), Belgium, Bulgaria (as of 2007), Cyprus (as of 2004), Czech Republic (as of 2004), Denmark, Estonia

Table 3.2: Educational Distribution of the Male Native and Immigrant Population in the Labor Force

Education Level	Native	Total Immigrant	European	Non-European	Naturalized
A. 1990					
High	17.3 %	9.7 %	8.7 %	10.1 %	15.1 %
Medium	45.4 %	23.5 %	23.8 %	21.0 %	39.0 %
Low	37.3 %	66.9 %	67.5 %	68.9 %	45.9 %
Total	100 %	100 %	100 %	100 %	100 %
B. 2000					
High	24.5 %	19.4 %	18.6 %	15.0 %	26.5 %
Medium	47.2 %	29.5 %	26.2 %	25.2 %	38.0 %
Low	28.3 %	51.1 %	55.2 %	59.8 %	35.5 %
Total	100 %	100 %	100 %	100 %	100 %
C. 2010					
High	31.8 %	25.8 %	22.9 %	23.1 %	29.9 %
Medium	46.9 %	34.4 %	30.9 %	32.1 %	39.8 %
Low	21.3 %	39.8 %	46.2 %	44.8 %	30.3 %
Total	100 %	100 %	100 %	100 %	100 %

shows striking differences in the relative employment status European and non-European immigrants. While European immigrants have similar employment status than native workers, the majority of non-European immigrants are either inactive or unemployed. The gender decomposition shows a very large share of unemployed non-European born men and a very large share of non-European

(as of 2004), Finland (as of 1994), France, Germany, Greece, Hungary (as of 2004), Iceland (as of 1994), Italy, Latvia (as of 2004), Liechtenstein (as of 1995), Lithuania (as of 2004), Luxembourg, Malta (as of 2004), Netherlands, Norway (as of 1995), Poland (as of 2004), Portugal, Romania (as of 2007), Slovakia (as of 2004), Slovenia (as of 2004), Spain, Sweden (as of 1994), Switzerland, United Kingdom. However, we consider the eastern European countries who became member of the EEA in 2004 and 2007 as non-EU countries due to data constraint. In fact, the confidentiality rule of our data does not allow us to have detailed information on the nationality of the migrants coming from Eastern European countries.

inactive women. Turning to naturalized workers, their employment status is in almost all cases in between the ones of non-European and European immigrants.

In Table 3.2, we report the shares of male natives and male foreign-born according to their education group for the year 1990, 2000 and 2010. Table 3.2 shows that the share of high educated immigrants (in the immigrant labor force) has almost tripled between 1990 and 2010. This increase is mostly due to the reduction in the share of low educated immigrants. Interestingly, the increase in the share of high educated immigrants is similar for both groups of European and Non-European immigrants.

Finally, in the Appendix, Table 3.12 reports the shares of immigrants and natives in a given education group relative to the total labor force in this group over time. Although immigration increased the supply of all workers in the past two decades, this supply shift did not affect all education groups equally. The supply shock experienced by French workers is far larger for those with high and medium levels of education. The immigrant share among highly educated workers almost doubled (from 4.7% in 1990 to 8.1% in 2010), while the immigrant share in the low educated group rose by 22.2%. This striking contrast may have important implications in terms of how the entire wage structure may be affected to immigration. In fact, we expect wages to grow fastest (slowest) for workers in those education groups that are least (most) affected by immigration. Given the relative increase in the number of high educated immigrants, wage inequality between skilled and unskilled natives should thus decrease.

4 The Estimates of the Elasticities of Substitution

Before simulating the overall effects of immigration on French wages and using the structural model to investigate the impact of chosen migration policies, we need to estimate the elasticities of substitution between workers, education and experience groups.³⁰

³⁰The empirical equations that we use to estimate the substitution elasticities are structurally derive from our CES nested framework. See the appendix, section 8.2, for details.

4.1 Elasticity of Substitution between Natives and Immigrants

Based on our theoretical model, we can structurally derive the following equation, which relates the relative average wages of immigrants to their relative productivity and the relative number of immigrant (as in Aydemir and Borjas (2007); Manacorda et al. (2012); Ottaviano and Peri (2012)):

$$\log\left(\frac{w_{bjkt}^M}{w_{bjkt}^N}\right) = \log\left(\frac{\theta_{bjkt}^M}{\theta_{bjkt}^N}\right) - \frac{1}{\sigma_I} \cdot \log\left(\frac{M_{bjkt}}{N_{bjkt}}\right), \quad (3.10)$$

where w_{bjkt}^M and w_{bjkt}^N gives the real average wage of immigrants (M) and natives (N) in a particular skill-cell (bj, k, t). On the *right-hand side*, the first and second terms capture the relative productivity of immigrants and the relative number of immigrants, respectively. Assuming that the relative productivity of immigrants can be decomposed into a set of fixed effects δ_{bjkt} and a random variable ξ_{bjkt} uncorrelated with relative labor supply, we can estimate $-1/\sigma_I$ using OLS.³¹

Table 3.3 reports the estimates using alternative specifications, samples and various sets of fixed effects. Unless otherwise specified, we use the relative log hourly average wage as our dependent variable. In Columns 1 to 5, we progressively add dummies mostly based on the existing literature. In column 1, we follow Ottaviano and Peri (2008) and we use education by experience fixed effects δ_{bjk} . As in D'Amuri et al. (2010); Manacorda et al. (2012), column 3 controls for education δ_{bj} , experience δ_k and time δ_t fixed effects; whereas column 4 relies on Ottaviano and Peri (2012) and uses a set of controls for skill-cell and period fixed effects.³² Column 5 of Table 3.3 gives an estimate of equation 3.10 where we include controls for all pair-wise interactions between the experience, education, and time dummies. This saturated specification is similar to Borjas et al. (2008, 2012) – the identification of the elasticity of substitution is here based on the full interaction of experience, time, and education.

³¹Our estimates may be sensitive to regression weights and measure of the log relative wage (Borjas et al., 2012). We weight our regressions by total employment in an education-experience cell and we use the log mean wages to capture the log relative wage. Yet, notice that our results of perfect substitutability between workers are not sensitive to both choices.

³²Notice that this strategy of identification leads these three empirical works to find evidence of imperfect substitutability between natives and immigrants for Germany (D'Amuri et al., 2010), the United Kingdom (Manacorda et al., 2012) and the United States (Ottaviano and Peri, 2012).

Table 3.3: Substitution Elasticity between Natives and Immigrants

	Estimates of $-1/\sigma_I$						
	(1)	(2)	(3)	(4)	(5)	High Educated	Low Educated
1. Baseline Regression	-0.01 (-0.32)	-0.03 (-0.84)	-0.05 (-1.19)	-0.04 (-0.78)	0.02 (0.33)	0.01 (0.09)	-0.04 (-0.85)
2. IV Regression	-0.05 (-0.35)	-0.10 (-1.10)	-0.19 (-1.69)	-0.41 (-1.24)	0.10 (0.22)	-0.52 (-1.01)	-0.09 (-0.74)
3. Experience $\in]5; 35]$	0.01 (0.17)	-0.01 (-0.29)	-0.03 (-0.47)	-0.01 (-0.11)	0.01 (0.12)	0.01 (0.09)	-0.04 (-0.85)
4. Male and Female	-0.03 (-0.78)	-0.03 (-1.01)	-0.04 (-0.88)	-0.04 (-0.68)	0.01 (0.15)	-0.15 (-1.27)	-0.01 (-0.24)
5. Private Sector Only	-0.02 (-0.45)	-0.02 (-0.74)	-0.04 (-1.14)	-0.05 (-1.01)	-0.02 (-0.22)	-0.04 (-0.29)	-0.04 (-1.05)
6. Monthly Wage	-0.02 (-0.69)	-0.04 (-1.23)	-0.06 (-1.49)	-0.05 (-0.99)	0.02 (0.33)	-0.01 (-0.07)	-0.05 (-1.13)
7. Sample $[3 \times 4 \times 21]$	-0.05 (-1.01)	-0.07 (-1.48)	-0.11* (-2.04)	-0.11* (-2.05)	-0.11 (-1.26)	-0.16 (-2.04)	-0.07 (-1.72)
8. Sample $[6 \times 4 \times 21]$	-0.02 (-0.61)	-0.03 (-0.94)	-0.07* (-1.73)	-0.08 (-1.63)	-0.05 (-0.68)	0.08* (2.01)	-0.04 (-1.11)
δ_{bj} (education dummies)	-	Yes	Yes	-	-	No	Yes
δ_k (experience dummies)	-	Yes	Yes	-	-	Yes	Yes
δ_t (time dummies)	No	No	Yes	Yes	-	Yes	Yes
δ_{bjk}	Yes	No	No	Yes	Yes	No	No
δ_{bjt}	No	No	No	No	Yes	No	No
δ_{kt}	No	No	No	No	Yes	No	No

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The main dependent variable is the relative log hourly average wage. The explanatory variable is the relative number of full-time workers in each cell. For the specifications 1 to 6, we use the baseline sample (3 education groups \times 8 experience groups \times 21 years) which numbers 504 observations. To run the IV estimates (specification 2), we use 252 observations as we use a ten-period lag instrument. For the two alternative samples, we use 252 (3 education groups \times 4 experience groups \times 21 years) and 504 (6 education groups \times 4 experience groups \times 21 years) observations. We weight each regression by total number of workers in a skill-cell. The standard errors are adjusted for clustering at the education and experience level.

Since the degree of substitution between natives and immigrants may vary by level of education (Peri and Sparber, 2011; Ottaviano and Peri, 2012), columns

6 and 7 break down our results by education groups. They respectively focus on (i) workers with an education level beyond high school (*i.e.*, belonging to the education group L_{Ht}) and (ii) workers with high school education and less (*i.e.*, belonging to the education groups L_{Lt} and L_{L2t} , respectively).³³

While the first specifications (rows 1, 2 and 3) focus on male workers, the fourth one includes female workers. As the relative labor supply is very likely to be endogenous, we propose an IV estimate in specification 2.³⁴ We follow the literature and use an instrument that captures the immigrants penetration which prevailed before the current period t (Borjas, 2003; Ottaviano and Peri, 2012; Dustmann et al., 2013). We use the ten-period lag of the number of immigrant in the cell $bj, k, t - i.e.$, $\log(M_{bjkt-10})$.^{35, 36}

In specification 3, we run regressions without the first and last experience groups.³⁷ The fifth specification exclusively focuses on private sector workers. Specification 6 uses the relative log monthly average wage as an alternative dependent variable. Finally, the two last specifications test the sensitivity of the estimates to different structure of education-experience cells. We use two alternative samples with four experience groups, each spanning an interval of 10 years. In particular, the specification 6 uses a sample combining 12 cells per year with three education levels, while the specification 7 combines 24 cells per year with six education level.³⁸

³³Notice that we do not include education dummies for column 7 as we use only one education group H_t .

³⁴In order to derive consistent estimates of $-1/\sigma_I$, the relative productivity has to be uncorrelated with the relative labor supplies after controlling for the fixed effects. Immigrant-biased productivity shocks concentrated in some cells may yet attract more immigrants to those cells leading to a positive correlation between relative productivities and labor supplies. This would induce an upward biased of the OLS estimator. The bias would be more severe with a larger correlation (Ottaviano and Peri (2012), p. 174).

³⁵We use ten lags since “pre-existing immigrant concentrations are unlikely to be correlated with current economic shocks if measured with a sufficient time lag” (Dustmann et al. (2005), p. 328). However, notice that the IV estimates presented in Table 3.3 are robust to different alternative lags.

³⁶In order to control for education, experience and time, the first stage of our IV regression also includes dummies for education, experience and time. The regression of $\log(M_{bjkt}/N_{bjkt})$ on $\log(M_{bjkt-10})$ and the controls provides an estimated coefficient equal to 0.15 (with a standard errors equal to 0.03). The Fisher statistic of the first stage regression is 350.

³⁷More generally, we have checked that our results still hold when we allow the substitution elasticity to vary by experience group.

³⁸As discussed in section 3, the six education groups used here correspond to the schooling groups provided in our data.

The coefficient of the inverse elasticity of substitution is mostly never significant at 10% pointing to a perfect elasticity of substitution between immigrants and natives. Out of 64 coefficients, we find four coefficients that are significantly different from 0 at 10% level. However, these estimates are not robust to IV estimations. Using the same IV strategy as in specification 2, we actually find no significant estimates for these estimated coefficients.

As our findings of a very high σ_I does not hinge on the sample, the estimation techniques, or the specifications and the identifying assumptions made about the vector of fixed effects, we consider immigrants and natives to be perfect substitutes in the production process.³⁹ By decomposing the immigrant population into European, non-European and naturalized immigrants, we moreover find that all these groups are perfect substitutes with the native workers.

4.2 Elasticities of Substitution for Education and Experience

The elasticities of substitution between high and low educated workers, σ_{HL} and within the group of low educated workers, σ_L , are estimated by using both following equations derived from our CES nested structure:

$$\log\left(\frac{w_{Ht}}{w_{Lt}}\right) = \delta_t - \frac{1}{\sigma_{HL}} \cdot \log\left(\frac{L_{Ht}}{L_{Lt}}\right) + \xi_t, \quad (3.11)$$

$$\log\left(\frac{w_{L2t}}{w_{L1t}}\right) = \delta_{L_t} - \frac{1}{\sigma_L} \cdot \log\left(\frac{L_{L2t}}{L_{L1t}}\right) + \xi_{L_t}. \quad (3.12)$$

Equations (3.11) and (3.12) use the log average relative wages as dependent variables. The variables of interest measure the relative labor supply through the number of full-time workers in the cell. The terms δ_t and δ_{L_t} capture the systematic component of the relative productivity $\log(\theta_{Ht}/\theta_{Lt})$ and $\log(\theta_{L2t}/\theta_{L1t})$, respectively. The ξ_t and ξ_{L_t} are the random disturbance terms.

³⁹Note that the empirical literature has reached mixed conclusions regarding the degree of substitution between natives and immigrants (See the special issue of the Journal of European Economic Association (Volume 10. Issue 1. February 2012) for exhaustive details). Ottaviano and Peri (2008, 2012) provide evidence that comparably skilled immigrants and natives are imperfect substitutes in production for the United States. This finding is also reported by D'Amuri et al. (2010); Felbermayr et al. (2010); Brücker and Jahn (2011) for Germany, Gerfin and Kaiser (2010) for Switzerland and Manacorda et al. (2012) for the United Kingdom. Specifically, D'Amuri et al.

Table 3.4: Substitution Elasticities Between Education Groups

	Estimates of $-1/\sigma_{HL}$		Estimates of $-1/\sigma_L$		Estimates of $-1/\sigma_H$	
Relative Labor Supply	-0.27*** (-9.98) {-10.09} [-9.77]	-0.25*** (-12.22) {-11.81} [-11.45]	-0.11*** (-5.62) {-5.59} [-9.77]	-0.11*** (-6.75) {-5.59} [-11.45]	0.35 (1.07) {1.20} [0.84]	0.06 (0.47) {0.47} [0.30]
$Dt = 1994$	-	0.08*** (12.89)	-	-0.04*** (-10.37)	-	0.34*** (30.65)
$Dt = 1996$	-	0.02*** (4.13)	-	0.07*** (19.90)	-	0.11*** (12.50)
$Dt = 2000$	-	-0.05*** (-7.99)	-	-0.05*** (-15.54)	-	-0.03*** (-3.42)
Constant	0.14*** (4.95)	0.16*** (6.71)	0.15*** (11.16)	0.14*** (17.75)	0.26*** (3.92)	0.30*** (9.02)
Observations	21	21	21	21	21	21

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports three set of estimated coefficients. The elasticity of substitution between broad education groups are measured by $\hat{\sigma}_{HL}$. $\hat{\sigma}_L$ and $\hat{\sigma}_H$ respectively capture the degree of substitutability between the medium/low educated workers and within the high educated workers. The main dependent variable is the relative log hourly average wage. The explanatory variable is measured using the relative number of full-time workers in each cell. T-statistics are derived from heteroscedastic-consistent estimates of the standard errors.

In order to approximate the period effects (δ_t and δ_{Lt}) some studies use a linear time trend (Katz and Murphy, 1992; Ottaviano and Peri, 2012), while others also use alternative proxies (Autor et al., 2008; Borjas et al., 2012).⁴⁰ In our case, both evolutions of $\log(w_{Ht}/w_{Lt})$ and $\log(w_{L1t}/w_{L2t})$ show some spikes, implying a non-linear trend (see Figure 3.2 in appendix, section 8.3).⁴¹ As in Gerfin and Kaiser (2010), we thus use time dummy variables for the main spikes to capture the non-

(2010); Ottaviano and Peri (2012) report an estimated elasticity of substitution between natives and immigrants of 20 for the United States and ranging between 16 and 21 for Germany.

⁴⁰As in Katz and Murphy (1992), Equations (3.11) and (3.12) introduce a technical issue. In fact, the model must include a full set of time fixed effects; although this is empirically impossible since there would be as many fixed effects as there are observations. For the United States, Katz and Murphy (1992) thus assume that the relative productivity terms can be approximated by a linear trend and an uncorrelated residual. See Borjas et al. (2012) for a discussion about the identifying assumptions on these relative productivity terms.

⁴¹In accordance with Charnoz et al. (2013); Verdugo (2014), Figure 3.2 indicates that wage inequality between high and low educated workers has declined in France over the past decades.

linearity of both trends. We approximate δ_t and δ_{Lt} by three time dummies equal to one when $t = 1994$, $t = 1996$ and $t = 2000$. Interestingly, the two first dummies coincide with a period where economic policies are implemented in France to exempt employers from payroll taxes for minimum wage workers (Fougere et al., 2000). Also, the 2000 year dummy may refer to the switch from the 39- to the 35-hour week implemented to increase employment.

Table 3.4 first reports the estimates for $-1/\sigma_{HL}$ and $-1/\sigma_L$ for our baseline sample of male workers. As dependent variable, we use hourly wages.⁴² For our estimations, we follow Ottaviano and Peri (2012) and we report t-statistics derived from both the heteroskedasticity-robust (in parentheses) and the Newey–West autocorrelation-robust standard errors (in curly brackets) since the time-series data may contain some autocorrelation. Also, we provide the t-statistics (in square brackets) derived from bootstrap estimations with 1,000 replications.

Our estimated results are strongly significant and they indicate that $\sigma_{HL} = 4$ and $\sigma_L = 10$.⁴³ In accordance with Ottaviano and Peri (2012), we find that $\sigma_{HL} < \sigma_L$, suggesting that the degree of substitutability of workers within the low education group is higher than workers between the high and low education groups. In addition, our estimates for $-1/\sigma_{HL}$ are consistent with the literature; in particular with Gerfin and Kaiser (2010) and Manacorda et al. (2012) who respectively find $\sigma_{HL} = 4$ and $\sigma_{HL} = 5$.

The last part of Table 3.4 provides the estimates for $-1/\sigma_H$, with σ_H the elasticity of substitution within the high group of education, between workers with a college degree and workers with some college.⁴⁴ Our results indicate that $\sigma_H \rightarrow \infty$. This implies that workers within the high educated group constitute a homogeneous labor supply group, supporting the nested structure of our theoretical model.

The parameter σ_X is estimated from Equation (3.13) by regressing the wage of particular groups on the size of the workforce in the cells.

⁴²Our results are robust to the use of monthly wages as an alternative dependent variable.

⁴³In order to estimate the substitution elasticities between the two broad education groups σ_{HL} and within the low education one σ_L , we respectively weight regressions by the number of workers used to compute w_{Ht} and w_{L2t} . Our estimates for $-1/\sigma_{HL}$ and $-1/\sigma_L$ are not sensitive to the weight used.

⁴⁴We weight regressions by the number of workers with a college degree. Our results are not sensitive to the weight used.

Table 3.5: Substitution Elasticity Between Experience Groups

	3 × 8 Skill-Cells		3 × 4 Skill-Cells		6 × 4 Skill-Cells	
	Dependent Variable		Dependent Variable		Dependent Variable	
	Hourly Wage	Monthly Wage	Hourly Wage	Monthly Wage	Hourly Wage	Monthly Wage
1. Baseline Regression	-0.16*** (-9.87)	-0.13*** (-7.05)	-0.17*** (-9.14)	-0.14*** (-6.69)	-0.14*** (-7.97)	-0.11*** (-6.67)
2. Male & Female	-0.14*** (-10.07)	-0.10*** (-7.93)	-0.15*** (-9.52)	-0.11*** (-7.77)	-0.14*** (-9.19)	-0.11*** (-7.51)
3. Private Sector Only	-0.18*** (-11.22)	-0.17*** (-8.70)	-0.20*** (-9.66)	-0.18*** (-7.28)	-0.15*** (-8.55)	-0.14*** (-8.12)
Observations	504	504	252	252	504	504

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The table reports the estimates of $-1/\sigma_X$. To compute the dependent variables, we use both hourly (columns 1, 3 & 5) and monthly wages (columns 2, 4 & 6). The explanatory variable is measured using the relative number of full-time workers in each cell. Each regression is weighted by total cell employment. The standard errors are adjusted for clustering at the level of education and experience.

$$\log(w_{bjkt}) = \delta_{bjkt} - \frac{1}{\sigma_X} \cdot \log(L_{bjkt}) + \xi_{bjkt}. \quad (3.13)$$

As in the literature (Aydemir and Borjas, 2007; Ottaviano and Peri, 2012), we approximate δ_{bjkt} by a set of time dummies, education-experience and experience-time fixed effects. Table 3.5 reports the estimates for $-1/\sigma_X$ for three specifications and three different grouping of education and experience, all used previously (see Table 3.3). Each regression is implemented twice using hourly wages as our main dependent variable and monthly wages as an alternative. Our estimates indicate an elasticity of substitution between experience groups between 5 and 10. This result is perfectly consistent with Card and Lemieux (2001) who also find an elasticity between 5 and 10 for the United States. Moreover, our finding is consistent with Ottaviano and Peri (2012) who find an elasticity of around 7 for the United States, and Manacorda et al. (2012) who find an elasticity of around 10 for the United Kingdom.

Despite the fact that very few studies address the potential endogeneity of the supply of workers to the various skill-groups in estimating the substitution elasticities between education and experience groups, the OLS regressions of Equations (3.11), (3.12) and (3.13) may lead to biased estimates of σ_{HL} , σ_L and σ_X . In effect, “income-maximizing behavior on the part of potential workers would generate larger supplies in those skill-cells that had relatively high wages” (Aydemir and Borjas (2007), p. 689).

More generally, our findings regarding the substitution elasticities might be challenged for different reasons. Therefore, in addition to using our set of parameter values $\sigma_{HL} = 4$, $\sigma_H \rightarrow \infty$, $\sigma_L = 10$ and $\sigma_X = 7.5$ to simulate the overall impact of immigration, we also use an alternative set of parameter values that are based on the literature, and especially on Ottaviano and Peri (2008, 2012): $\sigma_{HL} = 2$, $\sigma_L = 20$ and $\sigma_X = 7$. In particular, the value for σ_{HL} is consistent with, *e.g.* Katz and Murphy (1992) who find values for σ_{HL} ranging between 1.5 and 1.8 and Card and Lemieux (2001) who find $\sigma_{HL} = 2.25$.

5 The Labor Market Effects of Immigration

5.1 The Long-run Effects of Immigration in France

This section focuses on the long-run effects of immigration on wages. The long-run simulations assume the capital stock adjusts completely to the increased labor supply over the period 1990-2010 – *i.e.* $\Delta\kappa_t/\kappa_t = 0$.

Table 3.6 shows the simulated effects of immigration on native wages from Equation (3.9), by using our set of parameters: $\sigma_{HL} = 4$, $\sigma_H \rightarrow \infty$, $\sigma_L = 10$ and $\sigma_X = 7.5$. The table reports for each specification the direct, indirect and total wage effects caused by immigration. The baseline specification (column 1) focuses on full-time male workers. The second specification (column 2) includes female workers. In column 3, we focus exclusively on the private sector. Specification 4 adopts standard parameter values from Ottaviano and Peri (2008, 2012): $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. In columns 5 and 6, we assume that immigrants and natives are imperfect substitutes and impose $\sigma_I = 20$. While specification 5 reruns the baseline simulation, the specification 6 uses the parameter values from Ottaviano

Table 3.6: Simulated Long-run Effects of Immigration on Wages (1990-2010)

	Perfect Substitutability				Imperfect Subst.	
Average Wage Effect	-0.01	0.00	-0.01	-0.01	0.05	0.05
Average Direct Effect	-0.03	-0.02	-0.04	-0.04	0.16	0.15
Average Indirect Effect	0.02	0.02	0.03	0.03	-0.11	-0.10
Highly Educated	-0.96	-1.12	-1.11	-1.93	-0.71	-1.69
Direct Wage Effect	-2.22	-2.38	-2.55	-4.45	-1.60	-3.83
Indirect Wage Effect	1.26	1.25	1.44	2.51	0.89	2.14
Medium Educated	0.24	0.32	0.22	0.60	0.28	0.64
Direct Wage Effect	0.45	0.57	0.39	1.33	0.62	1.51
Indirect Wage Effect	-0.21	-0.25	-0.17	-0.72	-0.35	-0.86
Low Educated	0.43	0.52	0.45	0.69	0.38	0.64
Direct Wage Effect	1.11	1.21	1.15	1.64	0.96	1.49
Indirect Wage Effect	-0.68	-0.69	-0.70	-0.95	-0.58	-0.86
Sample/Specification	Male	Male & Female	Private Sector	Consensual Parameters	Male	Consensual Parameters

Notes. The table reports the long-run simulated effects of immigration on the wages of native workers. Each number stands for the percentage wage changes due to immigrants for natives. The simulations are ran for different samples. All columns assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$, except for columns 4 and 6 which use more consensual estimates: $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. The two last columns assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$. The total wage effect is computed as the sum of direct effects due to immigration and indirect ones due to employment responses.

and Peri (2008, 2012).

Over the period 1990-2010, the total average impact of immigration on wages is negligible. The direct effects of immigration on native wages are negative and very close to zero. This is in line with the fact that in the long-run, a host country's wage is independent of migration. The indirect effects are thus insignificant. Within the case of imperfect substitutability, the direct and total effects of migrant flows are slightly positive. This is consistent with the fact that when immigrants and natives are imperfect substitutes, the distributional immigration impact tends to be in favor of native workers.

As expected, the indirect wage effects always attenuate the direct wage effects caused by immigration. A labor supply shock due to immigration therefore impacts the level of unemployment in the economy, with a sluggish reaction of wages.

Table 3.6 also reports the distributional pattern across educational groups by decomposing the immigration wage effect. We find that highly educated native workers suffer a loss in their wage levels by around -1%, whereas the low and medium educated ones experience a slight improvement by around 0.5% and 0.3%, respectively. This asymmetric impact lies in the fact that the immigrant influx in France disproportionately increased the supply of high educated workers, implying a decrease in wage inequality. This result is consistent with Charnoz et al., 2013; Verdugo, 2014 who document a decline in wage inequality between high and low educated workers over the past decades in France. These studies explain that the reduction in wage inequality mainly reflects the increase in graduation rates among the French population.

In our data, the ratio between the wage of high educated workers and the wage of low educated workers has decreased by around 15% since 1990. This decline is mainly due to a lower increase in the wage of high educated workers compared to low educated workers. Because many other factors are at work, it is difficult to isolate the precise contribution of immigration in the evolution of the wage structure in France. Nevertheless, our simulations imply that immigration has reduced the relative wage of high educated native workers by around 2.7%. According to our CES model, immigration thus accounts for about 18% of the reduction of wage inequality between high and low educated native workers. Consequently, immigration has been a crucial factor in accounting for the drop in the relative wage of high educated workers in France.

As expected, the asymmetric impact of immigration across education groups is strengthened for specifications 4 and 6 which assume $\sigma_{HL} = 2$. Actually, the finding of imperfect substitution between the two broad education groups implies that the impact of high-skilled immigration on earnings is more concentrated among the highly educated natives, rather than diffused to a wide segment of the labor force.

Table 3.7: Long-run Effects of Immigration on Wages by Immigrant Groups (1990-2010)

	Perfect Substitutability				Imperfect Subst.	
Average Wage Effect	-0.01	0.00	-0.01	-0.01	0.05	0.05
Due to European	0.00	0.00	-0.01	-0.01	-0.01	-0.01
Due to Non-European	-0.01	0.00	-0.01	-0.01	0.00	0.00
Due to Naturalized	0.00	0.00	0.00	0.00	0.07	0.05
Highly Educated	-0.96	-1.12	-1.11	-1.93	-0.71	-1.69
Due to European	-0.22	-0.26	-0.25	-0.44	-0.19	-0.41
Due to Non-European	-0.28	-0.28	-0.39	-0.56	-0.22	-0.51
Due to Naturalized	-0.46	-0.58	-0.47	-0.93	-0.30	-0.80
Medium Educated	0.24	0.32	0.22	0.60	0.28	0.64
Due to European	0.03	0.05	0.02	0.13	0.03	0.13
Due to Non-European	0.04	0.07	0.05	0.16	0.05	0.17
Due to Naturalized	0.16	0.20	0.15	0.31	0.19	0.33
Low Educated	0.43	0.52	0.45	0.69	0.38	0.64
Due to European	0.12	0.14	0.13	0.17	0.08	0.12
Due to Non-European	0.15	0.15	0.18	0.21	0.11	0.16
Due to Naturalized	0.16	0.22	0.14	0.31	0.19	0.34
Sample/Specification	Male	Male & Female	Private Sector	Consensual Parameters	Male	Consensual Parameters

Notes. The table reports the long-run simulated effects of immigration on the wages of native workers with. Each number stands for the percentage wage changes due to immigrants for natives. The simulations are ran for different samples. All columns assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$, except for columns 4 and 6 which use more consensual estimates: $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. The two last columns assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$. The total wage effect is computed as the sum of direct effects due to immigration and indirect ones due to employment responses.

Table 3.7 disaggregates the total wage effects of immigration by immigrant groups. The gains and losses in the different segments of the labor market are different according to the nationality of migrants. Our decomposition indicates that the European and non-European immigrants have affected the French wage structure in the same magnitude. This result is explained by a similar education

profile of these two groups (Table 3.2). However, the negative wage impact on highly educated natives is mainly due to naturalized immigrants. This group of migrants is also mainly responsible for the positive wage effect of immigration on medium educated natives.

5.2 The Simulated Effects of U.S. Immigration on the French Wage Structure

In France, immigration has had a mitigating effect on wage inequality because immigrants to France tend to be disproportionately high educated. This section extends the long-run simulation exercise by exploiting a counterfactual scenario of immigration so as to underline the important role played by the skill composition of immigrants on the entire wage structure.

We use data on U.S. immigration to examine how French wages would have been affected after an immigrant supply shift such as the one experienced by the United States over the past two decades. The U.S. immigration pattern is very relevant for such an analysis. First, the United States has received over the past decades the largest immigrant influx (in absolute size) of any country in the world (Aydemir and Borjas, 2007). Moreover, the U.S. immigration policies generate immigrant populations that differ greatly in their skill mix compared to those in France. In fact, U.S. immigration has disproportionately increased the number of low educated workers (Borjas, 2003; Ottaviano and Peri, 2012), while France has rather experienced an important shift toward high educated immigrants over the past decades.

In order to use U.S. immigration as a counterfactual scenario, we have to compute the percentage change in immigrant labor supply that happened in the U.S. over the past two decades. We thus draw our data from Borjas et al. (2012), since they use the same rules for constructing their sample as in the present study.⁴⁵

We use their dataset called “count_nose”, provided in the online appendix of Borjas et al. (2012). It is based on the U.S. Decennial Census 1960-2000 and the

⁴⁵Borjas et al. (2012) aims at replicating a set of results found by Ottaviano and Peri (2012) so that their sample restrictions are also very similar to Ottaviano and Peri (2012).

Table 3.8: The Long-run Effects of French and U.S. Immigration on the French Wage Structure

	French Immigration			U.S. Immigration		
Average Wage Effect	-0.01	0.00	0.06	0.02	0.01	0.17
Highly Educated	-0.96	-1.12	-0.71	0.62	0.58	0.58
Medium Educated	0.24	0.32	0.28	0.17	0.08	0.19
Low Educated	0.43	0.52	0.38	-0.46	-0.51	-0.09
Sample/Specification	Male	Male & Female	Imperfect Subst.	Male	Male & Female	Imperfect Subst.

Notes. The table reports the long-run simulated effects of French (left-hand side) and U.S. (right-hand-side) immigration on French native wages. Each number stands for the percentage wage changes due to U.S. immigrants for French natives. All Columns assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$. Columns 3 and 6, however, assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$.

2006 American Community Survey. The data give the number of immigrant and native workers by education-experience cell in all years considered. Workers are classify into four education groups (high school dropouts, high school graduates, workers with some college, and college graduates), and into eight experience groups (1-5 years of experience, 6-10 years, 11-15 years, ..., 36-40 years). The sample includes individuals who are not residing in group quarters, are aged 18-64 (inclusive), worked at least one week in the calendar year prior to the Census, and have between 1 and 40 years of work experience (inclusive). Self-employed are excluded from their sample.

From this dataset, we restrict our attention to the years 1990 and 2006 so as to get a time span close to that of used in the present paper (1990-2010).⁴⁶ In order to be consistent with our education categories (appropriate to the French case), we merge both education groups denoted “workers with some college” and “college graduates”. Then, we define two broad education groups $b = H$ and $b = L$, where the low broad education L is composed of two finer education classes, denoted L_1 (high school dropouts) and L_2 (high school graduates) as in section 2. Finally,

⁴⁶The period 1990-2006 was also the period of fastest immigration growth in recent U.S. history (Ottaviano and Peri, 2012).

we compute the percent change in the number of immigrant and native workers by skill-cell (bj, k) between 1990 and 2006 – *i.e.*, $(\Delta M_{bjk, 1990-2010}^{US} / M_{bjk, 1990}^{US})$ – as a measure of the U.S. immigration-induced percent shift in the supply experienced by skill-cell.⁴⁷

Table 3.8 reports the long-run simulated effects of two different types of immigrant supply shifts on the wages of French natives. As a benchmark, the left-hand side of the table shows the effect of French immigration on French native wages. The right-hand side rather uses the immigrant supply shift that happened between 1990 and 2006 in the United States to simulate the effect of immigration on the French wage structure. For each side of the table, we use three different specifications or samples. The first specification runs the baseline simulation. While the second specification includes female workers in the sample, the third one focuses on males only and assumes natives and immigrants to be imperfect substitutes.

Table 3.8 underlines the important role played by the skill composition of immigrants in determining the main losers and winners from immigration. Indeed, this table shows that the low educated workers are the main winners from high education immigration (in reference to the French case), while they are the main losers from low educated immigration (in reference to the U.S. case). More specifically, if France would have experienced the same type of immigration than in the United States, immigration would have increased the real hourly wage of high educated natives by 0.6% and decreased that of low educated natives by 0.5%. Therefore, this (counterfactual) immigration shock would have widened the wage distribution between high and low educated native workers in France.

Although it implies smaller wage effects, the assumption of imperfect substitutability between immigrants and natives does not affect our conclusions: the skill mix of immigrants matters in shaping the wage distribution of domestic workers.

⁴⁷As earlier, we express labor supply as the level of employment in a specific cell. However, the simulated results provided in Table 3.8 are robust to alternative counts of workers, such as total annual hours worked by workers in a cell.

5.3 The Distributional Effects of Immigration under Selective Immigration Policies

As shown previously, the educational composition of immigrants tends to affect the wage distribution in host countries. This result suggests that selective immigration policies targeting education or origin should have important implications on the wage structure. This section is thus devoted to examine how immigration policies may affect the distributional effect of immigration on wages.

5.3.1 Migration Policies Targeting Education

We first study the role played by selective immigration policies based on education on wages inequality. We define two immigration scenarii (A and B) and quantify the distributional effects of immigration in both cases. Both counterfactual scenarii take the number of immigrants that prevails in 2010, but they assume different educational composition of migrants by keeping the distribution of migrants across experience groups identical with the distribution in 2010.

The first immigration scenario (A) refers to a selective policy in favor of high educated immigration. It assumes that the share of high educated immigrants changes from 10% in 1990 to 50% in 2010, and that both shares of low and medium educated ones change respectively from 67% and 23% to 25% each. In other words, this scenario informs us on what would have happened if immigrants were chosen, so that the share of high educated immigrants rises to 50% over the period.⁴⁸ The second immigration scenario (B) refers to a selective migration policy targeting low educated migrants. Here, we impose that the share of low educated immigrants goes from 67% in 1990 to 75% in 2010, with both shares of high and medium educated equal to 10% and 15% in 2010, respectively.

Table 3.9 reports the distributional effects of immigration under the two immigration scenarii. These effects are divided into the degree of wage rigidities (rigid/flexible wages) and a set of three specifications. The first specification runs the baseline simulation. While the second specification uses the consensual substitution elasticity estimates, the third one assumes natives and immigrants to be

⁴⁸Scenario A is all the more relevant as highly skilled migrants tends to make a large fiscal contribution (Rowthorn, 2008).

Table 3.9: Selective Migration Policies and Wage Effects of Immigration (1990-2010)

	Rigid Labor Market			Perfect labor Market		
A. Policy in Favor of high Educated Immigration						
Average Wage Effect	-0.02	-0.03	0.09	-0.05	-0.09	0.23
Highly Educated (<i>a</i>)	-2.21	-4.45	-1.68	-5.41	-10.9	-4.08
Medium Educated	0.63	1.43	0.65	1.45	3.42	1.53
Low Educated (<i>b</i>)	0.88	1.54	0.77	2.23	3.79	1.92
Differences (<i>a</i> – <i>b</i>)	-3.09	-5.99	-2.45	-7.64	-14.7	-6.00
B. Policy in Favor of low Educated Immigration						
Average Wage Effect	0.00	0.00	0.03	0.01	0.00	0.10
Highly Educated (<i>a</i>)	-0.02	-0.04	0.01	0.07	0.13	0.15
Medium Educated	0.08	0.05	0.08	0.23	0.08	0.21
Low Educated (<i>b</i>)	-0.10	-0.04	-0.02	-0.38	-0.23	-0.10
Differences (<i>a</i> – <i>b</i>)	0.08	0.00	0.03	0.45	0.36	0.25
Sample/Specification	Male	Consensual Parameters	Imperfect Subst.	Male	Consensual Parameters	Imperfect Subst.

Notes. The table reports the long-run simulated effects of immigration on native wages according to a “high educated immigration” scenario and a “low educated immigration” scenario. Each number stands for the percentage wage changes due to immigrants for natives. Columns 1 and 4 assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$, while columns 2 and 5 use more consensual estimates: $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. Columns 3 and 6 use our baseline substitution elasticities but assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$.

imperfect substitutes. For each simulation, we compute the difference between the wage changes of the high and low educated natives. A negative number implies that immigration has reduced wage inequality.

The simulated results provided in Table 3.9 emphasize the important role played by immigration policies on the wage structure in host countries. In fact, a selective immigration policy in favor of high educated immigrants (scenario A) reduces wage inequality between high and low educated native workers. In the second scenario, however, immigration has even a slight positive impact on wage disparities. Moreover, Table 3.9 underlines the role played by labor market

rigidities in dampening the impact of immigration on wage. The impact of a high educated (low educated) immigration on the decrease (increase) of wage inequality is lower in rigid labor markets.

Our results also indicate that the elasticity of substitution between the two broad education groups σ_{HL} matters to determine the distributional effects of immigration. The evolutions of wage inequality are magnified when we assume $\sigma_{HL} = 2$ – the negative impact on high educated natives is more pronounced, as well as the positive impact on low educated ones. Indeed, low substitution elasticity between the two broad education groups implies that the immigration impact is not diffused among all natives, but rather concentrated among workers within the same broad education group.

Finally, a low degree of substitutability between immigrants and natives does not challenge our baseline results. The main difference is that we find a slight positive average effect on native wages since the competitive effects of additional immigrant inflows are, in that case, mainly concentrated among immigrants themselves.

5.3.2 Migration Policies Targeting Immigrant's Origin

We now turn to selective immigration policies based on immigrant's citizenship and geographical origin (European and non-European). The number of citizenship acquisitions has been multiplied by eight over the period: the share of naturalized immigrants changes from 6.5% in 1990 to 40% in 2010. This sharp increase has been detrimental to the wages of high educated native workers. An increase in the number of naturalized immigrants should therefore decrease wage inequalities. In this regard, the Panel A of Table 3.10 presents the simulated wage effects of immigration from a counterfactual scenario where the share of naturalized immigrants had reached half of the immigrant population in 2010.⁴⁹ The simulation exercise suggests that an abrupt increase in the number of naturalized immigrants over the period would have lowered more wage inequality. This is more salient when we assume perfect flexible wages.

⁴⁹This scenario keep the distribution of naturalized immigrants across education-experience cells in line with the real distribution of 2010.

Table 3.10: Selective Migration Policies in terms of Immigrant's Origin (1990-2010)

	Rigid Labor Market			Perfect labor Market		
A. Policy in Favor of Naturalized Immigrants						
Average Wage Effect	-0.01	-0.02	0.09	-0.04	-0.04	0.26
Highly Educated (<i>a</i>)	-1.18	-2.39	-0.86	-2.69	-5.40	-1.87
Medium Educated	0.31	0.76	0.37	0.58	1.64	0.84
Low Educated (<i>b</i>)	0.51	0.85	0.48	1.28	1.98	1.19
Differences (<i>a</i> – <i>b</i>)	-1.69	-3.24	-1.34	-3.97	-7.38	-3.06
B. Policy in Favor of European Immigration						
Average Wage Effect	-0.01	-0.01	0.15	-0.02	-0.04	0.42
Highly Educated (<i>a</i>)	-1.31	-2.64	-0.90	-2.79	-5.61	-1.80
Medium Educated	0.41	0.86	0.48	0.76	1.77	1.10
Low Educated (<i>b</i>)	0.49	0.90	0.53	1.14	1.96	1.30
Differences (<i>a</i> – <i>b</i>)	-1.80	-3.54	-1.43	-3.93	-7.57	-3.10
C. Policy in Favor of Non-European Immigration						
Average Wage Effect	-0.01	-0.02	0.13	-0.02	-0.04	0.35
Highly Educated (<i>a</i>)	-1.23	-2.49	-0.87	-2.76	-5.54	-1.83
Medium Educated	0.36	0.80	0.42	0.69	1.72	1.00
Low Educated (<i>b</i>)	0.50	0.87	0.50	1.20	1.96	1.25
Differences (<i>a</i> – <i>b</i>)	-1.73	-3.36	-1.37	-3.96	-7.50	-3.08
Sample/Specification	Male	Consensual Parameters	Imperfect Subst.	Male	Consensual Parameters	Imperfect Subst.

Notes. The table reports the long-run simulated effects of immigration on native wages according to three scenarii. The two first scenario “high educated immigration” scenario and a “low educated immigration” scenario. Each number stands for the percentage wage changes due to immigrants for natives. Columns 1 and 4 assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$, while columns 2 and 5 use more consensual estimates: $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. Columns 3 and 6 use our baseline substitution elasticities but assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$.

We also design two alternative scenarii: an “European immigration” scenario and a “non-European immigration” scenario, where we double the total number of European and non-European immigrants over the period. These scenarii could have arisen due to the implementation of chosen immigration policies based on

origin. Table 3.10 summarizes the simulated effects of immigration on native wages according to both scenarii, by keeping the composition of immigrants constant. The results show that the main losers from both scenarii are the high educated native workers. This is mainly due to the fact that European and non-European immigrants have become more educated over time (Table 3.2). As a result, doubling the number of European and non-European would have magnified the narrowing effect of immigration on wage inequality.

6 The Short-run Effects of Immigration

As emphasized above, the previous simulations assume the capital stock adjusts completely to the increased labor supply. An alternative simulation would measure the wage immigration impacts in the short-run, allowing the possibility for capital to deviate from its balanced growth path trend.

Assuming fixed capital stock and that TFP is insensitive to migration the theoretical short-run direct impact of immigration on average wages becomes $(\Delta w_t/w_t) = (1 - \alpha) \cdot (\Delta \kappa_t/\kappa_t)$.⁵⁰ If the capital stock is assumed to be strictly fixed, the percentage deviation of the capital-labor ratio due to immigration, denoted $\Delta \kappa_t/\kappa_t$, therefore equals the negative percentage change of labor supply due to immigration. Phrased differently, $\Delta \kappa_t/\kappa_t$ should be equal to $-(\Delta M_t/L_t)$, where ΔM_t is the variation in labor supply due to immigrant workers over the corresponding period and L_t is the aggregate labor supply. Consequently, the counterfactual effects of immigration in the short-run can be computed as of our long-run simulations (Table 3.6).⁵¹

During the period 1990-2010, the cumulated inflow of male migrants increases the level of the labor force by 2.70%.⁵² Combining this percentage with the capital income share – equal to 0.3 in France⁵³ – implies that immigration induces a

⁵⁰See Ottaviano and Peri (2008) for further details.

⁵¹More generally, the short-term wage impact of immigration differs from the long-term effect by a common constant. The macroeconomic effect of immigration thus leaves the distributional effects unchanged across educated groups.

⁵²As Ottaviano and Peri (2008), we obtain this figure by cumulating yearly percentage changes, using the beginning of each year as the initial value.

⁵³Using French National Income Accounts series, Piketty (2003) shows that the capital share in value added fluctuated around 30% over the past century (1913-1998). The same figure is used by Borjas and Katz (2007) to simulate the short-run wage effects of immigration in the United States.

Table 3.11: Simulated Short-run Effects of Immigration on Wages (1990-2010)

	Perfect Substitutability				Imperfect Subst.	
	Male	Male & Female	Private Sector	Consensual Parameters	Male	Consensual Parameters
Average Wage Effect	-0.57	-0.77	-0.57	-0.57	-0.51	-0.51
Average Direct Effect	-0.83	-1.12	-0.84	-0.84	-0.64	-0.65
Average Indirect Effect	0.26	0.35	0.27	0.27	0.13	0.14
Highly Educated	-1.52	-1.90	-1.67	-2.50	-1.27	-2.25
Medium Educated	-0.32	-0.45	-0.34	0.05	-0.29	0.09
Low Educated	-0.13	-0.25	-0.11	0.13	-0.18	0.07
Sample/Specification	Male	Male & Female	Private Sector	Consensual Parameters	Male	Consensual Parameters

Notes. The table reports the short-run simulated effects of immigration on the wages of native workers with full capital adjustment. Each number stands for the percentage wage changes due to immigrants for natives. The simulations are ran for different samples. All columns assume $\sigma_{HL} = 4$, $\sigma_H = 1000$, $\sigma_L = 10$, $\sigma_X = 7.5$, except for columns 4 and 6 which use more consensual estimates: $\sigma_{HL} = 2$, $\sigma_{LL} = 20$ and $\sigma_X = 7$. The two last columns assume immigrants and natives as imperfect substitutes and imposes $\sigma_I = 20$. The total wage effect is computed as the sum of direct effects due to immigration and indirect ones due to employment responses.

negative direct effect on total wages by around 0.80%. The short-run indirect wage effect of immigration becomes 0.25%.⁵⁴ The total negative effect of immigration on average wages is thus around -0.55%.⁵⁵ Similarly, the cumulated inflow of male and female migrants increases the level of the immigrant labor force by 3.40%, so that the total wage effect on all natives becomes -0.70%. Table 3.11 replicates the Table 3.6 and reports the simulated total wage effects of immigration on worker wages in the short-run.

The assumption according to which capital be strictly fixed for 21 years can be restrictive. This is supported by Ortega and Peri (2009) who find that within OECD countries the capital-labor ratio fully recovers from an immigration shock in the short-run. In their study, Ottaviano and Peri (2008) thus assume a sluggish

⁵⁴We compute the short-run indirect effects by assuming that the labor supply elasticity is around -0.3%. Then, a decline in wages by 0.80% implies a negative employment response by around 0.25%.

⁵⁵In comparison, the immigrant influx from 1980 to 2000 is estimated to have reduced the wage of U.S. workers (including natives and immigrants) by 3.4% in the short-run (Borjas and Katz, 2007). Ottaviano and Peri (2008) find the same magnitude by around 3.2% over the period 1990-2007.

yearly response of capital. They simulate the dynamics of capital adjustment and estimate a speed of convergence equal to 10%. In order to compute the short-run effects with yearly capital adjustment, we combine the capital income share with the effect on the capital-labor ratio due to immigration. Here, we assume that capital adjustment begins the same year as immigration occurs. By summing the direct negative effect of immigration and indirect effect, we find a weaker total negative effect on average wages by around -0.20%.

7 Conclusion

The paper shows that the skill composition of immigrants is crucial in shaping wage inequality between low and high educated workers, and argues that selective immigration policies can be viewed as an instrument to shape the wage distribution.

To illuminate the quantitative implications of immigration on wage inequalities, we apply the “structural skill-cell approach”⁵⁶ to France; a rigid labor market where immigration has disproportionately increased the number of college workers over the past two decades. We then pursue three strategies. First, we provide intriguing findings related to the distributional effects of immigration in France. The immigrants influx in recent decades has contributed to narrow the French wage structure by adversely affecting the earnings of high educated native workers and improving the earnings of medium and low educated ones. Breaking down the immigrant population by citizenship, we show that these effects are mainly driven by the naturalized immigrants.

Second, we use U.S. immigration as a “real” scenario of immigration, and we show that if France would have experienced the same type of (low educated) migrant flows than in the United States, the distribution of French wages would have

⁵⁶The literature has emphasized some limitations of structural estimates of the wage effects of immigration. Some of them concern identification problems regarding the estimates of the substitution elasticities that lie at the core of the CES framework (Felbermayr et al. 2010; Borjas et al. 2012). Dustmann and Preston (2012); Borjas (2014) also challenge the restrictive assumptions of the “structural skill-cell approach.” While Dustmann and Preston (2012) show that the pre-assignment of immigrants to education-experience cells (based on their observed characteristics) may affect the simulation results; Borjas (2013) explains that the use of linear homogeneous aggregate production functions, such as the Cobb-Douglas function, might be restrictive to examine the wage effects of immigration.

rather widened. This simulation exercise shows that the skill mix of immigrants matters in determining their impact on the wages of domestic workers: a relative increase (decrease) in the number of high educated immigrants reduces (increases) wage inequality between low educated and high educated native workers.

By affecting the skill composition of immigrants, selective immigration policies may therefore impact wage inequalities. We finally investigate this implication by designing counterfactual scenarii of different immigration policies. In particular, we find that a policy in favor of high educated immigration would have strongly decreased the relative wage of high educated natives over the period, inducing a reduction of wage inequality.

The present study can be related to the studies on the fiscal impact of immigration, which generally conclude that high educated immigrants tend to make a large fiscal contribution (Rowthorn, 2008). Taken together, our studies imply that a selective immigration policy directed toward high educated immigrants could therefore achieve two objectives: reduce wage inequality and sustain fiscal policy.

8 Supplementary Material

8.1 The Shares of Immigrants and Natives in the Labor Force by Education

Table 3.12: Relative Size of Immigrants and Natives in the Labor Force by Education Group

Education Level	Native	Total Immigrant	European	Non-European	Naturalized
A. 1990					
High	95.3 %	4.7 %	1.6 %	2.6 %	0.5 %
Medium	95.6 %	4.4 %	1.8 %	2.1 %	0.5 %
Low	86.3 %	13.7 %	5.4 %	7.7 %	0.6 %
B. 2000					
High	92.4 %	7.6 %	1.8 %	2.6 %	3.3 %
Medium	93.9 %	6.1 %	1.4 %	2.3 %	2.5 %
Low	84.2 %	15.8 %	4.3 %	8.1 %	3.5 %
C. 2010					
High	91.9 %	8.1 %	1.6 %	2.8 %	3.7 %
Medium	92.7 %	7.3 %	1.4 %	2.7 %	3.4 %
Low	83.2 %	16.8 %	4.2 %	7.4 %	5.0 %

8.2 Deriving the Equations to estimate the Substitution Elasticities

As in the literature, we derive the empirical equations used to estimate the substitution elasticities by equating the wage w with the marginal productivity of labor (traditionally, $\delta Y/\delta L$) for the different nests of the production function.

In order to obtain Equation (3.10) that allows us to estimate $-1/\sigma_I$, we derive the aggregate production function Y_t by L_{objkt} corresponding to the number of

workers with nativity o , in the cell b, j, k, t . By applying the chain rule to derive marginal productivity and transforming the final equation in log-terms, we obtain:

$$\begin{aligned} \log(w_{objkt}) &= \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \log(L_{bt}) \\ &\quad + \log(\theta_{bjt}) - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \log(L_{bjt}) + \log(\theta_{bjkt}) - \left[\frac{1}{\sigma_X} - \frac{1}{\sigma_I} \right] \log(L_{bjkt}) \\ &\quad + \log(\theta_{objkt}) - \frac{1}{\sigma_I} \cdot \log(L_{objkt}). \end{aligned} \quad (3.14)$$

By taking the difference between $o = N$ and $o = M$ on both sides reduces the above equation to Equation (3.10). Finally, we can estimate the elasticity of substitution between natives and immigrants (*i*) by replacing the relative productivity term by a set of fixed effects and (*ii*) by adding an error term to the equation.

Equations (3.11), (3.12) and (3.3) are derived from the structural model by following the same strategy. Using the equilibrium condition that the average wage equals the marginal product of labor in each broad education group b – *i.e.*, $w_{bt} = Y_t/L_{bt}$ – we can write:

$$\log(w_{bt}) = \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \frac{1}{\sigma_{HL}} \log(L_{bt}) \quad (3.15)$$

By taking the difference between $b = H$ and $b = L$ on both sides, and assuming that $\log(\theta_{Ht}/\theta_{Lt})$ can be decomposed into period effects δ_t and an error term ξ_t , we obtain Equation (3.11). In order to have Equation (3.12), we derive the production function with respect to L_{bjt} . As we assume perfectly competitive market, this derivative is equal to the wage of workers, and find the following equation:

$$\begin{aligned} \log(w_{bjt}) &= \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \log(L_{bt}) \\ &\quad + \log(\theta_{bjt}) - \frac{1}{\sigma_b} \log(L_{bjt}). \end{aligned} \quad (3.16)$$

Then, we take the difference between the subgroup $j = L_1$ and $j = L_2$ within the low broad education group. Thus, we can estimate $-1/\sigma_L$ by replacing the relative efficiency term with a time trend and by adding an error term.

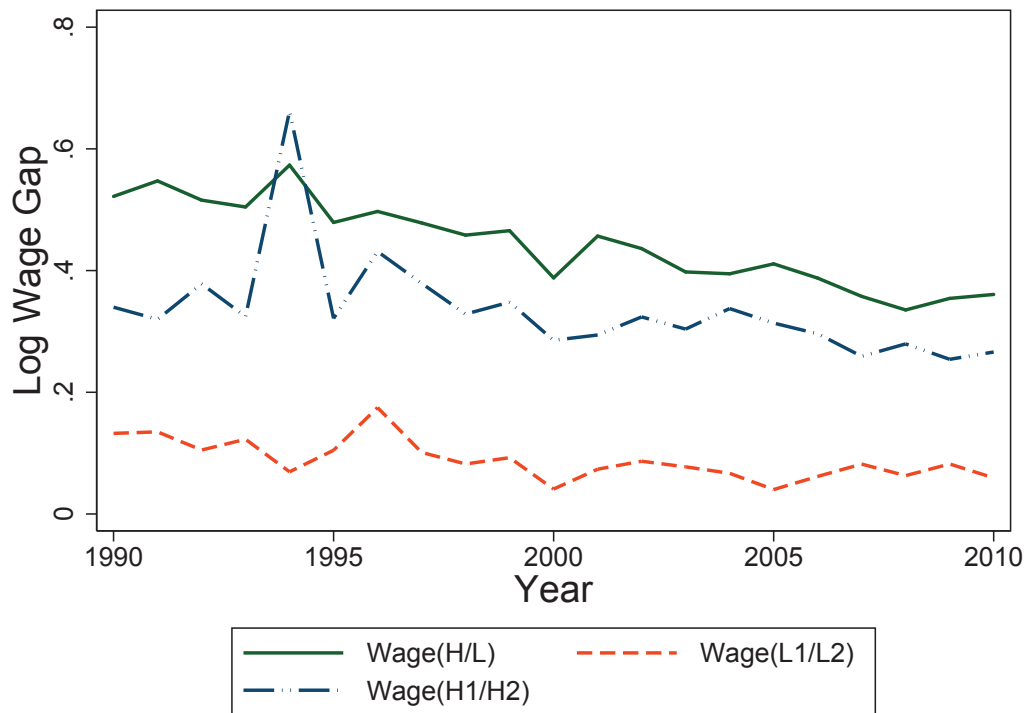
Finally, the equation used to estimate $-1/\sigma_X$ is obtained by first deriving Y_t by L_{bjkt} . We then transform the final equation using the logarithm function, and we come up with the following equation:

$$\begin{aligned} \log(w_{bjkt}) = & \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \log(L_{bt}) \\ & + \log(\theta_{bjt}) - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \log(L_{bjt}) + \log(\theta_{bjkt}) - \frac{1}{\sigma_X} \log(L_{bjkt}). \end{aligned} \quad (3.17)$$

From the above equation, we keep the term $-\frac{1}{\sigma_X} \log(L_{bjkt})$ and we replace the other terms by fixed effects to obtain Equation (3.3).

8.3 Trends in Wage Ratios

Figure 3.2: Hourly Wage Ratios between Education Groups



Notes. The green solid line, the red dash line and the blue dash-dot line respectively show the evolutions of $\log(w_{Ht}/w_{Lt})$, $\log(w_{L1t}/w_{L2t})$ and $\log(w_{H1t}/w_{H2t})$.

CHAPTER 4

Immigration and the Gender Wage Gap

⁰This chapter results from a joint work with Farid Toubal (ENS de Cachan, Paris School of Economics, CEPII).

1 Introduction

One of the most significant migration trends in the recent years has been the feminization of the migration population (Zlotnik, 2003). According to the United Nations Population Division, the total number of women living outside their country of birth constitute about half of all migrants. Earlier female migration was largely via family reunion while women are increasing now the proportion of employment-related migrants (Omelaniuk, 2005).

The trends towards the feminization of migration have certainly important implications on host countries' labor markets, in particular on the wage of native men and women. The present paper analyzes whether the feminization of the migration population has widened the gender wage gap by bringing together two strands of the migration literature. The first is focusing on the substitution between migrants and natives and investigates the impact of migrants on native wages using structural methods.¹ The second examines the feminization of the migrant population.²

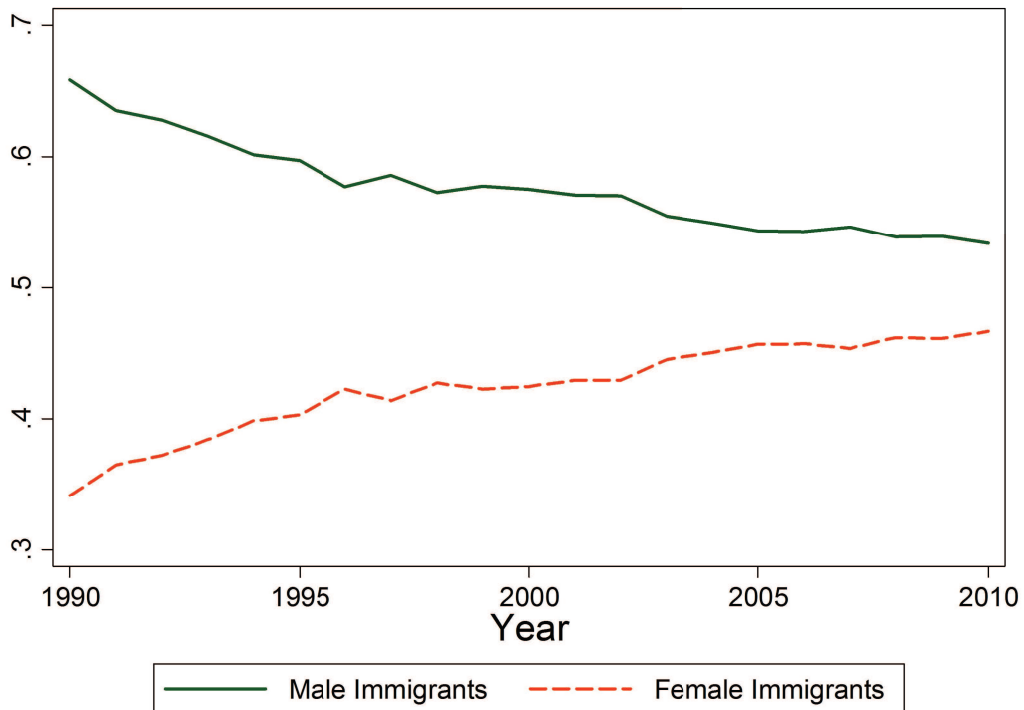
In France, immigration has augmented the supply of female workers by more than it has augmented the supply of male workers. While 34% of the immigrant labor force was women in 1990, this share increased to 47% in 2010 (Figure 4.1).³ The share of female immigrants in the total labor force has doubled, increasing from 2.3% in 1990 to 4.3% in 2010, while the share of male immigrants only increased from 4.5% to 4.9%.⁴ In addition, as emphasized by Beauchemin et al. (2013), the feminization of the immigrant population over the past two decades is not driven by family reunification, but rather it is due to alternative migration

¹Since its popularization by Borjas (2003), structural methods have been widely employed (see, e.g., Aydemir and Borjas (2007); Borjas and Katz (2007); Ottaviano and Peri (2012) for the United states, D'Amuri et al. (2010); Felbermayr et al. (2010); Brücker and Jahn (2011) for Germany, Gerfin and Kaiser (2010) for Switzerland, Manacorda et al. (2012) for the United Kingdom, Edo and Toubal (2014a) for France, as well as Docquier et al. (2013) for OECD countries or Elsner (2013b) on the emigration wage effect in Great Britain).

²See, e.g., Zlotnik (1995); Marcelli and Cornelius (2001) who emphasize that the gender composition of migration has shifted, becoming less male-dominated. For an investigation of the skill composition of female migration see, e.g., Docquier et al. (2009, 2012).

³Since 2008, women represent 51% of the total immigrant population in France (Beauchemin et al., 2013).

⁴In terms of workforce participation, the share of female immigrants in the female labor force went from 5% to 9%, while the share of male immigrants in the male labor force went from 8% to 10%.

Figure 4.1: The Gender Distribution of Immigrants over Time

Notes. The Figure reports the shares of male and female immigrants in the immigrant labor force between 1990 and 2010. The population used to compute these shares includes all immigrants participating in the labor force aged from 16 to 64, not enrolled at school and having between 1 and 40 years of labor market experience. Self-employed people are excluded from the sample.

motives such as work.

In order to analyze the impact of migration on the wage of native men and women, we follow the recent literature and we use a structural labor market equilibrium approach (Aydemir and Borjas, 2007; Manacorda et al., 2012; Ottaviano and Peri, 2012). The prevalence of important wage rigidities on the French labor market may prevent wages from adjusting to their market clearing level (Card et al., 1999).⁵ We thus follow D'Amuri et al. (2010) and develop a model that also allows for wage rigidities.

The literature that uses this structural approach finds mixed results concerning the substitution elasticity between immigrants and natives of similar education

⁵A drop in the marginal productivity due to immigration may rather depress the level of employment in the economy.

and age (Aydemir and Borjas, 2007; Ottaviano and Peri, 2012). Yet, the degree of substitutability between similarly educated natives and immigrants is crucial to determine the labor market effects of immigration (Borjas et al., 2012). In the long-run, the imperfect substitutability between natives and immigrants leads the distributional effects of immigration to be in favor of native workers (Manacorda et al., 2012; Ottaviano and Peri, 2012).⁶

The literature explains the “within-group imperfect substitutability” as the result of important differences between natives and immigrants in terms of skills, occupied jobs and performed tasks. According to Ottaviano and Peri (2012, p. 175), imperfect substitutability between two types of workers (in their case, between natives and immigrants) “may derive from somewhat different skills among these groups leading to different choices of occupations.”

Interestingly, the same reasoning applies to men and women. The prevalence of gender differences in terms of skills and preferences (Charles and Grusky, 2005; Croson and Gneezy, 2009) may lead men and women of similar education to work in different jobs and perform different productive tasks (Anker et al., 1998; Blau et al., 2002). In particular, Croson and Gneezy (2009) identify strong gender differences in attitudes and behaviors, aversion to competition and overconfidence. These differences in productive characteristics may lead employers to prefer men or women to perform certain jobs or functions. Also, men and women of similar education may differ in terms of their physical and relational skills, leading (i) men to be overrepresented in manual occupation (Sikora and Pokropek 2011) and (ii) women to perform jobs related to services and social interactions (Charles and Grusky, 2005). Many other factors, ranging from outright discrimination, to the processes associated with gender role socialization may lead to different choices of occupation between men and women (Eccles, 1994). As a result, men and women of similar education and experience are very unlikely to compete for the same types of jobs, making them to be imperfect substitutes.

⁶For instance, Ottaviano and Peri (2012) show that immigrant influx raises average wage of US-born workers by 1% in the long-run. Using agnostic approaches, some studies even show that the imperfect substitutability between immigrants and natives of similar observable characteristics can lead immigration to improve the outcomes of competing native workers through a reallocation of their task supply (Peri and Sparber, 2011; Cattaneo et al., 2013; Foged and Peri, 2013; Ortega and Verdugo, 2014).

In our data, we find a great deal of occupational segregation between men and women. Moreover, we find that occupational segregation by gender is more important than occupational segregation by nativity status.⁷ Similar results are found in the literature (Anker et al., 1998; Blau et al., 2002; Dustmann et al., 2007). This preliminary analysis suggests that men and women of similar education and experience may not compete in the same labor market, so they may be imperfect substitutes.

The imperfect substitutability between men and women (with the same level of experience and education) should imply differential wage reactions induced by immigration on both groups. Indeed, the fact that men are employed in occupations that are different from those taken by women may protect them from the increasing competition induced by female immigrants. Given (i) the relative increase in the number of female immigrants and (ii) the “within-group imperfect substitutability” between men and women, immigration should thus increase the relative wage of male native workers in the long-run, thereby contributing to a widening gender wage gap. More generally, the increasing feminization of immigration may damp a labor market trend to lower earnings inequality between men and women in developed countries (as documented in Weichselbaumer and Winter-Ebmer (2005)).

This paper makes at least three contributions to the literature. First, while there is some literature on the impact of female migration on employment or job specialization, there are very few studies on the effect of immigration on female wages.⁸ The literature on the impact of migrants on wage or employment mostly focuses on males or aggregates males and females.

Second, this paper introduces the question of the substitutability between men and women (within a context of increasing feminization of international migration). Since men and women of similar education specialize in different segments

⁷This implies that the imperfect substitutability between similarly educated men and women is consistent with both findings of imperfect and perfect substitutability between natives and immigrants.

⁸Cortes (2008); Barone and Mocetti (2011); Cortes and Tessada (2011); Farré et al. (2011) study the effect of female immigration on the price levels or female labor supply. Amuedo-Dorantes and De La Rica (2011) investigate the impact of immigration on tasks specialization by gender in Spain.

of the labor market, they may be imperfect substitutes. We thus add an additional nest to the CES structure by allowing men and women to be imperfect substitutes. Hence, we structurally estimate the elasticity of substitution between male and female workers within the same education and experience group without assuming *ex ante* that they are perfectly substitutable. In line with the prevalence of gender differences in terms of skills, occupied jobs and performed tasks, our results indicate that men and women are imperfect substitutes in the production process (with an elasticity between 4 and 12).

Third, we study a new aspect of immigration by linking female immigration and gender wage inequality. We find that the long-term effects of immigration are detrimental for the relative wage of female natives – the wage immigration effects are always positive for native men and mostly negative for native women.⁹ This asymmetric impact is due to (i) the increasing feminization of migration and (ii) the imperfect substitutability between men and women. Thus, the trend towards the feminization of migration has had a widening effect on the gender wage gap in France. We also find that the detrimental effect of immigration on the relative wage of women is larger when we assume a flexible labor market.

The remainder of this paper proceeds as follows. In section 2, we describe the theoretical framework used to simulate the overall effects of immigration on wages. In section 3, we describe the data. The section 4 provides our estimates regarding the elasticity of substitution between men and women and it discusses our choices for the other substitution elasticity values. In Section 5, we present the simulated results of our model. The last section concludes.

⁹Our simulated results have a *ceteris paribus* interpretation. The calculated wage change is only the difference between the equilibrium wages after and before the migration shock, all other things being equal – so that our simulations yield the change in wages due to immigration in absence of other adjustment channels. Thus, our study does not aim at explaining the change in real wages in its entirety, but only the share of the wage changes that can be attributed to immigration.

2 Theoretical Framework

2.1 The Nested CES Structure

This paper uses the traditional “structural skill-cell approach” to evaluate the full wage response of natives to immigration. This method has been widely used to study the wage response to labor supply and demand shocks at the national level (Katz and Murphy, 1992; Card and Lemieux, 2001; Borjas, 2003; Ottaviano and Peri, 2012). It allows to investigate the overall impact of immigration on native wages, inasmuch this structural approach does “not simply estimate the own-effect of a particular immigrant influx on the wage of directly competing native workers, but also the cross-effects on the wage of other native workers” (Borjas (2014), p. 106). New to this paper is our extension of this framework, allowing men and women to be imperfect substitutes.

The “structural skill-cell approach” is based on an aggregate production function with a nested CES structure of labor (*e.g.*, see Borjas (2003); Manacorda et al. (2012); Ottaviano and Peri (2012)). We assume a constant-return-to-scale aggregate production function that takes the Cobb-Douglas form (D’Amuri et al., 2010; Brücker and Jahn, 2011; Ottaviano and Peri, 2012). This assumption allows us to concentrate exclusively on the long-run effects of immigration on wages, by considering full capital adjustment as a response to immigrant-induced labor supply shifts.

The aggregate production function is given by Equation (4.1). The physical capital K_t and a labor composite L_t are combined to produce output Y_t at time t .

$$Y_t = (A_t \cdot K_t^{1-\alpha} \cdot L_t^\alpha), \quad (4.1)$$

where A_t is exogenous total factor productivity (TFP) and $\alpha \in (0, 1)$ is the income share of labor. L_t is defined as a composite of different categories of workers who have different level of education, work experience and nativity. We follow the literature on the wage structure (Katz and Murphy, 1992; Autor et al., 2008; Goldin and Katz, 2009) or on migration (Card and Lemieux, 2001; Card, 2009; Ottaviano and Peri, 2012) by assuming L_t to have a nested CES structure,

which combines the labor supply of two broad education groups $b \in \{H, L\}$. L_{Ht} and L_{Lt} are aggregate measures of the labor supply of high and low educated workers, respectively.

$$L_t = \left[\theta_{Ht} \cdot L_{Ht}^{\rho_{HL}} + \theta_{Lt} \cdot L_{Lt}^{\rho_{HL}} \right]^{1/\rho_{HL}}. \quad (4.2)$$

The parameters θ_{Ht} and θ_{Lt} measure the relative efficiency of each category, with $\theta_{Ht} + \theta_{Lt} = 1$. $\rho_{HL} = (\sigma_{HL} - 1) / \sigma_{HL}$ with σ_{HL} being the degree of substitution between the group of high educated workers and the group of low educated workers.

The education groups L_{Ht} and L_{Lt} respectively refer to an education level beyond high school and less than college. Implicitly, this classification assumes that within these two large groups, workers with different levels of education are perfect substitutes. Despite Card (2009, 2012) suggests to use a classification with two main education groups, this classification might be too restrictive (as suggested by Manacorda et al. (2012); Ottaviano and Peri (2012)). As a result, we split up L_{Ht} and L_{Lt} into two finer education groups $j \in \{1, 2\}$ as follows:

$$L_{Ht} = \left[\theta_{H_1t} \cdot L_{H_1t}^{\rho_H} + \theta_{H_2t} \cdot L_{H_2t}^{\rho_H} \right]^{1/\rho_H}, \quad (4.3)$$

$$L_{Lt} = \left[\theta_{L_1t} \cdot L_{L_1t}^{\rho_L} + \theta_{L_2t} \cdot L_{L_2t}^{\rho_L} \right]^{1/\rho_L}, \quad (4.4)$$

where $\rho_H = (\sigma_H - 1) / \sigma_H$ and $\rho_L = (\sigma_L - 1) / \sigma_L$, with σ_H and σ_L capture the degree of substitution between workers within each broad education groups. The terms L_{bjt} for $b, j \in \{H_1, H_2, L_1, L_2\}$ are aggregate measures of labor supplied by workers with, respectively, some college education (H_1), a college degree (H_2), less than high school education (L_1) and a high school education (L_2). For ease of clarification, we note $\sigma_b \in \{\sigma_H, \sigma_L\}$. The parameters θ are the education specific productivity levels with $\theta_{H_1t} + \theta_{H_2t} = 1$ and $\theta_{L_1t} + \theta_{L_2t} = 1$.

As shown by Edo and Toubal (2014a) for France, the education group L_{Ht} (representing 25% of the total number of workers) is composed of homogeneous individuals – *i.e.*, the workers with some college (L_{H_1t}) or a college degree (L_{H_2t})

are perfect substitutes in production. As a result, we consider that $\sigma_H \rightarrow \infty$.¹⁰ However, within the group of low educated workers,¹¹ Edo and Toubal (2014a) find that workers with high school education (L_2) and less than a high school education (L_1) are imperfect substitutes (with an elasticity of substitution equals to 10). We thus keep the decomposition of the low educated group L_{Lt} into two finer education classes, denoted L_{L_1t} and L_{L_2t} .¹² As a result, we use two broad education groups $b \in \{H, L\}$, and three education classes¹³ grouping together workers with tertiary education L_{Ht} , secondary education L_{L_2t} and primary education – where $L_{bjt} \in \{L_{L_1t}, L_{L_2t}, L_{Ht}\}$.

Considering the experience level of workers, we divide the labor composite L_{bjt} into four experience intervals of five years [1-10 ; 10-20 ; 20-30 ; 30-40], as in Felbermayr et al. (2010); Gerfin and Kaiser (2010); Elsner (2013b). This strategy has two advantages. First, it attenuates the impact of any potential bias regarding our experience measure, and in particular, the fact that employers may evaluate the experience of immigrants differently from that of natives. Also, since women tend to face more frequent periods of inactivity or unemployment, the correspondence between their potential and effective experience may collapse. It is therefore relevant to use four but broader experience groups to study the labor market effects of immigration on male and female natives.

$$L_{bjt} = \left[\sum_{k=1}^4 \theta_{bjkt} \cdot L_{bjkt}^{\rho_X} \right]^{1/\rho_X}, \quad (4.5)$$

L_{bjkt} is the number of workers with education bj and experience k at time t . We define $\rho_X = (\sigma_X - 1) / \sigma_X$, where σ_X measures the elasticity of substitution across the different experience classes and within a narrow education group. The parameters θ_{bjkt} capture the relative efficiency of workers within the education-experience group.

The present paper allows males and females to be imperfect substitutes. As

¹⁰This follows Card and Lemieux (2001); Card (2009) who do not disaggregate the high education group corresponding to college equivalent workers.

¹¹The low educated category L_{Lt} regroups 75% of workers, among which 62.6% have a high school degree and 37.4% have an education below high school.

¹²This disaggregation is consistent with Goldin and Katz (2009); Borjas et al. (2012); Ottaviano and Peri (2012).

¹³As in, e.g., D'Amuri et al. (2010); Gerfin and Kaiser (2010); Elsner (2013b)

men and women work in different jobs (Anker et al., 1998; Blau et al., 2002), they may not compete in the same labor market. One reason behind this labor market segmentation may lie in important gender differences in attitudes and behaviors, aversion to competition, overconfidence (Croson and Gneezy, 2009) and other types of productive characteristics. We thus assume that L_{bjkt} incorporates contributions of workers who differ in gender, and we divide L_{bjkt} into a CES aggregator of males and females as follows:

$$L_{bjkt} = \left[\theta_{S_Mbjkt} \cdot Male_{bjkt}^{\rho_F} + \theta_{S_Fbjkt} \cdot Female_{bjkt}^{\rho_F} \right]^{1/\rho_F}, \quad (4.6)$$

where $\rho_F = (\sigma_F - 1) / \sigma_F$ and σ_F denotes the elasticity of substitution between men and women, while θ_{S_Mbjkt} and θ_{S_Fbjkt} stand for their specific efficiency levels standardized so that $\theta_{S_Mbjkt} + \theta_{S_Fbjkt} = 1$.

Turning to the nativity of workers, we follow Manacorda et al. (2012); Ottaviano and Peri (2012) and assume L_{Sbjkt} to be a CES aggregate of native-born N_{Sbjkt} and of foreign-born workers M_{Sbjkt} :

$$L_{Sbjkt} = \left[\theta_{Sbjkt}^N \cdot N_{Sbjkt}^{\rho_I} + \theta_{Sbjkt}^M \cdot M_{Sbjkt}^{\rho_I} \right]^{1/\rho_I}, \quad (4.7)$$

where $\rho_I = (\sigma_I - 1) / \sigma_I$ and σ_I captures the degree of substitution between natives and immigrants in an education-experience cell. The relative efficiency for each group of workers is given by the productivity parameters θ_{Sbjkt}^N and θ_{Sbjkt}^M , with $\theta_{Sbjkt}^N + \theta_{Sbjkt}^M = 1$.

2.2 Wage Rigidities

The nested CES framework allows to compute the overall impact of immigration (see Ottaviano and Peri (2008, 2012) for a detailed presentation) under the assumption that wages adjust perfectly to labor supply shocks. However, French institutional features (such as high minimum wage, high unemployment benefits, strict employment protection and powerful labor unions) may prevent full wage adjustment. In fact, these institutional dimensions should affect the wage-setting mechanism (Babecký et al., 2010), the reservation wage (Cohen et al., 1997) and

the scope for bargaining, which in turn should have an impact on the responsiveness of wages to labor supply shocks (as suggested in D'Amuri et al. (2010); Felbermayr et al. (2010); Brücker and Jahn (2011); Brücker et al. (2014)). This is consistent with Card et al. (1999) who show that labor supply shocks have less impact on the adjustment of wages in France because of wage rigidities. For France, Edo (2013) also finds that immigration have no detrimental effect on the wage structure, whereas it positively affects the level of unemployment in the economy in the short-run.

Within this context, wages should not adjust perfectly to immigrant-induced supply shifts. We thus extend the structural approach by accounting for wage rigidities, as in D'Amuri et al. (2010).¹⁴ In their model, they assume that “a change in wages [produced by immigration] may induce an employment response for natives” (D'Amuri et al. (2010), p. 553). In this model, natives respond to wage changes because of the prevalence of high unemployment benefits. A change in native labor supply should also indirectly affect the level of wages in the economy. As a result, immigration should induce (i) a direct wage effect due to immigrant-induced supply shifts and (ii) an indirect wage effect through native employment response. In this model, the indirect wage effects thus attenuate the direct wage effects induced by immigration, allowing for a sluggish adjustment of wages.

In order to compute the employment effects (or the indirect wage effects) due to immigration, we follow the strategy by D'Amuri et al. (2010) and we assume that for every 10 immigrants that find a job 3 unemployed native workers are displaced.¹⁵

2.3 Labor Market Equilibrium

In equilibrium, wages (and employment) levels are such that firms maximize profits. Profit-maximizing firms pay each skill group a real wage equal to the group's marginal product. By equating native wage to the marginal products of their labor ($\tau w_{Sbjkt}^N = \delta Y_t / \delta N_{Sbjkt}$) and using Equations (4.1) to (4.7), we can derive an expression for the equilibrium wage of natives for each gender-education-age-

¹⁴See also Edo and Toubal (2014a) for more details.

¹⁵This magnitude is found by Glitz (2012) for Germany and Edo (2013) for France.

time cell:

$$\begin{aligned}
\log(w_{Sbjkt}^N) = & \log(\alpha \cdot A_t \cdot [\kappa_t]^{1-\alpha}) + \frac{1}{\sigma_{HL}} \cdot \log(L_t) + \log(\theta_{bt}) - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \log(L_{bt}) \\
& + \log(\theta_{bjt}) - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \log(L_{bjt}) + \log(\theta_{bjkt}) - \left[\frac{1}{\sigma_X} - \frac{1}{\sigma_I} \right] \log(L_{bjkt}) \\
& + \log(\theta_{Sbjkt}) - \frac{1}{\sigma_F} \cdot \log(L_{Sbjkt}) + \log(\theta_{Sbjkt}^N) - \frac{1}{\sigma_I} \cdot \log(N_{Sbjkt}) \quad (4.8)
\end{aligned}$$

$\kappa_t = (K_t/L_t)$ and the productivity parameters θ measure the specific productivity levels between workers with different education, experience, gender and nativity. σ_{HL} , σ_b , σ_X , σ_F and σ_I respectively measure the elasticities of substitution between the high and low education groups, within both broad education groups, between experience groups, between men and women and between natives and immigrants.

Any change in one of the factors on the right-hand side affects the marginal product, which leads to a change in the real wage *ceteris paribus*. According to Equation (4.8), an immigration-induced supply shift in a given skill group S, b, j, k thus generates a (potentially negative) partial effect on the wages of native workers in the same gender-education-experience group, as well as (potentially positive) cross-effects on the wages of natives in other groups.

2.4 Simulating the Wage Effects of Immigration

The overall impact of immigration on native wages can be derived from the demand function (4.8). As in Borjas (2003); Ottaviano and Peri (2012), the TFP and productivity levels are assumed to be insensitive to immigration. Thus, we can express the percentage wage changes due to immigrants for natives in the long-run as:

$$\begin{aligned}
\left(\frac{\Delta w_{bjkt}^N}{w_{bjkt}^N} \right) &= \left[\frac{1}{\sigma_{HL}} \right] \sum_b \sum_j \sum_k \sum_S \left(s_{Sbjkt}^M \cdot \frac{\Delta M_{Sbjkt}}{M_{Sbjkt}} + s_{Sbjkt}^N \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} \right) \\
&\quad - \left[\frac{1}{\sigma_{HL}} - \frac{1}{\sigma_b} \right] \left(\frac{1}{s_{bt}} \right) \sum_j \sum_k \sum_S \left(s_{Sbjkt}^M \cdot \frac{\Delta M_{Sbjkt}}{M_{Sbjkt}} + s_{Sbjkt}^N \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} \right) \\
&\quad - \left[\frac{1}{\sigma_b} - \frac{1}{\sigma_X} \right] \left(\frac{1}{s_{bjt}} \right) \sum_k \sum_S \left(s_{Sbjkt}^M \cdot \frac{\Delta M_{Sbjkt}}{M_{Sbjkt}} + s_{Sbjkt}^N \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} \right) \\
&\quad - \left[\frac{1}{\sigma_X} - \frac{1}{\sigma_F} \right] \left(\frac{1}{s_{bjkt}} \right) \sum_S \left(s_{Sbjkt}^M \cdot \frac{\Delta M_{Sbjkt}}{M_{Sbjkt}} + s_{Sbjkt}^N \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} \right) \\
&\quad - \left[\frac{1}{\sigma_F} - \frac{1}{\sigma_I} \right] \left(\frac{1}{s_{Sbjkt}} \right) \left(s_{Sbjkt}^M \cdot \frac{\Delta M_{Sbjkt}}{M_{Sbjkt}} + s_{Sbjkt}^N \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} \right) \\
&\quad - \left[\frac{1}{\sigma_I} \right] \left(\frac{\Delta N_{Sbjkt}}{N_{Sbjkt}} \right)_{response} + (1 - \alpha) \left(\frac{\Delta \kappa_t}{\kappa_t} \right), \tag{4.9}
\end{aligned}$$

where s_{bt} , s_{bjt} , s_{bjkt} , s_{Sbjkt}^M and s_{Sbjkt}^N are the shares of the total wage income paid to the respective groups.¹⁶ The terms $(\Delta M_{Sbjkt}/M_{Sbjkt})$ and $(\Delta N_{Sbjkt}/N_{Sbjkt})_{response}$ are the changes in immigrant and native labor supply in the same respective groups over the corresponding period.

The fraction $(\Delta M_{Sbjkt}/M_{Sbjkt})$ represents the percentage change in the supply of immigrant workers with gender S , education bj and experience k between 1990 and 2010. The terms capture the direct effect of the change in the supply of immigrants on wages. The terms associated with the subscript “response” account for employment effects caused by the change in the supply of immigrant workers in a given skill-cell – *i.e.*, $(\Delta N_{Sbjkt}/N_{Sbjkt})_{response}$ represents the change in labor supply of native workers in the same group caused by immigration. These terms capture the indirect wage effects due to the change in native employment caused by immigrants. As a result, the percentage wage changes due to immigration depends on (i) the income shares accruing to the various factors, (ii) both direct and indirect wage effects depending on the size of the immigration supply shock and (iii) the various elasticities of substitution that lie at the core of the CES framework.

As in D’Amuri et al. (2010), the response of native employment in the cell

¹⁶For instance, $s_{Sbjkt}^M = (w_{Sbjkt}^M M_{Sbjkt}) / (\sum_b \sum_j \sum_k \sum_S (w_{Sbjkt}^M M_{Sbjkt} + w_{Sbjkt}^N N_{Sbjkt}))$ is the share of total wage income in period t paid to migrant workers with with gender S , education bj and experience k .

(S, b, j, k, t) is obtained by multiplying 0.7 by the change in immigrants standardized by the initial employment – *i.e.* $(\Delta M_{Sbjkt}/M_{Sbjkt} + N_{Sbjkt})$. This strategy assumes that the displacement effects due to immigration are similar across cells. Section 5 discusses the implications of this assumption.

Using the percentage change in wages for each cell (S, b, j, k, t) , we can then aggregate and find the effect of immigration on several representative wages. From Equation (4.9), we can calculate the mean wage effect of immigration for the various education groups by taking the weighted average of the wage effects across the experience groups for a particular education group. The weights are given by income shares. By taking the weighted average of the wage effects across education groups, we can compute the total wage effects due to immigration.

3 Data & Facts

3.1 The Selected Sample

The analysis uses data from the French annual labor force survey (LFS) which covers 21 years of individual-level data for the period 1990 to 2010. The LFS is conducted by the French National Institute for Statistics and Economic Studies (INSEE).¹⁷ It provides detailed information on the demographic and social characteristics of a random sample of around 210,000 individuals per year.¹⁸ Our empirical analysis uses information on individuals aged from 16 to 64, who are not self-employed and who are in full-time jobs.¹⁹ We also restrict the labor market experience to 40 years.

The employment survey divides the education level into six categories: college graduate, some college, high school graduate, some high school, just before high school, no education. According to the International Standard Classification of Education (ISCED), those levels of education respectively correspond to (1) a second stage of tertiary education, (2) first stage of tertiary education, (3) post-

¹⁷Institut National de la Statistique et des Etudes Economiques.

¹⁸We use an individual weight (computed by the INSEE) to make our sample representative of the French population. For each observation this weight indicates the number of individuals each observation represents in the total population.

¹⁹Unless otherwise specified, we deal with full-time workers. Note that all the results presented in the paper are not sensitive to the inclusion of part-time workers in the sample.

secondary non-tertiary education, (4) (upper) secondary education, (5) lower secondary education and (6) a primary or pre-primary education. In order to classify the workers in terms of their level of education, we merge the two highest education groups (1) & (2) to build the group L_H , the two medium (3) & (4) and the two lowest (5) & (6) to build L_{L_2} and L_{L_1} , respectively.

Individuals with the same education, but a different age or experience are unlikely to be perfect substitutes (Card and Lemieux, 2001). Hence, individuals are distinguished in terms of their labor market experience. Following Mincer (1974), work experience is computed by subtracting for each individual the age of schooling completion from reported age. This measure differs from the one used in the migration literature since the age of completion of schooling is usually unavailable.²⁰ For a few surveyed individuals, the age of completion of schooling is very low, between 0 and 11 inclusive. Since individuals cannot start accumulating experience when they are too young, we have raised the age of completion of schooling for each surveyed individual to 12 if it is lower.

In order to simulate our model, we need a proxy for labor supply in each skill-cell. From a theoretical point of view, the labor quantity in a specific cell stands for the number of “efficiency units” provided by all workers. Following Borjas et al. (2008, 2011); D’Amuri et al. (2010), we express labor supply as the level of full-time employment in a specific cell. This strategy is also consistent with Manacorda et al. (2012) who use population as a measure of labor supply.

3.2 The Educational Distribution of Natives and Immigrants by Gender

Table 4.1 shows the educational composition of natives and immigrants in the labor force by gender groups. For both males and females, we display the fraction of natives and foreign-born in the labor force for the three education categories (high, medium, low education level) in 1990 and 2010.

Table 4.1 shows that the labor force becomes increasingly educated over time. In particular, the table illustrates the rapid increase of the fraction of immigrants

²⁰Empirical works rather assign a particular entry age into the labor market to the corresponding educational category.

Table 4.1: Education Distribution of the Male Native and Immigrant Population in the Labor Force

	Males				Females			
	Natives		Immigrants		Natives		Immigrants	
	1990	2010	1990	2010	1990	2010	1990	2010
High Education	17.3 %	31.8 %	9.7 %	25.8 %	19.4 %	38.2 %	9.3 %	30.1 %
Medium Education	45.4 %	46.9 %	23.5 %	34.4 %	41.8 %	42.8 %	21.7 %	32.9 %
Low Education	37.3 %	21.3 %	66.9 %	39.8 %	38.8 %	19.1 %	68.3 %	37.0 %
Total	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

in the highly educated category (with some college or more). Irrespective of gender, about 28% of immigrants are classified as highly educated, against less than 10% in 1990. However, the educational shift experienced by immigrants is more pronounced for female immigrants than for their male counterparts. This fact is also consistent with the native individuals. Besides, native women have become relatively more educated than the native men.

3.3 Gender and occupation

Table 4.2 breaks down the occupational distribution by educational attainment, distinguishing the labor force between men and women (upper-part), as well as between natives and immigrants for comparison (lower-part). We distinguish between five occupational categories. The first category regroups the white-collar (high wage) occupations, while the second refer to non-manual skilled workers. The administrative workers refer to semi-skilled and unskilled occupations related to administrative activities (such as secretary and personal service). The two last occupational categories are composed of the skilled and unskilled individuals who perform manual tasks in industry and handicrafts.

Table 4.2: Occupation by Level of Education by Gender and Origin for Individuals in the Labor Force

	High Education		Medium Education		Low Education	
	Males	Females	Males	Females	Males	Females
Professionals & Managers	56.0 %	31.2 %	8.1 %	4.0 %	4.5 %	1.7 %
Supervisors	32.6 %	47.4 %	25.5 %	18.3 %	14.1 %	8.5 %
Administrative Workers	7.2 %	20.2 %	16.1 %	66.6 %	17.6 %	63.7 %
Skilled-Manual Workers	2.5 %	0.6 %	34.2 %	4.2 %	31.7 %	7.1 %
Unskilled-Manual Workers	1.7 %	0.6 %	16.2 %	6.8 %	32.2 %	19.1 %
Total	100 %	100 %	100 %	100 %	100 %	100 %

	Natives	Immig.	Natives	Immig.	Natives	Immig.
	Professionals & Managers	43.2 %	42.6 %	6.3 %	5.1 %	3.4 %
Supervisors	41.0 %	29.6 %	22.5 %	16.9 %	12.3 %	5.6 %
Administrative Workers	13.5 %	20.3 %	39.3 %	35.9 %	40.3 %	32.9 %
Skilled-Manual Workers	1.4 %	3.7 %	20.3 %	25.2 %	19.1 %	26.7 %
Unskilled-Manuals Workers	1.0 %	3.8 %	11.6 %	16.8 %	24.8 %	33.6 %
Total	100 %	100 %	100 %	100 %	100 %	100 %

Professionals and Managers: Manager of public sector; Professor and scientific profession; art, spectacles and information related professions; Administrative and commercial managers; Engineers and technical manager. **Supervisors:** School teachers, teachers and similar; Intermediate health professions and social work; Professionals in the public administration; Professionals in private companies; Technicians; Foremen, supervisors. **Administrative Workers:** Employees and agents of the public administration; Administrative employees; Commercial Workers Personal services. **Skilled-Manual Workers:** Skilled industrial workers; Skilled craft workers; Skilled handling, storage and transport. **Unskilled-Manuals Workers:** Drivers; Unskilled industrial workers; Unskilled craft workers; Laborers.

In line with other studies, the table reports strong occupational differences by gender (*e.g.*, Anker et al. (1998); Blau et al. (2002); Jurajda (2003); Collado et al. (2004)). Among the highly educated women, only 31.2% work as professionals and managers, against 56% for men. Within the groups of medium and low education, the concentration of women is particularly strong in non-manual occupations. This is in line with Dustmann et al. (2007) that show a disproportionate concentration of women in intermediate non-manual occupations and in personal service works in the United Kingdom. Sikora and Pokropek (2011) also show that,

in almost all countries, girls lead boys in their interest in non-manual occupations.

The lower part of Table 4.2 shows the occupational segregation by education for natives and immigrants. First, we find evidence of occupational differences between natives and immigrants. Especially, within each education group, immigrants tend to be distributed more towards unskilled jobs. This result is consistent with Dustmann et al. (2013), although they report evidence of a much stronger segregation between natives and immigrants for the United Kingdom. Second, Table 4.2 indicates that the occupational differences by education group are more important between men and women than between natives and immigrants. Similar results are found for the United Kingdom (Dustmann et al., 2007) and Spain (Amuedo-Dorantes and De La Rica, 2011).²¹

Thus, the assumption of imperfect substitutability between men and women of similar education and experience may be consistent with both findings of imperfect and perfect substitutability between natives and immigrants.

The strong occupational differences between similarly educated men and women suggests that they may compete for different types of jobs, so they may be imperfect substitutes in production. This dimension is studied in the next section.

4 Elasticities of Substitution

4.1 The Substitution Elasticity between Men and Women

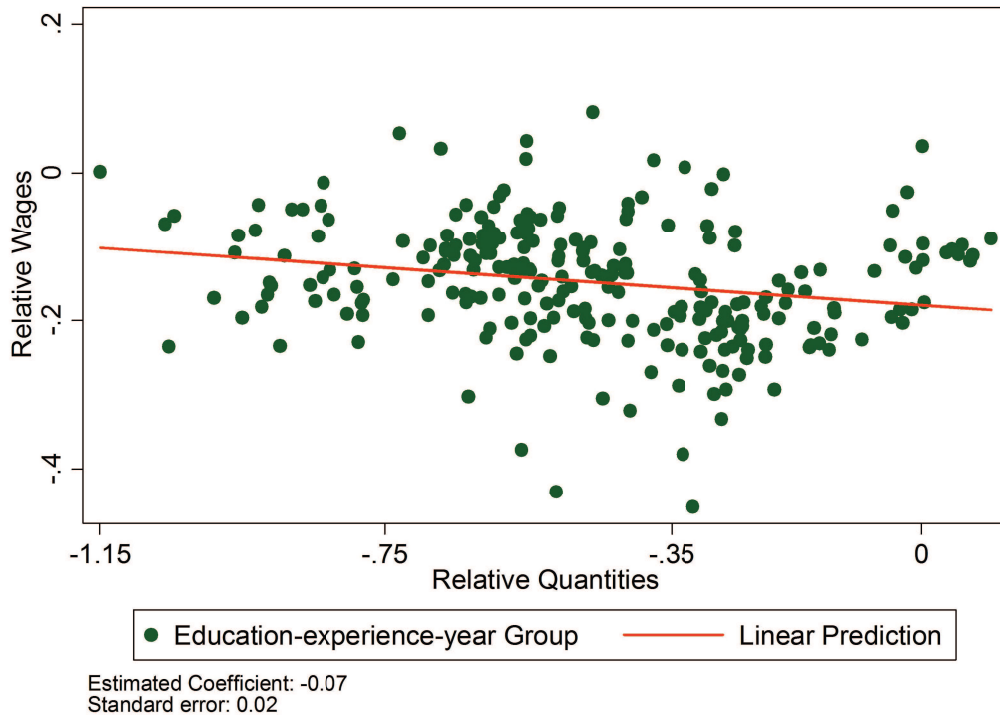
We begin with the estimation of the elasticity of substitution between men and women sharing all education and experience characteristics. Based on Equation (4.8), we can derive a test of imperfect substitution between men and women by relating the log relative wage of women in a particular skill group to the log relative supply of women in that group:

$$\log\left(\frac{w_{bjkt}^{Female}}{w_{bjkt}^{Male}}\right) = \log\left(\frac{\theta_{S_Fbjkt}}{\theta_{S_Mbjkt}}\right) - \frac{1}{\sigma_F} \cdot \log\left(\frac{Female_{bjkt}}{Male_{bjkt}}\right), \quad (4.10)$$

where $\log\left(\theta_{S_Fbjkt}/\theta_{S_Mbjkt}\right)$ captures the relative productivity of women. In order to estimate the elasticity of substitution between men and women (denoted σ_F),

²¹It is also documented that occupational segregation by gender in the United States was more important than occupational segregation by race or ethnicity (Blau et al., 2002).

Figure 4.2: Correlation between Relative Wage of Women and their Relative Labor Supply



Notes. The Figure provides the basic correlation between the relative wage of women and their relative labor supply by education-experience group in all years considered. The graphs give the log female-male hourly wage, $\log(w_{bjkt}^F/w_{bjkt}^M)$, on the vertical axis and the log female-male labor supply, $\log(Female_{bjkt}/Male_{bjkt})$, on the horizontal axis. Thus, each observation corresponds to an education-experience group in one of the considered year.

we assume that the relative productivity term (or relative demand term) can be captured by a vector of fixed effects δ_{bjkt} and a group-specific error term ξ_{bjkt} uncorrelated with the log relative supply of women.

If women and men are perfect substitutes, one should find no effect of changes in the relative employment of women to men on their relative wage (in which case $-1/\sigma_F$ will be zero). By contrast, a small (and significant) value for σ_F would suggest that male and female workers are imperfect substitutes, and relative wages would then be correlated with relative quantities.

Figure 4.2 provides a preliminary look at the data. It presents the scatter diagram relating the log of $(w_{bjkt}^{Female}/w_{bjkt}^{Male})$ to the log of $(Female_{bjkt}/Male_{bjkt})$. The plot illustrates a negative and significant relationship between relative wages (by

women relative to men) and relative labor supplies into particular skill groups. The plot also suggests that the regression line is not being driven by any particular outliers. The coefficient is precisely estimated and implies that the substitution elasticity σ_F is around 14. This preliminary result is a first piece of evidence in favor of imperfect substitutability between men and women.

The estimate of $-1/\sigma_F$ provided in Figure 4.2 would have been consistent if the relative demand term (or relative productivity term) was constant.²² Yet, the relative demand for women should differ across age (or experience) groups, and potentially over time. In fact, the expectation of higher labor costs (and lower productivity) induced by maternity may affect the relative demand for women. In particular, the expectation of maternity may lead the labor demand to be relatively higher for men in young age groups than in old age groups (as shown in Duguet et al. (2005)). The differences in labor demand across age groups may affect the relative wage of women, and *in fine* their relative labor supply in specific age cells. In order to control for systematic changes of the relative productivity of female workers across experience groups over time, we thus use experience δ_k and time δ_t dummies, as well as their interaction ($\delta_k \times \delta_t$).²³

In order to test the robustness of our identifying assumption about δ_{bjkt} , we use an alternative set of fixed effects including education dummies. In addition to using the experience by time fixed effects, we thus include education dummies δ_{bj} to control for systematic differences in the relative productivity term across education groups. This strategy of identification relies on D'Amuri et al. (2010); Manacorda et al. (2012), who estimate the degree of substitutability between natives and immigrants by including education, experience and time dummies.

Table 4.3 reports the estimates of $-1/\sigma_F$. We use alternative specifications, samples and identifying assumptions about δ_{bjkt} . The dependent variable is the relative log hourly wage of full-time workers. Unless otherwise specified, the

²²More generally, the estimates of $-1/\sigma_F$ are not biased if the error term ξ_{bjkt} is uncorrelated with the relative labor supply – *i.e.*, if relative productivities are uncorrelated with relative labor supplies.

²³Because the dependent variable in this regression is the difference in female-male log wages, factors that affect female and male labor demand equally are automatically removed from the equation. Thus, “any biased technological change affecting the productivity of more educated (experienced) workers relative to less educated (experienced) workers would be washed out in the ratios” (Ottaviano and Peri (2012), p. 170)

Table 4.3: Estimates of $-1/\sigma_F$, the Inverse Elasticity of Substitution between Men and Women

	Baseline		1995-2005		Labor Force		All Population	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. OLS Estimates	-0.10**	0.05*	-0.07**	0.00	-0.13**	0.04*	-0.10**	0.05*
	(-2.30)	(1.96)	(-2.54)	(0.27)	(-2.60)	(2.02)	(-2.40)	(1.82)
Observations	252	252	132	132	252	252	252	252
2. IV Estimates	-0.08**	-0.10**	-0.11**	-0.14***	-0.15**	-0.12***	-0.24***	-0.15**
	(-2.39)	(-2.71)	(-2.34)	(-3.89)	(-2.74)	(-3.19)	(-5.11)	(-2.63)
Observations	132	132	72	72	132	132	132	132
First Stage:								
Instrument	0.25	0.25	0.25	0.25	0.23	0.23	0.19	0.19
T-statistic	(13.09)	(13.09)	(13.09)	(13.09)	(11.81)	(11.81)	(7.92)	(7.92)
F-statistic	138.67	138.67	138.67	138.67	53.77	53.77	56.38	56.38
Dummies:								
δ_j (edu)	No	Yes	No	Yes	No	Yes	No	Yes
δ_k (exp)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
δ_t (time)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\delta_t \times \delta_k$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Key. ***, **, * denote statistical significance from zero at the 1%, 5%, 10% significance level. T-statistics are indicated in parentheses below the point estimate.

Notes. The main dependent variable is the relative log hourly average wage. The explanatory variable is the relative number of full-time workers in each cell. We weight each regression by total number of workers in a skill-cell. The standard errors are adjusted for clustering at the education and experience level.

explanatory variable is the log relative number of female workers in full-time employment. Specification 1 focuses on our baseline sample. The second specification restricts its attention to the period 1995-2005. Instead of using the number of full-time employment as a measure of labor supply, specifications 3 and 4 respectively use the workforce (*i.e.* employed and unemployed individuals) and the total population (*i.e.* active and inactive individuals) in a given skill-cell. Both specifications 3 and 4 are based on Manacorda et al. (2012, p. 140) who explain that using “population as a measure of labor supply is a more exogenous source of variation in supply than employment or hours often used in other studies.”

For each specification, we use two different identifying assumptions to ap-

proximate the relative productivity term of women (as discussed above). Finally, we weight each regression by total number of workers in a skill-cell, and we cluster the standard errors at the education-experience level to allow error correlation within skill group.

The upper-part of Table 4.3 reports the OLS estimates of $-1/\sigma_F$. When using experience by time fixed effects (columns 1, 3, 5 and 7), we find significant and negative estimates, implying that men and women (within narrowly defined skill groups) are imperfect substitutes. This result seems to be sensitive to the inclusion of education dummies. In fact, the estimated coefficients in columns 2, 4, 6 and 8 present a very low degree of significance, and they moreover have the wrong sign. One explanation behind these positive estimates is the endogeneity of the relative labor supply.

The relative labor supply of women in skill groups may be endogenous in a different sense (even after controlling for the fixed effects). Suppose a women-biased productivity shock in specific cells. This (unobserved idiosyncratic) shock should affect positively the relative labor demand and the relative wage of women, thereby attracting women mainly in those skill cells. Thus, there would be a spurious positive correlation between relative wage and relative labor supply. Our OLS estimates would be upward biased, and the estimates in columns 1, 3, 5 and 7 would then be interpreted as lower bounds of the true value of $-1/\sigma_F$.

The lower-part of Table 4.3 reports the IV estimates of $-1/\sigma_F$, along with the first stage estimates. We follow the literature and use an instrument that captures the immigrants penetration which prevailed before the current period t (Borjas, 2003; Ottaviano and Peri, 2012; Dustmann et al., 2013). We use the ten-period lag of the number of immigrants in the cell (bj, k, t) – *i.e.*, $\log(M_{bjkt-10})$.^{24, 25} The estimates from the IV regressions are highly significant and all negative. For columns 1, 3, 5 and 7, the IV coefficients even show a lower degree of substitutability between

²⁴We use ten lags since “pre-existing immigrant concentrations are unlikely to be correlated with current economic shocks if measured with a sufficient time lag” (Dustmann et al. (2005), p. 328).

²⁵In order to control for education and experience, the first stage of our IV regression also includes dummies for education and experience (the IV estimates are robust to the inclusion of time dummies in the first stage regression). As shown in Table 4.3, the F-test of exclusion is above 50. This is much larger than the lower bound of 10 suggested by the literature on weak instruments (Bound et al., 1995; Stock et al., 2002).

men and women than what is implied by our OLS estimates. More generally, our results are consistent with the fact that the estimation of $-1/\sigma_F$ by OLS tends to be upward biased. The IV coefficients range between 0.08 and 0.24, implying an elasticity of substitution between 4 and 12.

Our results indicate that the elasticity of substitution between men and women is very likely to be smaller than infinity. For the simulation, we will choose $\sigma_F = 12$ as an upper bound value for the elasticity of substitution between men and women.

4.2 The Remaining Set of Substitution Elasticities

In order to simulate the wage effects of immigration, we rely on two alternative sets of parameter values. First, we follow the literature, and especially Ottaviano and Peri (2012), to define the substitution elasticity values between education and experience groups. We thus assume the elasticity of substitution between the two broad education groups $\sigma_{HL} = 2$, between the medium and low educated groups $\sigma_L = 20$ and between experience groups $\sigma_X = 7$. These numbers are in line with Katz and Murphy (1992) who find values for σ_{HL} ranging between 1.5 and 1.8 and Card and Lemieux (2001) who find $\sigma_{HL} = 2.25$. Our chosen value for σ_X is also in line with Card and Lemieux (2001) who find an elasticity between 5 and 10, Manacorda et al. (2012) who find an elasticity of around 10 for the United Kingdom, and Edo and Toubal (2014a) who find an elasticity of around 7.5 for France.

However, the magnitude of σ_L (*i.e.*, the elasticity of substitution between high school dropouts and high school graduates) might be too large (Borjas et al., 2012), when at the same time the parameter value of σ_{HL} might be too small (Gerfin and Kaiser, 2010; Manacorda et al., 2012). As a result, we use a second set of substitution elasticities between education groups based on Edo and Toubal (2014a), who find for France $\sigma_{HL} = 4$ and $\sigma_L = 10$.

Under a wide range of specifications and samples, Edo and Toubal (2014a) find for France that immigrants and natives are perfect substitutes regardless of their gender. This finding is in line with Aydemir and Borjas (2007); Borjas et al. (2012). We thus assume $\sigma_I \rightarrow \infty$ to simulate the wage effects of immigration. However,

given the fact that the empirical literature has reached mixed conclusions regarding the degree of substitution between natives and immigrants (Borjas et al., 2012; Manacorda et al., 2012; Ottaviano and Peri, 2012), we also assume an alternative scenario where $\sigma_I = 20$. This number is based on D'Amuri et al. (2010); Ottaviano and Peri (2012) who find an estimated elasticity of substitution between natives and immigrants around 20 for the US and ranging between 16 and 21 for Germany.

5 Simulating the Wage Effects of Immigration on Male and Female Natives

Based on Equation (4.9), Table 4.4 reports the simulated effects of immigration on the mean wage of native workers in the long-run (implying full capital adjustment), along with the distributional effects of immigration by gender and education. We use alternative parameter values to implement our simulations. They are reported in the upper-part of Table 4.4.

The left-hand side of the table assumes $\sigma_F = 12$ (columns 1 to 4). Columns 1 and 2 indicate that immigration has no detrimental effect on the average wage of native workers in the long-run. In columns 3 and 4, we assume natives and immigrants to be imperfect substitutes, and we find a small positive impact on native wages in the long-run.²⁶ Columns 1 to 4 also indicate that immigration has decreased the relative average wage of female native workers (relative to male natives) over the past two decades. Columns 1 and 2 even show that immigration has decreased the wages of female natives and increased those of male natives. The asymmetric wage effect of immigration by gender is driven by the assumption of imperfect substitutability between men and women, and it is robust to the assumption made about the degree of substitutability between natives and immigrants.

The right-hand side of the table assumes $\sigma_{HL} = 4$ and $\sigma_L = 10$ (Edo and Toubal, 2014a) and examines the wage effect of immigration under an extreme case where men and women are complements in production $\sigma_F = 4$, and where they are perfect substitutes $\sigma_F \rightarrow \infty$. When we assume $\sigma_F = 4$, immigration induces important wage losses among women and wage gains among men, implying a

²⁶By assuming yearly capital adjustment (as in Ottaviano and Peri (2008)), we find that the short-run effects of immigration on wages are negative by around -0.30%.

Table 4.4: The Long-term Effects of Immigration on Native Wages by Gender and Education

	(1)	(2)	(3)	(4)	(5)	(6)
Set of Parameter Values						
σ_{HL}	2	4	2	4	4	4
σ_L	20	10	20	10	10	10
σ_X	7	7	7	7	7	7
σ_F	12	12	12	12	4	∞
σ_I	∞	∞	20	20	∞	∞
Percentage Change of Native Wage due to Immigration						
Average Long-term Effects	-0.01	0.00	0.09	0.10	-0.01	0.00
Male	0.07	0.06	0.13	0.12	0.16	0.01
Female	-0.14	-0.11	0.01	0.05	-0.34	0.00
Highly Educated	-1.61	-0.68	-1.34	-0.41	-1.32	-0.37
Male	-1.57	-0.64	-1.32	-0.40	-1.20	-0.37
Female	-1.67	-0.75	-1.36	-0.44	-1.53	-0.36
Medium Educated	0.59	0.21	0.67	0.29	0.24	0.20
Male	0.66	0.28	0.70	0.32	0.46	0.19
Female	0.45	0.07	0.62	0.24	-0.20	0.20
Low Educated	0.55	0.29	0.51	0.26	0.78	0.06
Male	0.57	0.31	0.52	0.27	0.84	0.05
Female	0.51	0.25	0.49	0.24	0.64	0.06

Notes. The table reports the simulated effects of immigration on the wages of native workers by education and gender. Each number stands for the percentage wage changes due to immigrants for natives. All simulations assume $\sigma_X = 7$. While the left-hand side of the table assumes $\sigma_F = 12$, the right-hand side assumes alternative values for σ_F . We test the robustness of our results by using different substitution elasticity values between education groups, and between natives and immigrants. The total wage effect is computed as the sum of direct effects due to immigration and indirect effects due to employment responses.

strong negative effect on the relative wage of female natives. As expected, column 6 (where men and women are perfect substitutes) shows that immigration has a symmetric effect on the wages of men and women.²⁷

²⁷The slight difference in the wage effect of immigration between men and women in column

These different average effects (across columns) can be decomposed by education groups. In line with the fact that the share of high educated immigrants substantially increased over our period (as shown in Table 4.1), the negative wage effects of immigration are mainly driven by the wage losses experienced by the highly educated male and female native workers. More specifically, immigration has decreased their wages by between -0.4% and -1.6%.²⁸ We also find that both low and medium educated natives have experienced a slight improvement in their wage levels. However, the imperfect substitutability between men and women induces lower wage losses among the high educated male natives compared to female natives; as well as higher wage gains among the medium and low educated native men.

Table 4.5 aims at comparing the mean effect of immigration on the gender wage gap under rigid labor market with the reference case of perfect labor markets. More specifically, this table reports the effects of immigration on the wages of female and male natives according to whether wages are assumed to be rigid (left-hand side) or perfectly flexible (right-hand side). We set $\sigma_{HL} = 4$ and $\sigma_L = 10$ (Edo and Toubal, 2014a).²⁹ For each scenario, we assume different degree of substitutability between men and women, as well as between immigrants and natives. For each simulation, we compute the difference between the wage changes of male and female native workers. A positive number implies that immigration has increased the gender wage gap.

First, our results indicate that the negative effect of immigration on the gender wage gap is greater when σ_F is low and σ_I is high. Second, the impact of immigration on the relative wage of female natives is lower in rigid labor markets than in flexible labor markets. This finding points out the important role played by labor market rigidities in dampening the impact of immigration on the gender wage dispersion.

6 are due to small differences in the educational composition between male and female native workers.

²⁸The asymmetric wage impact of immigration across education groups is reinforced when we assume $\sigma_{HL} = 2$ – *i.e.* a very low degree of substitution between the two broad education groups. In fact, when we assume $\sigma_{HL} = 2$, the wage effect induced by (a high educated) immigration is more concentrated among the highly educated natives, rather than diffused among all native workers.

²⁹The conclusions drawn from Table 4.5 are not sensitive to the chosen values for σ_{HL} and σ_L .

Table 4.5: The Long-run Effects of Immigration by Gender under Rigid/Perfect Labor Market

	(1)	(2)	(3)	(4)	(5)	(6)
Set of Parameter Values						
σ_{HL}	4	4	4	4	4	4
σ_L	10	10	10	10	10	10
σ_X	7	7	7	7	7	7
σ_F	4	12	12	4	12	12
σ_I	∞	∞	20	∞	∞	20
	Rigid Labor Market			Perfect Labor Market		
Average Wage Effect	-0.01	0.00	0.10	-0.05	-0.01	0.25
Male (<i>a</i>)	0.16	0.06	0.12	0.32	0.11	0.31
Female (<i>b</i>)	-0.34	-0.11	0.05	-0.74	-0.25	0.14
Differences (<i>a</i> – <i>b</i>)	0.50	0.17	0.07	1.06	0.36	0.17

Notes. The table reports the long-run simulated effects of immigration on native wages by gender according to whether wages are rigid or perfectly flexible. Each number stands for the percentage wage changes due to immigrants for natives. We use $\sigma_{HL} = 4$, $\sigma_L = 10$, $\sigma_X = 7$ and different values for σ_I and σ_F . On the left-hand side, the total wage effect is computed as the sum of direct effects due to immigration and indirect effects due to employment responses.

It is important to note that the two types of simulations (according to whether we assume rigid or flexible labor market) can be interpreted as giving numerical bounds for the wage effects of immigration. Actually, it might be that the displacement effects due to immigration (inducing indirect wage effects) are not identical across all labor market cells, but rather concentrated in some skill-cells.³⁰ A reason for such asymmetric displacement effects may lie in the fact that some skill-cells are less affected by wage rigidities. As a result, the effect of immigration on the average wages of natives in France should be somewhere between a scenario where all wages are rigid and a scenario where wages are perfectly flexible.

³⁰In this regard, Edo (2013) finds that the negative effects of immigration on the employment of competing native workers are mostly concentrated within the medium and low educated segments of the French labor market.

6 Conclusion

Many studies have analyzed whether immigration has important distributional impacts, across high- and low-skilled workers, across native and immigrant workers and across rigid and flexible labor markets. Much less attention has been paid to whether immigration affects male and female workers differently. In this paper, we document the feminization of the migration population and investigate the impact of migration on the gender wage gap. Our paper brings two related literatures, one focusing on the impact of migration on native wages and the other investigating the feminization of migration.

We extend the national structural approach to the analysis of the effect of immigration on wages, and we allow men and women to be imperfect substitutes. In this framework we found a significant degree of imperfect substitutability between men and women within education and experience groups. The literature in economics, sociology and psychology points to numerous drivers of this imperfect substitution (Maltz and Borker, 1982; Charles and Grusky, 2005; Croson and Gneezy, 2009). In addition, our model takes into account the rigidity in wages which is particularly relevant when studying a country such as France. Our analysis combines the CES nested framework with the possibility of employment effects due to rigid institutions as in D'Amuri et al. (2010).

The present paper has important implications given (i) the increasing feminization of the immigrant labor force and (ii) the imperfect substitutability between men and women of similar education and age. We find that the main winners among the natives from immigration are men. This result is valid regardless of any assumption on the degree of substitutability between natives and immigrants. The female natives even experience wage losses in our preferred specification (when we assume natives and immigrants to be perfect substitutes).

Immigration has negatively impacted gender wage inequality because immigrants in France tend to be disproportionately female. More generally, our results imply that the increasing feminization of international immigration may damp a labor market trend to lower earnings inequality between men and women in developed countries (as documented in Fortin and Lemieux (1998); Weichselbaumer

and Winter-Ebmer (2005)).

General Conclusion

In this dissertation, I investigate the effects of immigration on the labor market outcomes of native workers in France over the 1990-2010 period. The first part of this dissertation examines the partial effects of immigrants on the labor market outcomes of natives who have similar skills. The second part investigates the overall effects of immigration on the entire wage structure. This part also deals with the distributional effects of immigration.

In the first part, I find that immigration-induced supply shifts lower the labor market outcomes of competing native workers in the short-run. In particular, I find that immigration has small negative effects on native wages, but large negative effects on their employment. This result is consistent with economic theory which predicts that immigration should lower the outcomes of workers who have similar skills (at least in the short-run).

However, the negative relation between immigration and the outcomes of competing natives, which is at the core of this dissertation, differs from the findings of Ortega and Verdugo (2014). Although we use the same methodology, Ortega and Verdugo (2014) find for France a positive effect of immigration on the wages and employment of competing natives. One consideration may explain why our results differ. In this dissertation, I use annual data from 1990 to 2010, so I capture a short-run impact of immigration on native outcomes. Instead, Ortega and Verdugo (2014) use six censuses from 1968 to 1999. Similar results are found for Germany: whereas Glitz (2012) indicates a depressive short-run impact of immigration on native employment using annual data, Bonin (2005) finds different effects with a longer time span. Taken together, our results for France and Germany, suggest that a longer time period may allow for mechanisms of adjustment that reduce the negative short-run impact of immigration. For instance, in the medium-run, industries may adapt their output mix and production technology to local labor supplies (Lewis, 2004, 2005; Glitz, 2012). The contrast between my result and Ortega and Verdugo (2014) is also consistent with Peri (2010, p. 4): “in the short-run, immigration may slightly reduce native employment and average income at first, because the economic adjustment process is not immediate.”

The first part of this dissertation not only emphasizes a negative relation between immigration and the outcomes of competing native workers. This part also

sheds new light on the role played by labor market institutions (such as minimum wage laws, high unemployment benefits and strict employment protection) in shaping the labor market effects of immigration. In fact, the prevalence of downward wage rigidities in France leads to very small negative effects of immigration on the wages of competing native workers (as compared to North-American countries). Instead, I find that an immigration-induced increase in workers within a skill group strongly reduces the employment of natives in that group. The inverse relation between employment changes and migration-induced labor supply shifts is consistent with standard economic theory. If wages do not adjust perfectly to positive labor supply shocks, the level of unemployment increases.

Moreover, I find that immigrant-native differences in outside options and cultural norms are the main reasons behind the negative immigration effects on native outcomes. Because the foreign-born population has lower outside options and different cultural norms than the native population, the former are relatively more attractive/profitable for firms. For instance, immigrants are more willing to accept lower wages and to exert more effort in the production process than equally productive natives. Thus, immigration induces wage losses as well as displacement effects. First, an immigration-induced increase in workers weakens the bargaining position of competing natives by improving the firm's outside option. This decline in the bargaining power of natives leads, however, to small wage losses because of (downward) wage rigidities. Second, immigrants displace the native workers since the latter are relatively more profitable.

The heterogeneity between natives and immigrants in terms of outside options and cultural norms accounts in determining the labor market effects of immigration. This result may have policy implications: a way to reduce the (negative) competitive effects of immigrants on the outcomes of natives with similar skills would be to improve the outside options of immigrants, as well as to foster their assimilation.

In the second part of the dissertation, I investigate the overall effects of immigration on the wages of natives in the long-run by accounting for the possibility

of wage rigidities. This analysis not only estimates the competitive effect of immigration on native outcomes; it also estimates the complementarity effects of immigration on the outcomes of natives with different skills. In line with economic theory, I find no detrimental effect of immigration on wages in the long-run. However, I show that immigration has produced losers and winners over the past two decades.

I find that immigration has contributed to narrow the wage structure by adversely affecting the earnings of high educated native workers and improving the earnings of medium and low educated ones. Over the past two decades, immigration has accounted for about one-fifth of the reduction of wage inequality between high and low educated native workers in France. Moreover, I show that immigration has increased the relative wage of male native workers, thus contributing to increase gender wage inequality. These distributional effects are mainly due to the French immigration patterns. French immigration has disproportionately increased the number of high educated and female workers since 1990.

These results may have important implications for selective immigration policies. For instance, by selecting immigrants on the basis of their education, migration policies should affect the wage distribution.

Although we have traveled far, this dissertation has only considered one dimension of the economic impact of immigration. I restrict my analysis to the effects of immigration on native wages and employment. However, immigrants should affect host economies in ways that are not reflected by wage and job displacement studies.

Immigrant entrepreneurship should create jobs and open up firms. High-skilled immigrants may foster innovation, and therefore growth. The presence of immigrants can lower the price of services in many industries benefiting native consumers. Immigrants may be positively associated with further openings to trade and other forms of exchange. Immigrants are not only workers. They buy goods and services produced by national firms, increasing the demand for native workers. Immigrants are also tax payers, and they may be net contributors to

public finances. Finally, the economic impact of today's immigration is not limited to the current generation. Because of the intergenerational link between the skills of parents and children, current immigration might already be determining the skill endowment of the labor force for the next two or three generations.

All these dimensions have to be considered when judging the economic consequences of immigration.

French Summary

Au cours du siècle dernier, la part des immigrés dans la population française est passée de 6,6 % en 1931 à 7,4 % en 1975, puis s'est stabilisée jusqu'au milieu des années 1990. En 2011, l'INSEE a recensé plus de cinq millions d'immigrés en France, représentant 8,7 % de l'ensemble de la population. Selon l'OCDE, la France se situerait ainsi au 17^{ème} rang des pays développés comptant le plus d'immigrés (en pourcentage de la population totale) ; en Allemagne et aux États-Unis, par exemple, 13 % de la population est immigrée. Comparés à d'autres sources, ces chiffres globaux sont à prendre avec précaution puisqu'ils dépendent de la définition de l'immigré. Est-il né à l'étranger ou de nationalité étrangère ? Est-il de seconde ou de n-ième génération ? Cette thèse adopte la définition qu'en donne le Haut Conseil à l'Intégration : un immigré (ou immigrant) est défini comme une personne née étrangère dans un pays étranger et résidant en France. La qualité d'immigré est ainsi permanente, elle ne dépend pas de la nationalité actuelle de la personne : les immigrés qui ont acquis la nationalité française continuent d'appartenir à la population immigrée.

En France et dans la majorité des pays développés, l'immigration est perçue par la population comme l'une des causes de la stagnation des salaires et/ou de la faiblesse du niveau d'emploi (Bauer et al., 2001; Mayda, 2006). Ces croyances sont très prononcées au sein de l'Union européenne où un citoyen sur deux perçoit les immigrants comme une menace directe pour leur emploi (Thalhammer et al., 2001). La défiance des populations natives vis-à-vis des populations immigrées n'est pas nouvelle, elle était déjà très présente en France dans la période de l'entre-deux-guerres (Noiriel, 1988)³¹. En témoignent, par exemple, les lois votées dans les années 1930 visant à restreindre l'emploi des immigrants afin de protéger la main-d'œuvre nationale contre la concurrence étrangère (Singer-Kérel, 1989).

Quel est l'impact de l'immigration sur les salaires et l'emploi des natifs ? Quel est le rôle des rigidités salariales dans la détermination des effets de l'immigration sur le marché du travail ? Quelle est l'importance de la structure de qualification de la population immigrée sur la distribution des salaires ?

Cette thèse apporte des éléments de réponse solides à ces questions en se

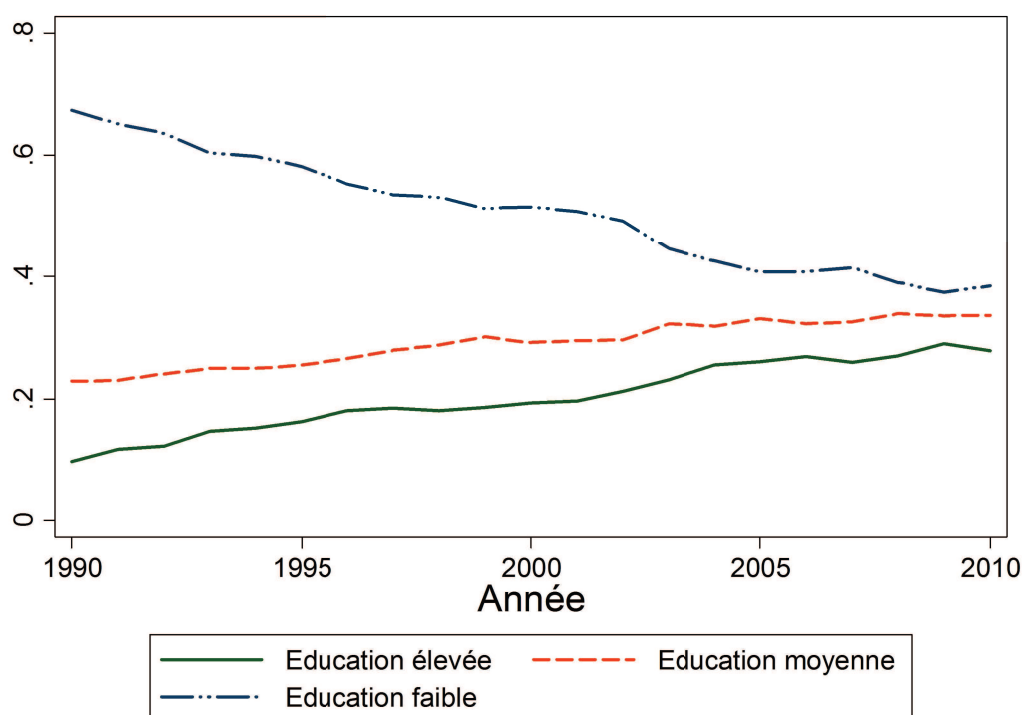
³¹A la fin des années 1920, la France connaît le plus fort taux d'immigration du monde, devant les États-Unis (Noiriel, 1988). À cette époque, la population immigrée était principalement composée d'italiens, de polonais, d'espagnols ou de belges (Déchaux, 1991).

focalisant sur le marché du travail français entre 1990 et 2010. L'étude de ces questions dans le cas français est pertinente à trois égards. Premièrement, les questions relatives à l'immigration et à ses conséquences économiques suscitent de nombreuses controverses. Une analyse profonde des effets de l'immigration sur les salaires et l'emploi permettrait de contribuer au débat public, notamment en France où la recherche économique sur ces questions est lacunaire.

Deuxièmement, l'étude des effets économiques de l'immigration est un moyen pour les économistes de mieux comprendre comment une économie peut absorber des chocs d'offre de travail. Cette dernière dimension est essentielle puisque la pleine compréhension des phénomènes économiques permet la prescription de politiques publiques adéquates en fonction des objectifs fixés par les pays. L'analyse des effets de l'immigration sur les salaires et l'emploi dans le contexte français prend ici tout son sens, puisque la France est caractérisée par de fortes rigidités salariales (Card et al., 1999). En particulier, les caractéristiques institutionnelles du marché du travail français devraient affecter la sensibilité des salaires suite à des chocs d'offre de travail causés par l'immigration.

La première source évidente de rigidités salariales concerne l'existence d'un salaire minimum élevé. En France, 14% des salariés sont rémunérés au salaire minimum depuis 1990, alors que ce taux n'est que de 5% dans la plupart des pays où un salaire minimum existe (Du Caju et al., 2008). Une source de rigidités salariales alternative réside dans l'existence d'allocations sociales (dont les indemnités chômage) généreuses (Nickell, 1997). En affectant positivement le salaire de réserve (Cohen et al., 1997), les filets de sécurité sociaux réduisent considérablement la propension des employés à accepter des réductions de salaire (Saint-Paul and Cahuc, 2009). De plus, la prédominance d'accords salariaux au niveau des branches professionnelles (plutôt qu'au niveau des firmes), et les procédures d'extension qui s'en suivent à la quasi-totalité des travailleurs, tendent à renforcer la rigidité des salaires en France (Dickens et al., 2007; Babecký et al., 2010). Enfin, Nickell (1997); Babecký et al. (2010) montrent que l'existence d'un contrat à durée indéterminée – caractérisé par une forte protection de l'emploi – accroît le pouvoir de négociation des travailleurs et contribue à rigidifier les salaires à la baisse. Cette source additionnelle de rigidités salariales devrait jouer

Figure 4.3: La structure de qualification des immigrants de 1990 à 2010



Notes. Ce graphique reporte les proportions d'immigrants très éduqués, moyennement éduqués et peu éduqués dans la population active immigrée de 1990 à 2010. L'échantillon utilisé comprend les immigrants actifs âgés de 16 à 64 ans, non étudiants et ayant une expérience professionnelle d'un à quarante ans. Les entrepreneurs individuels sont exclus de l'échantillon.

un rôle important en France puisque 90% des travailleurs y possèdent un contrat de travail à durée indéterminée³².

Par conséquent, l'ensemble de ces facteurs devrait affecter la sensibilité des salaires aux chocs économiques. L'étude des effets de l'immigration dans le contexte institutionnel français doit donc contribuer à améliorer la compréhension des effets de l'immigration sur le marché du travail, et ainsi contribuer à la littérature existante.

Troisièmement, si la part des immigrants dans la population active française est passée de 7% en 1990 à 10% en 2010, cette augmentation cache de fortes disparités selon le niveau d'éducation considéré. L'une des particularités françaises est

³²Bien que les travailleurs français détiennent majoritairement des contrats à durée indéterminée, les deux tiers des embauches en France sont réalisées sur des contrats à durée déterminée (Abowd et al., 1999).

que l'immigration a majoritairement augmenté le nombre de travailleurs très qualifiés durant les deux dernières décennies (*i.e.*, l'immigration a augmenté la quantité relative de travailleurs très qualifiés). Depuis 1990, la part des travailleurs immigrés très qualifiés s'est fortement développée en France. En 2010, 28% des immigrants ont un niveau d'éducation élevé, alors que ce taux était de 10% en 1990 (Graphique 4.3). à l'inverse, cette période a été marquée par un déclin significatif de la part des immigrants faiblement qualifiés (dans la population active immigrée), de 67% à 39%. Le changement de structure de qualification des immigrants constaté en France est à mettre en relation avec la réduction des inégalités observée en France entre travailleurs très qualifiés et peu qualifiés depuis 1990 (Charnoz et al., 2013; Verdugo, 2014).

La baisse des inégalités salariales est principalement causée par la hausse du niveau de qualification de la population française (Verdugo, 2014). Ainsi, il serait probable qu'en France, une partie de la réduction des inégalités salariales soit imputable à l'immigration qui tend majoritairement à augmenter l'offre de travail très qualifié, et donc à accroître le niveau de qualification de la population. En sus d'une étude approfondie des effets de l'immigration sur les salaires et l'emploi, cette thèse analyse aussi la contribution de l'immigration à la réduction des inégalités salariales observée en France entre travailleurs qualifiés et non qualifiés depuis les années 1990. Plus généralement, il sera question de produire une analyse nouvelle du lien existant entre l'immigration et les inégalités salariales dans les pays d'accueil.

Les effets théoriques de l'immigration

La théorie économique distingue les effets moyens de l'immigration sur les salaires de ses effets redistributifs. L'effet moyen de l'immigration sur les salaires des natifs dépend de l'horizon considéré. Si l'immigration réduit le salaire moyen des natifs à court terme, des ajustements productifs devraient s'opérer à moyen et long termes sur le marché du travail, annulant ainsi les effets instantanés (potentiellement négatifs) de l'immigration. La réduction immédiate des salaires induite par l'immigration devrait inciter les firmes à embaucher, puis à accumuler du capital (facteur complémentaire au travail) pour répondre aux nouvelles oppor-

tunités de profit créées par l'immigration. L'accumulation du capital (induite par la hausse relative de la rémunération relative du capital) devrait s'accompagner d'une hausse de la demande de travail (émanant des entreprises). Cet accroissement de la demande de travail devrait ensuite conduire à une augmentation du salaire moyen dans l'économie. À long terme, l'accumulation de capital permet de rétablir le salaire moyen à son niveau initial – *i.e.* celui qui prévalait avant l'épisode migratoire. En théorie, les effets de long terme de l'immigration sur le salaire moyen sont donc nuls et se traduisent simplement par une augmentation proportionnelle de la population, du capital et de la production.

Quel que soit l'horizon considéré (court ou long terme), la théorie économique enseigne qu'un choc d'offre de travail induit par un afflux d'immigrés dégrade les opportunités d'emploi des travailleurs qui leurs sont substitués (qualification similaire) et améliore celles des travailleurs qui leurs sont complémentaires (qualification différente). En effet, si l'immigration affecte l'offre de travail, elle affecte aussi la demande de travail. Ainsi, un afflux de travailleurs qualifiés aura pour effet de réduire le salaire des travailleurs qualifiés (suite à la hausse de l'offre de travail qualifié) et d'accroître celui des non qualifiés (suite à la hausse de la demande travail non qualifié)³³. Dans cet exemple, l'immigration redistribue la richesse des travailleurs avec lesquels les immigrants sont en concurrence (qualifiés) vers ceux avec lesquels les immigrants sont complémentaires (non qualifiés). Ainsi, les effets redistributifs de l'immigration dépendent de la structure de qualification de la population immigrée par rapport à celle des natifs.

Bien qu'à long terme le salaire moyen des natifs soit insensible à l'immigration, celle-ci tend à produire des gagnants et des perdants. Les effets redistributifs de l'immigration sont donc permanents.

Littérature

Tous les ans, des immigrés intègrent le marché du travail français. Leur impact sur les salaires et l'emploi des natifs ne se réduit pas à celui induit lors de leur

³³La baisse des salaires des travailleurs qualifiés doit se traduire par une hausse de l'emploi qualifié. Étant donné la complémentarité entre le travail qualifié et non qualifié, les firmes doivent embaucher de nouveaux travailleurs non qualifiés pour accroître leur production et épuiser leurs opportunités de profit. Cette demande de travail additionnelle pour les travailleurs non qualifiés se traduit donc par une hausse de leur salaire.

arrivée. Les immigrants affecteront la structure des salaires et de l'emploi tant qu'ils seront économiquement actifs. C'est pourquoi le choc d'offre provoqué par l'immigration est généralement mesuré par la part du "stock" d'immigrés dans la force de travail, plutôt que par les "flux" qu'ils composent (Borjas et al., 1992).

La première méthode utilisée pour évaluer l'impact de l'immigration sur le marché du travail consiste à estimer l'effet de la part des immigrants dans la force de travail sur les salaires moyens des natifs au sein de zones géographiques délimitées (ville, département, région). Les résultats issus de cette méthode (dite des corrélations spatiales) indiquent une incidence marginale de l'immigration sur les conditions salariales des natifs (Card, 1990; Hunt, 1992; Friedberg and Hunt, 1995). Toutefois, cette méthode fait implicitement l'hypothèse de l'immobilité des travailleurs entre zones géographiques. Or, pour éviter d'éventuelles dégradations de leurs conditions d'emploi suite à un choc migratoire localisé, les natifs peuvent se déplacer d'une zone géographique à l'autre. L'insensibilité des salaires à l'immigration, observée au niveau local, ne signifie donc pas forcément que l'immigration n'a aucun effet sur les salaires ; elle peut résulter du fait que les natifs diffusent l'impact de l'immigration au niveau national en migrant d'une zone à l'autre (Borjas, 2006)³⁴.

Pour tenir compte de cette limite, Borjas (2003) a initié une méthode d'analyse portant sur des "classes (ou cellules) de compétence" au niveau national. Cette méthode consiste à décomposer le marché du travail national en classes de compétence définies par les niveaux d'éducation et d'expérience professionnelle. La définition de classes de compétence au niveau national est une stratégie qui garantit l'immobilité des travailleurs entre classes (contrairement à la méthode des corrélations spatiales). *A priori*, il est impossible pour les natifs de se déplacer d'une cellule de compétence à une autre pour éviter des dégradations de salaire – ils ne peuvent pas modifier leur niveau d'expérience et très difficilement leur niveau d'éducation.

Il est possible d'estimer, pour chaque classe de compétence, l'impact du taux

³⁴De plus, la méthode des corrélations spatiales fait face à une limite économétrique importante liée à un biais de simultanéité. En effet, les immigrants se localisent souvent dans les zones géographiques où les conditions d'emploi sont les plus avantageuses. Par conséquent, l'observation d'une corrélation positive entre la part d'immigrés et les opportunités d'emploi pourrait simplement traduire les causes du choix migratoire et non ses conséquences.

de pénétration des immigrés (mesuré par la part des immigrés dans la population active) sur le salaire moyen des travailleurs natifs de cette classe. Borjas (2003) montre ainsi qu'aux États-Unis, une hausse de la part des immigrés de 10 % dégrade d'environ 3 % les salaires (hebdomadaires) des natifs de même niveau d'éducation et d'expérience. Ce résultat est conforme à la théorie économique : l'augmentation de l'offre de travail générée par les immigrés pénalise les travailleurs natifs auxquels les immigrés sont substituables.

Bien que les natifs ne peuvent pas se déplacer d'une classe de compétence à une autre, un biais de simultanéité persiste. En effet, les immigrants ne sont pas distribués aléatoirement entre les classes de compétence. Supposons que les conditions d'emploi sur le marché du travail sont telles qu'elles attirent les immigrants principalement dans les cellules où les salaires sont les plus élevés. Alors, nous devrions observer une corrélation positive entre la part d'immigrés et le niveau des salaires, conduisant à sous-estimer l'effet négatif de l'immigration sur les salaires au sein d'une classe de compétence (Borjas, 2003; Borjas et al., 2010; Bratsberg et al., 2014). Monras (2013) reproduit cette méthodologie en traitant le biais de simultanéité et montre effectivement que l'immigration tend à réduire les salaires des natifs de même qualification d'environ 10%.

Il est crucial de noter que la méthodologie de Borjas (2003) ne fournit qu'une estimation partielle des effets de l'immigration (Ottaviano and Peri, 2012). Cette méthode suppose que les immigrés n'ont d'incidence que dans la classe de compétence dans laquelle ils sont répertoriés. Or, pour évaluer l'impact global de l'immigration sur les salaires, il faut prendre en considération les effets que l'immigration peut induire sur le salaire des travailleurs dont les qualifications sont complémentaires à celles des immigrants. De plus, la méthodologie de Borjas (2003) omet les différents ajustements de moyen et long termes qui pourraient s'opérer sur le marché du travail, réduisant (voire annulant) les effets de l'immigration sur les salaires. Depuis les années 2010, la littérature en économie de l'immigration a privilégié des méthodes dites structurelles pour analyser les effets globaux de l'immigration à long terme.

Ces méthodes structurelles font l'hypothèse implicite que l'économie peut être représentée par une technologie de production particulière (type Cobb-

Douglas)³⁵. Les études menées dans plusieurs pays montrent qu'à long terme, l'immigration n'a aucun effet sur les salaires des natifs (Aydemir and Borjas, 2007; Edo and Toubal, 2014a) ; elle a même parfois un effet légèrement positif (Ottaviano and Peri, 2012; Docquier et al., 2013; Brücker et al., 2014).

Faible réaction des salaires, forte réaction de l'emploi

La première partie de cette thèse (**Chapitres I et II**) reproduit la méthodologie de Borjas en exploitant les enquêtes-emploi annuelles menées par l'INSEE depuis 1990. Nos estimations indiquent un effet très limité de l'immigration sur les salaires mensuels des natifs de même niveau d'éducation et d'expérience. Une hausse de 10% de la part d'immigrés dans une classe de compétence donnée réduit le salaire mensuel des natifs de cette même classe d'environ 0,6%³⁶. L'ajustement des salaires est beaucoup plus faible en France qu'aux États-Unis. Ce résultat n'est pas surprenant compte tenu de la forte rigidité salariale qui caractérise le marché du travail français. L'existence d'un salaire minimum national élevé, d'indemnités chômage importantes et d'une large couverture des accords de branches sont autant d'éléments qui peuvent expliquer la faiblesse de l'ajustement des salaires suite à une augmentation de l'offre de travail (Card et al., 1999).

Pour souligner le rôle joué par les rigidités salariales dans la détermination des effets de l'immigration sur le marché du travail, nous décomposons les travailleurs natifs en deux sous-échantillons selon la durée de leur contrat de travail (contrat à durée indéterminée ou CDI/contrat à durée déterminée ou CDD). L'intérêt de cette décomposition réside dans le fait que le degré de rigidité des salaires des travailleurs en CDI devrait être beaucoup plus élevé que celui des travailleurs en CDD (Babeckỳ et al., 2010). L'une des raisons principales est que la rotation des travailleurs est plus importante sur les contrats à durée déterminée, dont la

³⁵Plusieurs limites associées aux approches structurelles sont soulevées dans les études de Borjas et al. (2012); Borjas (2014).

³⁶De manière générale, nous montrons que la correction de l'endogénéité dans les estimations renforce nos résultats empiriques. Ce résultat est en parfait accord avec la littérature existante (Borjas, 2003; Borjas et al., 2010; Bratsberg et al., 2014). De même, nous montrons que nos résultats ne dépendent pas d'un éventuel déclassement de la part des immigrants (le fait que les immigrants acceptent des emplois qui requièrent un niveau de qualification plus faible que celui qu'ils possèdent). Ce dernier résultat est aussi cohérent avec l'étude de Docquier et al. (2013), dans laquelle les auteurs montrent qu'en France, les immigrants (notamment qualifiés) ne se déclassent pas.

durée moyenne est très faible et d'environ une année. Ainsi, pour ajuster la masse salariale suite à des chocs économiques, les employeurs tendent à embaucher de nouveaux travailleurs en CDD à un salaire plus faible que celui des travailleurs dont le contrat se termine (Babeckÿ et al., 2012). Nos estimations indiquent une très forte hétérogénéité des effets de l'immigration sur les salaires en fonction du contrat de travail. Alors que le salaire des travailleurs natifs en CDI est insensible à l'immigration, celui des travailleurs natifs en CDD décline fortement avec un accroissement de la part d'immigrés dans la population active. Cet effet asymétrique est cohérent avec la théorie économique: quand les salaires sont flexibles, un choc d'offre de travail causé par l'immigration détériore les salaires des travailleurs avec lesquels les immigrants sont substituables. Plus généralement, notre résultat met en évidence une source importante de rigidités salariales en France. Il souligne aussi le rôle prépondérant des rigidités de salaires dans la détermination des effets de l'immigration sur le marché du travail.

Si l'immigration n'a en moyenne qu'un effet négligeable sur le salaire des natifs en France, nous trouvons qu'elle induit une forte réaction de l'emploi. Nos résultats indiquent qu'une hausse de 10 % de la part des immigrés dans une classe de compétence dégrade le taux d'emploi des natifs de cette classe d'environ 3 %³⁷. Ce résultat est cohérent avec la théorie économique: en présence de rigidités salariales, un choc d'offre de travail induit par l'immigration tend à accroître le chômage des travailleurs de même qualification dans l'économie (Saint-Paul and Cahuc, 2009).

La baisse du taux d'emploi résulte d'une substitution entre les immigrés et les natifs ayant des caractéristiques individuelles similaires : âge, formation, expérience sur le marché du travail. L'analyse des différences de conditions d'emploi entre les populations natives et immigrées permet de comprendre les facteurs à l'origine de la substitution des immigrés aux natifs d'une même classe de compétence. En particulier, nous montrons qu'à niveaux de productivité similaires, les immigrés ont des salaires plus faibles (de 2% à 3% de moins) et des conditions de travail plus difficiles (travail de nuit, le week-end ou à

³⁷Le taux d'emploi correspond au ratio entre le nombre d'actifs occupés et le nombre total d'actifs.

horaires tardifs). Les immigrants tendent à avoir des comportements d'offre de travail différents de ceux des natifs. Pour bénéficier d'une main-d'œuvre moins exigeante sur ses conditions d'emploi, les entreprises tendent alors à substituer des immigrants aux natifs³⁸.

Ces différences de comportement entre natifs et immigrants s'expliquent en partie par la situation particulière des immigrants vis-à-vis du marché du travail. Sur le plan juridique d'abord, plusieurs dispositions restreignent les opportunités d'emploi et les alternatives offertes aux immigrés. Leur accès aux minima sociaux est limité (Math, 2011). Pour qu'ils puissent en bénéficier, le droit français exigeait jusqu'en 2003 que les immigrants soient titulaires depuis au moins trois ans d'un titre de séjour les autorisant à travailler ; la "loi Sarkozy" du 23 novembre 2003 a porté cette durée à cinq ans. Sur le marché du travail, l'accès à la fonction publique (environ 30 % de l'ensemble des emplois français en 1999) est fermé aux étrangers non européens tandis que différents dispositifs restreignent ou interdisent l'accès des étrangers aux professions libérales et à de nombreuses professions indépendantes (Math and Spire, 1999). Par ailleurs, le renouvellement de la carte de résidence ou l'accès à la naturalisation des immigrés requièrent des preuves d'intégration, notamment l'occupation d'un emploi. Pour toutes ces raisons, les immigrés disposent, à qualification égale, de moins d'alternatives que les natifs : pour eux, la probabilité de trouver un emploi est plus faible et le coût de ne pas en avoir est plus élevé.

Ensuite, les immigrants et les natifs d'un même niveau de qualification peuvent se distinguer en termes de normes culturelles (ou d'attentes vis-à-vis du marché du travail). En effet, si la référence des immigrés en matière de salaires et de conditions de travail est celle de leur pays d'origine (où les conditions d'emploi sont généralement moins avantageuses), ils peuvent être, dans leur pays d'accueil, plus enclins que les natifs à accepter des salaires faibles et des conditions de travail difficiles (Wilson and Jaynes, 2000; Constant et al., 2010). De plus, les immigrés peuvent être tenus à une forme d'hypercorrection sociale qui réduit leur propension à revendiquer une amélioration de leur condition (Sayad,

³⁸A niveaux de productivité similaires, les immigrants pourraient être plus attractifs que les natifs pour d'autres raisons. Par exemple, les immigrants seraient moins enclins que les natifs à contester leurs conditions de travail au regard de la loi ou à se mettre en grève (Sa, 2011).

1999).

L'hétérogénéité de la population immigrée peut être statistiquement exploitée pour préciser l'impact de ces différences. Au sein de cette population, il est d'abord possible de distinguer les immigrés naturalisés des non naturalisés. Les premiers, ayant acquis la nationalité française, ne sont plus soumis aux lois qui restreignaient leur accès aux emplois publics et aux minima sociaux. De plus, les exigences relatives aux demandes de naturalisation sont telles que les immigrés naturalisés sont généralement très intégrés. Par conséquent, si l'effet de substitution entre immigrés et natifs s'explique par des différences juridiques et/ou d'attentes vis-à-vis du marché du travail, on peut s'attendre à ce que les immigrés naturalisés n'aient qu'un impact très limité sur le taux d'emploi des natifs.

Nos estimations (toujours basées sur la méthodologie de Borjas (2003)) montrent qu'en effet la substitution sur le marché du travail ne s'observe qu'entre les immigrés non naturalisés et les natifs. Une population immigrée ayant des caractéristiques proches de celles des natifs en termes juridique et culturel n'a qu'un impact marginal sur le niveau d'emploi des natifs.

Nous distinguons ensuite, au sein de la population immigrée non naturalisée, les immigrés provenant des pays de l'UE-15, de Norvège, Islande et Liechtenstein (membres de l'espace économique européen) et de Suisse (liée à l'Union européenne par des traités bilatéraux), d'une part ; les autres immigrés, de l'autre³⁹. Les immigrés européens bénéficient des avantages offerts par les traités européens. Ils ont accès aux minima sociaux sans condition de résidence et à la majorité des métiers de la fonction publique. De plus, venant de pays économiquement proches de la France, leurs références en termes de conditions de travail et de salaires tendent à être similaires à celles des natifs. Nos résultats montrent que l'effet de substitution consécutif à l'immigration n'est attribuable qu'aux immigrés non européens, c'est-à-dire à ceux dont les droits et les références salariales sont les plus éloignés de ceux des natifs.

Nous reproduisons le même exercice de décomposition de la population immigrée par nationalité pour étudier l'existence d'effets différenciés sur les salaires

³⁹Notre base de données et les problèmes d'identification associés à la décomposition de la population immigrée ne nous permettent pas de décomposer les immigrants non européens en différents sous-groupes de nationalités.

des natifs. Si l'effet moyen de l'immigration sur le salaire mensuel des natifs n'est que de - 0,6 % (comme indiqué ci-dessus), cet effet cache de fortes disparités selon la nationalité des immigrants. En effet, nos estimations indiquent que seuls les immigrants de nationalité non européenne réduisent le salaire des natifs: une hausse de 10% de la part des immigrés de nationalité non européenne réduit le salaire mensuel des natifs de même qualification d'environ 1%. Les salaires des natifs sont insensibles à la hausse du nombre d'immigrés naturalisés et européens. En accord avec une étude danoise (Malchow-Møller et al., 2012), il semblerait donc qu'une hausse de la part des immigrés réduise les salaires des natifs dans la mesure où les immigrés (ici, les immigrés non européens) tendent à accepter des salaires plus faibles que des natifs de même qualification. En disposant d'une main-d'œuvre alternative relativement moins chère, les firmes pourraient donc contraindre les natifs de même qualification à revoir leurs exigences salariales à la baisse. Ces résultats renforcent l'interprétation de l'effet de substitution évoqué ci-dessus. Ils suggèrent que les effets induits par les immigrants sur les salaires et l'emploi des natifs dépendent de la situation des premiers vis-à-vis du marché du travail. Lorsque les immigrants se différencient des natifs en termes de références salariales et d'alternatives sur le marché du travail, ils tendent à dégrader les conditions d'emploi des natifs.

L'ensemble de ces résultats suggère que les politiques qui, pour protéger le bien-être des natifs, restreignent l'accès des immigrés aux emplois publics et/ou aux minima sociaux, pourraient se révéler contre-productives. En réduisant les alternatives dont peuvent disposer les immigrés, ces politiques tendent à renforcer l'effet négatif de l'immigration sur l'emploi des natifs.

L'immigration a réduit le salaire relatif des natifs très qualifiés

La méthode que nous avons utilisée jusqu'ici mesure l'effet d'une hausse de la part des immigrés dans la population active sur l'emploi des natifs auxquels ils sont substituables. Cette méthode omet les effets de complémentarité que l'immigration peut induire sur les travailleurs dont les qualifications diffèrent de celles des immigrants. Elle exclut aussi les mécanismes d'ajustement de long terme liés à l'investissement des entreprises. Pour tenir compte de ces deux effets,

nous utilisons une approche structurelle issue de Aydemir and Borjas (2007); Ottaviano and Peri (2012). Dans la mesure où le marché du travail français est caractérisé par de fortes rigidités salariales, nous adaptons notre modèle afin qu'il puisse générer un ajustement imparfait des salaires suite à des chocs d'offre de travail.

Nos simulations de court terme indiquent qu'entre 1990 et 2010, l'immigration a réduit le salaire moyen des natifs d'environ 0,6%. Issue d'une approche structurelle, cette dernière estimation est en parfait accord avec l'effet moyen de l'immigration sur les salaires obtenu dans les **Chapitres I et II** dans lesquels nous avons utilisés une approche non-structurelle⁴⁰. Ces deux estimations se renforcent mutuellement. Elles soulignent notamment l'importance des rigidités salariales dans la détermination des effets de l'immigration sur le marché du travail.

En accord avec la théorie économique, les simulations indiquent qu'à long terme, l'immigration n'a aucun effet global sur les salaires des natifs (Table 4.6). Sur longue période, les salaires sont, en moyenne, indépendants du taux de pénétration des migrants. Si les effets de long terme sont nuls, nous montrons que l'immigration génère des gagnants et des perdants parmi les natifs. La méthodologie que nous utilisons nous permet de mesurer les effets de l'immigration sur la dispersion des salaires en fonction du niveau de qualification des natifs. Comme nous l'avons indiqué plus haut, l'immigration récente en France a majoritairement contribué à accroître l'offre de travail très qualifié (Graphique 4.3). En proportion de la population immigrée, le nombre d'immigrés faiblement qualifiés a fortement chuté depuis 1990. Ces évolutions vont induire sur les salaires des natifs des effets différenciés selon les niveaux d'éducation.

Les simulations de long-terme, présentées dans la Table 4.6, indiquent que l'immigration a pénalisé les salaires horaires des travailleurs natifs très qualifiés (- 1 %) alors qu'elle a amélioré ceux des travailleurs natifs faiblement qualifiés (+ 0,5 %) ⁴¹. Ainsi, dans la mesure où la France connaît depuis vingt ans une

⁴⁰Cette similitude est aussi observée aux États-Unis (Aydemir and Borjas, 2007).

⁴¹Les simulations permettent d'isoler les effets de l'immigration sur les salaires. De fait, ces chiffres représentent les effets de l'immigration, toutes choses égales par ailleurs – *i.e.* en ignorant la possibilité que d'autres facteurs aient pu influencer sur les salaires (comme le progrès technique

Table 4.6: Les effets de long terme de l'immigration sur les salaires des natifs selon le niveau d'éducation (1990-2010)

	Effet moyen	Éducation élevée	Éducation moyenne	Éducation faible
Salaire français	0.0 %	-0.96 %	0.24 %	0.43 %
Salaire flexible	0.0 %	-2.22 %	0.45 %	1.11 %

immigration majoritairement qualifiée, l'immigration a contribué à la réduction des inégalités salariales entre travailleurs très qualifiés et faiblement qualifiés. Ce résultat est en accord avec les travaux d'Aydemir and Borjas (2007) pour le Canada, où l'immigration qualifiée des dernières décennies y a réduit le salaire relatif des travailleurs natifs qualifiés. Ainsi, nos résultats montrent toute l'importance de la structure de qualification des immigrants dans la détermination de leurs effets sur la distribution des salaires des natifs.

L'impact négatif de l'immigration sur le salaire relatif des travailleurs natifs qualifiés est à mettre en parallèle avec la compression des salaires observée en France depuis les années 1970 (Charnoz et al., 2013; Verdugo, 2014). La Table 4.6 indique que l'une des causes de la réduction des inégalités salariales entre travailleurs qualifiés et non qualifiés est liée à l'immigration. En particulier, le **Chapitre III** montre que l'immigration a contribué à réduire les inégalités salariales d'environ 18%.

Dans la Table 4.6, nous remarquons aussi que l'effet de l'immigration sur la dispersion des salaires est amplifié lorsque les femmes sont incluses dans l'échantillon. Ce résultat tient au fait que, depuis les années 1990, la part des femmes immigrées dans la population active a augmenté beaucoup plus vite que celle des hommes. Les effets sur les salaires sont donc plus prononcés car la contribution des femmes immigrées à la hausse de l'offre de travail est plus importante. Par ailleurs, nos simulations montrent que la contribution de l'immigration à la réduction des inégalités salariales serait plus marquée si l'ajustement des salaires

ou la mise en place des 35 heures).

n'était pas contraint par les caractéristiques institutionnelles du marché du travail français (Table 4.6, hypothèse de salaire flexible).

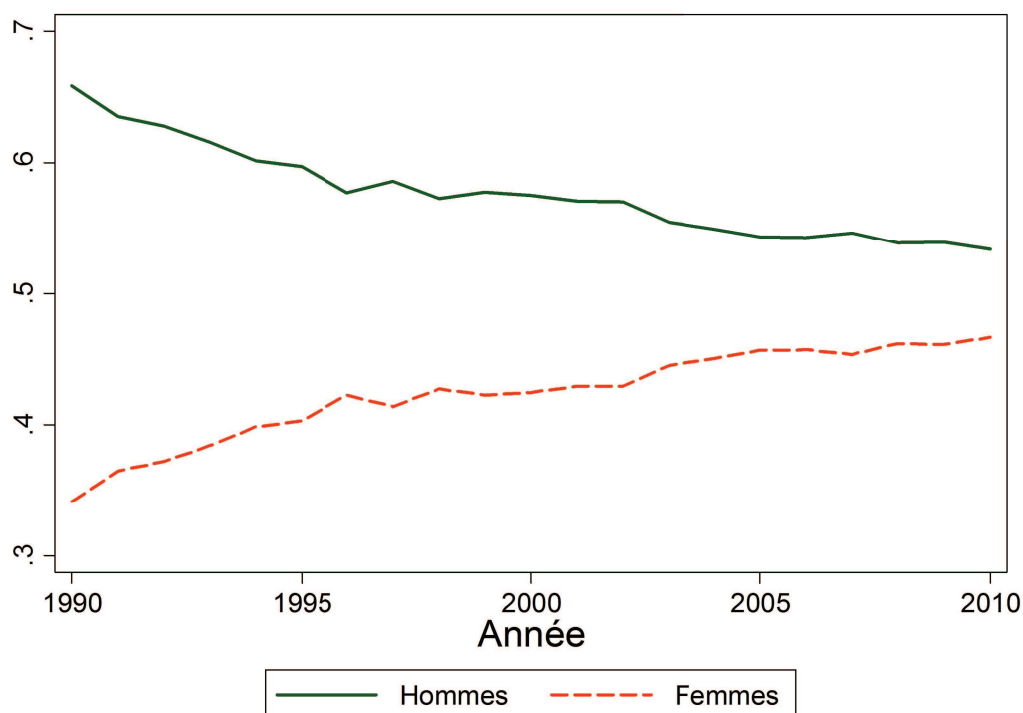
Cette première analyse souligne l'importance de la structure de qualification de la main-d'œuvre immigrée dans les effets redistributifs de l'immigration. Pour approfondir ce lien, nous utilisons une série de données sur l'immigration aux États-Unis afin d'évaluer les effets que l'immigration américaine aurait eu sur la structure des salaires français. Nous utilisons l'immigration américaine comme scénario d'immigration puisque la structure de qualification des immigrants aux États-Unis est très différente de la France. Contrairement à la France, l'immigration américaine a été très majoritairement non qualifiée depuis les années 1990 (Borjas, 2003; Ottaviano and Peri, 2012). Les effets redistributifs de ce type d'immigration non qualifiée devraient donc être inversés par rapport aux résultats obtenus dans la Table 4.6. En effet, nos simulations indiquent que si la France avait fait l'expérience de l'immigration américaine depuis 1990, le salaire des travailleurs natifs très qualifiés aurait augmenté (+ 0,6 %) et celui des travailleurs faiblement qualifiés aurait diminué (- 0,5 %). Ces deux effets de sens opposés auraient donc conduit à un accroissement des inégalités salariales entre les travailleurs très qualifiés et faiblement qualifiés.

Pour finir, nous simulons l'impact de différentes politiques d'immigration. Nous montrons qu'une politique d'immigration sélective en faveur d'une immigration qualifiée contribuerait à réduire les inégalités salariales entre les travailleurs qualifiés et non qualifiés dans les pays d'accueil. En plus de favoriser l'innovation et de contribuer positivement aux finances publiques, l'immigration qualifiée tend à réduire les inégalités salariales. Cette dernière dimension devrait être prise en considération dans le débat public et dans la mise en œuvre de politiques d'immigration.

L'immigration a réduit le salaire relatif des femmes

Depuis 1990, la population immigrée s'est fortement féminisée en France. à cet égard, le Graphique 4.4 indique que la part des femmes immigrées dans la population active immigrée totale est passée de 34% en 1990 à 47% en 2010. La modification de la politique migratoire et la reconnaissance légale du droit au

Figure 4.4: La composition de la population immigrée par genre de 1990 à 2010



Notes. Ce graphique reporte les proportions d'hommes et de femmes dans la population active immigrée de 1990 à 2010. L'échantillon utilisé comprend les immigrants actifs âgés de 16 à 64 ans, non étudiants et ayant une expérience professionnelle d'un à quarante ans. Les entrepreneurs individuels sont exclus de l'échantillon.

regroupement familial à partir de 1974 ne suffisent pas à expliquer la féminisation de la population immigrée depuis le milieu des années 1970. En effet, les femmes qui arrivent en France sont de plus en plus souvent des célibataires ou des "pionnières" qui devancent leur conjoint (Beauchemin et al., 2013).

Depuis 1990, l'immigration en France a majoritairement contribué à accroître l'offre de travail des femmes – *i.e.* l'immigration a augmenté le nombre relatif de femmes sur le marché du travail français. Cette tendance peut avoir des effets différenciés sur le salaire des natifs selon leur genre, notamment si les hommes et les femmes sont imparfaitement substituables dans le processus productif. À niveaux d'éducation et d'expérience professionnelle comparables, les femmes pourraient avoir des caractéristiques productives (réelles ou supposées) différentes de celles des hommes, les rendant imparfaitement substituables dans

le processus productif. Dans ce cas, la féminisation de la population immigrée aurait pour conséquence principale une réduction du salaire relatif des femmes. Le **Chapitre IV** examine le degré de substitution entre les hommes et les femmes, et évalue les effets de la féminisation de la population immigrée sur le salaire des natifs selon leur sexe.

En accord avec de nombreuses études (Anker et al., 1998; Blau et al., 2002), nous montrons que la ségrégation professionnelle entre les hommes et les femmes sur le marché du travail français est très forte⁴². Les femmes sont notamment concentrées dans des professions qui ne requièrent pas de compétences manuelles. Ce dernier résultat est cohérent avec les travaux de Sikora and Pokropek (2011) qui montrent que les jeunes filles ont un intérêt plus grand pour les professions non manuelles que les jeunes garçons.

Les hommes et les femmes ne semblent donc pas en concurrence sur les mêmes types de postes. Premièrement, les femmes et les hommes de même niveau d'éducation et d'expérience pourraient avoir des caractéristiques productives différentes, ce qui les rendrait imparfaitement substituables. à cet égard, Croson and Gneezy (2009) identifient de fortes différences selon le genre dans les attitudes, les comportements, l'aversion face à la concurrence et l'estime de soi. Ces différences peuvent mener les employeurs à préférer les hommes ou les femmes selon les professions. Les hommes et les femmes pourraient aussi se différencier en termes de compétences physiques et relationnelles, menant les premiers à être surreprésentés dans des professions pénibles physiquement et menant les secondes à occuper des professions sociales (Charles and Grusky, 2005). L'étude de la DARES (2013a) montre notamment que les femmes sont sur-représentées dans les métiers d'enseignants, d'employés administratifs et de secrétaires. En revanche, elles sont sous-représentées dans les métiers d'ouvriers dans le bâtiment (second et gros œuvre), de techniciens et agents de maîtrise dans les travaux publics et d'agriculteurs.

Deuxièmement, le poids des mentalités et des normes sociales (ou même

⁴²Notre constat est aussi confirmé par une étude récente de la DARES (2013a). D'ailleurs, certains métiers sont presque exclusivement occupés par des femmes (assistantes maternelles, à 99 % ; secrétaires, à 98 %), d'autres quasiment exclusivement occupés par des hommes (ouvriers qualifiés du bâtiment, à 98 % ; techniciens et agents de maîtrise de la maintenance, à 93 % ; conducteurs de véhicules, à 90 %).

Table 4.7: Les effets de long terme de l'immigration sur les salaires des natifs selon le genre (1990-2010)

	Effet moyen	Homme	Femme
Salaire français	0.0 %	0.06 %	-0.11 %
Salaire flexible	0.0 %	0.11 %	-0.25 %

de simples considérations sexistes) pourrait conduire les employeurs à préférer systématiquement les femmes ou les hommes pour occuper certains emplois. Dans ce cas, des hommes et femmes de même qualification ne seraient pas en concurrence sur les mêmes postes. Ils seraient donc imparfaitement substituables dans le processus de production.

Les estimations réalisées dans le **Chapitre IV** confirment l'idée selon laquelle le marché du travail est segmenté selon le genre. Le degré de substituabilité entre les hommes et les femmes de même qualification est d'ailleurs très faible. Nos résultats indiquent donc que la concurrence sur le marché du travail s'exerce au sein de ces deux groupes.

Pour analyser les effets de l'immigration sur le salaire des natifs selon leur genre, nous utilisons la même approche que dans le **Chapitre III**. Cette méthode est structurelle et inclut la possibilité qu'interviennent des rigidités salariales. Étant donné la forte féminisation de la force de travail immigrée, nos simulations de long terme indiquent que l'immigration a réduit le salaire relatif des femmes natives depuis 1990 (Table 4.7). L'immigration a augmenté le salaire des hommes (+ 0,06 %) et réduit celui des femmes (- 0,11 %). L'ampleur de ces deux effets aurait été plus prononcée si les salaires français étaient parfaitement flexibles (Table 4.7, hypothèse de salaire flexible).

La féminisation de la population immigrée est donc un phénomène qui tend à augmenter les inégalités salariales entre les hommes et les femmes. Comme dans la Table 4.6, nous remarquons que les rigidités salariales contiennent l'accroissement de ces inégalités. Ce dernier résultat souligne, une nouvelle fois, le rôle majeur joué par les rigidités salariales dans la détermination des effets de l'immigration

sur le marché du travail.

En guise de conclusion...

Cette thèse est destinée à analyser les effets de l'immigration sur les salaires et l'emploi des natifs en France depuis les années 1990. L'intérêt de ce travail est triple. Premièrement, il n'existe que très peu d'études qui examinent l'impact de l'immigration sur le marché du travail français. À cet égard, ce travail fournit une série d'éléments nouveaux utiles au débat public. Deuxièmement, les caractéristiques institutionnelles françaises génèrent des rigidités salariales. L'étude du cas français doit contribuer à la littérature existante en examinant le rôle joué par les rigidités salariales dans la détermination des effets de l'immigration sur les salaires et l'emploi. Cette dimension a été omise dans la grande majorité des études à ce sujet. Troisièmement, la France a connu une forte évolution de la composition de sa force de travail immigrée depuis les années 1990. La population immigrée s'est fortement féminisée ; elle est aussi devenue de plus en plus qualifiée. Cette double caractéristique française nous permet d'évaluer les effets redistributifs de l'immigration, et de mieux comprendre comment la composition de la population immigrée affecte la structure des salaires dans les pays d'accueil. Nous résumons les résultats principaux de cette thèse dans ce qui suit.

Nous montrons que l'immigration en France n'a eu qu'un effet très limité sur les salaires des natifs de niveaux d'éducation et d'expérience comparables. Du fait des rigidités salariales, l'ajustement a davantage porté sur l'emploi. Les entreprises ont eu tendance à substituer aux natifs des immigrés lorsqu'un accès plus restreint aux emplois et aux dispositifs sociaux et de moindres attentes rendaient ces derniers moins exigeants. De ce point de vue, les politiques qui, pour protéger le bien-être des natifs, introduisent des discriminations institutionnelles entre natifs et immigrés, pourraient se révéler contre-productives.

Si elle n'a guère d'impact global sur les salaires de long terme, l'immigration agit sur la structure salariale. Suite à la forte augmentation de la qualification des immigrés au cours des vingt dernières années, l'immigration a eu un impact négatif sur les salaires des natifs très qualifiés, mais positif sur ceux des natifs peu qualifiés. Elle a ainsi contribué à la réduction des inégalités salariales entre ces

deux catégories de travailleurs. Enfin, nous montrons que la féminisation de la population immigrée a légèrement réduit le salaire relatif des femmes. Ce résultat est principalement lié au fait que les hommes et les femmes de même qualification tendent à être imparfaitement substituables dans le processus productif – *i.e.* ils se concurrencent moins qu'ils ne se complètent. La composition de la main-d'œuvre immigrée en termes d'éducation et de genre conditionne donc les effets redistributifs de l'immigration sur les salaires des natifs.

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Résumé

En France, en 2010, un dixième de la population active était immigrée. Quel impact cet apport d'actifs a-t-il eu sur les salaires et l'emploi des natifs ? Une analyse centrée sur la substitution entre natifs et immigrés montre d'abord que l'immigration n'a eu qu'un faible impact sur le salaire des natifs de même niveau d'éducation et d'expérience. Une hausse de 10% de la part d'immigrés réduit le salaire mensuel des natifs de même qualification d'environ 0,6%. Ce résultat n'est pas surprenant compte tenu de la forte rigidité salariale qui caractérise le marché du travail français : l'existence d'un salaire minimum national et d'indemnités chômage élevées peut expliquer l'absence d'ajustement des salaires suite à une augmentation de l'offre de travail. Dans ce contexte de fortes rigidités salariales, l'ajustement porte sur le taux d'emploi. Nos résultats indiquent qu'une hausse de 10 % de la part des immigrés dégrade d'environ 3 % le taux d'emploi des natifs ayant des caractéristiques individuelles similaires : âge, formation, expérience professionnelle. L'emploi des natifs diminue au profit de celui des immigrés puisque ces derniers sont relativement plus attractifs pour les entreprises. Les immigrants sont notamment plus enclins à accepter des salaires plus faibles et des conditions de travail plus difficiles que des natifs de même qualification.

Cette première analyse de court terme n'est que partielle puisqu'elle omet les effets de complémentarité que l'immigration devrait induire sur les travailleurs dont les qualifications diffèrent de celles des immigrants. En tenant compte de ces effets de complémentarité, une seconde analyse montre que si l'immigration n'a aucune incidence sur le salaire moyen des natifs à long terme, l'immigration a produit en France des gagnants et des perdants depuis les années 1990. Dans la mesure où la population immigrée est de plus en plus qualifiée, l'immigration a réduit le salaire des natifs très qualifiés et augmenté celui des natifs faiblement qualifiés. L'immigration a donc contribué à la réduction des inégalités salariales entre les travailleurs qualifiés et non qualifiés constatée en France durant cette période. De même, nous montrons que la forte féminisation de la population immigrée a eu un impact différencié sur les salaires des natifs selon leur genre. Depuis 1990, nos estimations indiquent que l'immigration a diminué le salaire des femmes et augmenté celui des hommes. Cet effet asymétrique s'explique par le fait que les hommes et les femmes tendent à être imparfaitement substituables dans le processus productif.

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