Money, trust and central bank communication : textual analysis of central bank communications for understading the political and financial implications of monetary trust

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By Moritz Pfeifer

Preface

First ideas on the topic of trust and money came to me in what now seems like a different era, when I was working for a political foundation in Brussels. It was during the heyday of the Euro-crisis and all of a sudden the word "trust" was in everyone's mouth. Amidst fears of Grexits and shaming of PIIGS, there was no question about it: confidence had to be restored and trust rebuilt. The more I heard pleas for trust, the more skeptical I grew. I started to read on the topic, and felt none the wiser—a feeling that persists, even to this day, when one of the few things I might have reason to feel confident about is having at last completed this dissertation.

I am deeply grateful to the German Academic Exchange Service (DAAD) for allowing me to spend four years at the University of Nanterre, where I have been blessed to meet two wonderful colleagues: Connie Stubbe and Bernd Zielinski, the latter agreeing to become my supervisor for this project. My thanks in particular for their comments, advice, guidance and criticism in connection with this project to: Guillaume Dezaunay, Nathaniel Draper, Anastasia Eleftheriou, Cécilia Kutter, Konstanty Kuzma. Juri Marucci and Wolfgang Härdle for introducing me to text analysis; Meike Stolley of the Pressearchiv at the Bundesbank; Frédérik Grélard, Fabrice Reuzé and the staff at the Service du Patrimoine Historique et des Archives of the Banque de France; Dr. Gabriele Schwalbach at the Universitätsbibliothek Trier for shipping 48 volumes of press data to Paris; Fiona Lefrère, Olesea Dubois, Donatienne Magnier, Delphine Millet for digitizing the Bundesbank archives; Cornelia Woll for allowing me to use the digitization services at SciencesPo; Gérard Jorland who taught me that science is a question of changing perspectives; my family for their confidence and trust.

1 Introduction

When, in 1988, the European Council decided to further European integration through the creation of an economic and monetary union (EMU), with the steps towards a single currency elaborated in the decade that followed, hardly any policymaker felt it necessary to point out the degree of trust that such a union would inevitably entail. Neither the Delors Report of April 1988, nor the major documents on the single currency written by the governors of the national central banks, the European Monetary Institute and the European Central Bank, which was founded in 1998, mention trust as a sociopolitical prerequisite for a monetary union, let alone an economic concept of monetary theory. Even in public debates on the euro from this period—for example, in speeches by politicians or newspaper articles in prominent business magazines—references to trust were, with a few exceptions, largely absent. After the financial crisis of 2008, policymakers caught up with what had been missed. Suddenly, central bankers were talking about "restoring confidence," economists were analyzing the "crisis of confidence" and politicians were accusing each other of "breaches of confidence" in view of collapsing financial markets, swelling rescue packages and the threat of national bankruptcies. The term "confidence" was used so frequently that one respected chronicler of the financial crisis mocked panicked politicians and their appeals to confidence as "confidence fairies" (Krugman 2013).[1]

How can this turn of events be explained? Were so-called *animal spirits* at work—a blind trust in dubious economic doctrines that were taken as indisputable facts? Or does trust, like social institutions, work best when it is taken for granted? Is trust a precious

[1] The most recent example of a central banker playing the role of a "confidence fairy" can be seen in Mark Carney, who was the Governor of the Bank of Canada from 2008 until 2013 and the Governor of the Bank of England from 2013 to 2020. In his new book, *Value(s)*, the words "trust" and "confidence" get mentioned over 240 times (around two-thirds as frequently as the word "money"). Yet the reader is made no wiser as to whether that "trust is justified," since the author, tellingly, does not ask that question.

social lubricant that simplifies complex social relationships and makes economic transactions more efficient? Or does trust also reflect social relations based on power and conflicts of interest? This dissertation examines the role trust has played in monetary theory and the of role central bank communications for maintaining trust in money, as observed in Germany and France from the founding of the Economic and Monetary Union until today. The concept of trust will be understood drawing both from sociological literature and from insights of institutional economics, in order to analyze the communication strategies of German, French and EU-linked monetary policy decisions in a relationship of dependence between market, state and society. The dissertation is divided in two parts: the first part looks at the role monetary trust has played in economic theory (Chapter 2), and the second part offers an empirical analysis of central bank communications in order to analyze whether central bankers can effectively manage the trust relation of their competing constituents through their communications.

Not least due to its resistance to quantification, the concept of trust occupies an uncertain place in economic and social science studies of money. One way to cut through the medley of overlapping and recurring debates on trust in money is to distinguish between theoretical, political and empirical approaches, a distinction I will follow in this dissertation. In the first chapter (2), I will review the role monetary trust has played in economic theory in order to distinguish between two tendencies. The first approach defines monetary trust as a horizontal relation between individuals. This approach is grounded in the neoclassical economic tradition (2.1.1) and has influenced mainstream microeconomic and macroeconomic theory to this day. In the second approach, monetary trust is considered from a vertical perspective, focusing on the institutional context and social embeddedness of trust relationships. This theory is grounded in sociology and political economy, as well as in state and credit theories of money (2.1.4).

In the microeconomic studies of the first category, trust in money is primarily understood as an interpersonal relationship limited to *personal trust* between economic agents. This relationship is most commonly defined in terms of money's acceptability, and the observation that people trust money because others trust money as well. This turns trust into a functionalist value; in fact, it makes trust very much like money, a comparison that is as popular in central bank speeches as it is in economic theory. The idea is that in the absence of trust, monetary relations would work less efficiently, the shadow of barter lurking at every turn. If monetary trust is also recognized from an institutional perspective in this approach, it is to highlight how institutionalized trust resolves coordination problems, making collective living more efficient, profitable and predictable. Understood in purely horizontal terms, institutional norms thus simply replicate the lower bonds of the economic sphere: the more trust, the better. The mainstream economic understanding that trust flows through institutions as an all-encompassing lubricant to facilitate economic exchange—a framing of the hierarchical institution of monetary trust as a matter of horizontal trust relations—most often amounts to circular reasoning, rather than shedding light on, e.g., the process of money creation. Trust is thus understood as the very thing it is supposed to replace. Why do people trust in money? Because they trust each other. Why do people trust each other? Because they trust in money. Because this horizontal vision of monetary trust effectively masks the institutional dimension of money, this vision has been interpreted as a form of benign neglect, in which the institutional dimension of the trust relationship is at once acknowledged and diffused. This interpretation follows a long tradition of sociological studies on money, which claims that such naturalizations, i.e., the collective forgetting about the hierarchical structure of institutions, is a constitutive part for their stability and legitimacy. A particular attention to this framework of analysis will thus be paid in the assessment of the literature discussed in this chapter.

Economists favoring a hierarchical, or vertical, approach to monetary trust look at institutions from a social conflict point of view. From this perspective, trust in money is not natural, but must be created, developed and sustained because of competing interests among members of the society. Far from resolving coordination problems, institutions have distributive effects that may overshadow their efficiency. Thus, studies deviating from classical models understand trust in money in terms of a triangular relationship between currency issuers, currency users, and monetary spaces (states and societies). This relationship is impersonal and hierarchical, i.e., it is based on a political and a social *power relationship* in which the demand for money has a dual character: as a *public good* and as a *private commodity*. Recent studies of money, influenced by economic sociology and state and credit theories of money, agree that monetized debt is the most trusted and sought-after money. The existence of debt gives money its value. If debts are predominantly in public hands, money gains institutionalized legitimacy from the government's promise to pay its debts through taxes redeemed in the future. Politically, the creditors here are the citizens of the state themselves, whose claims are guaranteed by public consent and democratically-based constitutional rights. Trust as a means of communication that creates equilibrium plays only a subordinate role in these theories, because the citizens' loyalty shown to the state depends on whether the state, for its part, provides services in return. If the process of money creation is predominantly public, a social imbalance may arise between a society accustomed to prosperity and private financiers disenfranchised by the money creation process. If, on the other hand, the money creation process no longer depends on the loyalty of citizens but predominantly on the trust of private creditors, the public may lose its trust in government and the monetary authority. If debts are private, there is an increasing risk of commodification. Here, the creditors are not citizens but international investors whose claims are based not on constitutional law but on civil law. Although private creditors

cannot vote out the democratically elected representatives of indebted states, they can withdraw their trust by devaluing the state's creditworthiness and selling or forgoing the purchase of promissory bills.

The story told in the first chapter follows what have traditionally been considered the three functions of money: a means of exchange (money tokens to make payments), a store of value (capital transferred in time), and a unit of account (state-sanctioned means of final settlement). The trust relation inherent in each of these functions becomes increasingly vertical as we move from one function to the next. In other words, acknowledging all of these functions reveals that monetary trust operates in a hierarchy, where the function of money that requires the most hierarchical form of trust is the control of the unit of account. In modern credit economies, this control is relegated to the central bank, which makes the central bank the most important guardian over monetary trust, or, the institution in which political and social conflicts over the process of credit creation are carried out. As shall be shown at the very end of the first chapter (2.2), French and German central bankers in the Eurozone have, until recently, followed a horizontal view of monetary trust in their self-perception. This benign neglect towards their own role in the monetary system may seem strange. In light of the fact that the central bank is the most important monetary institution, one would expect central bankers to address this fact more frequently. Unless, of course, monetary trust fundamentally implies forgetting about institutional hierarchies—the claim made by the economic sociologists and institutional economists.

Few events have revealed the hierarchies, and hence the question of trust, in the credit creation process more callously than the financial crisis of 2007/8: on the one hand, the profound misconduct of private financial institutions undermined the private pillar of this partnership; on the other, the rise in central bank balance sheets fueled public "fear of inflation" and anger against "welfare for banks." While orthodox monetary theories and their

custodians at the sources of money creation had, until then, assumed that the communicative partners of the national central banks and the ECB were limited to a handful of selected financial actors and economic elites, and that their monetary policies could be transparently deduced from the rules laid down in the ECB's mandate, the crisis brought the process of money creation back into the spotlight of public debate and transformed it into a contested arena of competing interests within and between member states. Thus, in the aftermath of the crisis, the Banque de France, the Bundesbank, and the ECB found themselves obliged to communicate not only with markets but also with an increasingly distrustful French, German, and European community. Here, the biggest challenge was no longer managing rational expectations and ensuring horizontal trust in money, but establishing trust in the legitimacy of the monetary authority.

An anecdotal example will suffice to illustrate the communicative challenge this implies. When the German government passed the *Financial Market Stabilization Act* (FMStG) in October 2008 to rescue troubled banks, the law was explicitly described as a confidence-restoring measure vis-à-vis market participants in the Bundestag's draft, in the Bundesbank's monthly report, in the admission statement drawn up by the European Commission and in the ECB's statement.[2] Fears that the "stabilization package" would also diminish German taxpayers' confidence in monetary policy institutions cannot be inferred from any of the papers. It remained up to the communication strategists of the German government and the Bundesbank to ensure public confidence in the context of bank

[2] The very first paragraph of the draft law formulates the "uncertainty of market participants" as a "crisis of confidence" and interprets it as the task of the state to "restore" the lost confidence in the financial market. Cf. BT-DrS 16/10600 (2008: 1). The Bundesbank explicates "confidence" of banks as the "functioning" of the interbank market. Cf. Deutsche Bundesbank (2008: 12). EU Competition Commissioner Neelie Kroes praised "the German rescue package [as] an efficient instrument to strengthen confidence in the market" (EU Commission 2008). The ECB's first statement adopted the discourse in text (Trichet 2008). The first press release of the Special Fund for Financial Market Stabilization (SoFFin), provided by the FMStG, also praised the rescue measures as confidence-restoring (SoFFin 2008).

bailouts. A few days before the decision, Chancelor Angela Merkel emphasized in an oft-quoted government press statement that the "restoration of confidence" was not about the interests of the banks but about "protecting the citizens."[3] In November, at the Employers' Day event of the Confederation of German Employers' Associations, Bundesbank President Axel A. Weber assured the "real economy" that "such measures, which are not counter-financed, are only of a very temporary nature" and that "upward forces" could already be expected in the medium term.[4] The fact that this discursive double game causes incompatibility on both sides of the target groups was demonstrated by the fact that, despite assurances of confidence, the rescue packages did not meet the requirements of the panicked financial institutions. At the same time, there was also a contagion effect among the population, which can be read not only from the press, where even before the decision was made citizens were spoken of as "forced shareholders," but also from numerous confidence surveys.[5]

With the assumption that monetary trust is fundamentally hierarchical drawn in the first chapter (2), the next chapter (3) tests whether the monetary authorities in the Eurozone are able to efficiently manage the communicative challenge of pandering to the different demands of their three distinct target audiences—the markets, the state, and the public at large. This chapter builds on the growing literature of analyzing central bank communications to better understand the political and financial implications of monetary policy. I intend to contribute to this literature by 1) creating a new database of 21 years of speeches and interviews of the Banque de France, the Bundesbank and the ECB (1999-2019) 2) devising a new method for analyzing communications that takes into account different

[3] Merkel (2008: 2).
[4] Weber (2008).
[5] In the six years after 2008, confidence in the ECB in the euro area fell from +29 to -23, i.e., a majority of the population distrusted the central bank. See Roth, Jonung and Nowak-Lehmann (2016: 944–60), Berlemann (2013: 25-48) and Foster and Frieden (2017: 511–35).

audiences (3.1) and 3) providing empirical evidence for the observation that monetary policy is not neutral, i.e., that communications are biased towards some economic groups over others. The theoretical justification for this analysis is based on the insights of institutional economics and economic sociology, where central bank independence is questioned on the grounds that monetary authorities are always embedded in a broader system of social and political institutions. Central bankers thus do not communicate in a vacuum, in spite of well-intentioned aspirations, but face different economic interest groups that compete over monetary policy decisions. In such a framework of analysis, the central bank faces a communicative challenge in governing the different economic constituents of its jurisdiction. For the ECB, this problem is exasperated by the fact that on top of the interests of different economic groups may tower diverging interests of members states. In quantitative studies on central bank communication, the question of whom central bankers may or may not be addressing has hitherto been overlooked. In short, how can we talk about communication when we do not even mention audiences?

The results of this analysis (3.2) yield several interesting findings: 1) the findings show that French and German central bankers face a communicative challenge in coordinating communications when they speak to their respective audiences at home and on the European level. In some respects, these differences are representative of the varieties in German and French economic traditions, with the "German view" favoring responsibility and accountability and the "French view" favoring flexibility, in particular in times of crises. The divergence between these views can be seen from the communications of the French and German central bankers regarding the inflation gaps, the most important indicator for conducting monetary policy. French central bankers thus appear to be less inflation averse than their German neighbors. This finding could be indicative of the Franco-German "battleground" over European monetary policy, with Germany being more at ease with

underperforming inflationary targets than its neighbor, where monetary policy is considered less a question of rule than a political process comprising more general goals, including economic growth. 2) There are also remarkable divergences in the messages carried by central bank speeches and interviews toward their different interest groups. The communications towards financial markets and the general public are thus significantly more positive in tone than the communications directed at governments. This insight confirms the hypothesis that that not all audiences enjoy the same seat at the symphony of central bank communication. The results from a regression analysis also reveals that central bankers communicate differently with regards to financial and macroeconomic indicators, as well as with regards to the soft constraint of trust. This analysis also reveals that a bias towards market forces can be observed. Lastly, a significant change in communications can also be observed before and after the financial crisis, an indication that building trust in the unorthodox monetary policies has set the tune for the post-crises period.

The political implications of this study indicate that the tension between the monetary authority and its audiences may not be resolved by a more efficient or transparent communication strategy. In other words, more transparency, or a communicative strategy that is accustomed to the diverging interests of its audiences, may not rebuild trust but exasperate mistrust, as it reveals the hierarchical structure of the monetary trust relation. On the other hand, less transparency, or benign neglect, can also not be considered a lasting solution as it damages diverging trust relations, in particular in times of crisis. Money may work best when it is taken for granted, but a transparent communication strategy would imply that it should not be; i.e., it should acknowledge the inherent tensions at the heart of monetary policy and strive for political consensus. A communicational central bank, then, may be considered to be one that develops public consensus on its monetary policy decisions, practicing openness in the form of public debate on the right policy decisions for all the

members of its constituencies. In this view building confidence is not first and foremost a communicative strategy but a democratic process. It accepts that independence is limited and has to be balanced by true democratic accountability to elected representatives. This implies a revival of politics in central banking. It serves as a reminder that the central bank is a creation of democratic authority, not a creature of central bankers.

2 The Concept of Trust in Monetary Theory

> *Credit means that a certain confidence is given, and a certain trust reposed. Is the trust justified and is that confidence wise? These are the cardinal questions.*
>
> Sir Walter Bagehot (1873): 22

Few concepts are so puzzling as the concepts of trust and its semantic cousin confidence.[6] In the most basic sense, trust exists when someone (a trustor) is willing to rely on the future actions of someone else (a trustee) without knowing for sure whether these actions will be fulfilled. This is the case, for example, when I trust that my friend will be on time to go to the movies with me. I may not be fully certain, and an infinite number of variables may interfere with him being there on time. However, perhaps I know from prior experience that he is a punctual fellow. So, if my trust in his punctuality is not well-grounded it is at least plausible. I may also trust that the bus he will use to get to the movie theater is reliable, that there will not be any traffic on the way and that the streets are safe enough not to interfere with our appointment. Because of these interdependencies, trust is most often understood as an emotion underpinning social relations (Bernoux and Servet 1997; Frevert 2013: 15; Pixley 2012: 36).[7] The consensus goes little further. Some scholars also believe that trust is a virtue.[8] They argue that there is a certain value attached to trust, for example,

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[6] I will follow linguistic pragmatism (and Walter Bagehot) in treating trust and confidence synonymously. While arguments could be made for there to be a tendency to use the term "confidence" in contexts of psychological and nonrational phenomena, and the term "trust" in more structural and rational terms, economists, let alone central bankers, do not appear to make such distinctions. Trying to delimit precise definitions for each term runs the risk of scholasticism, at best. Furthermore, in languages such as French or German, there is only one word, *confiance* and *Vertrauen*, respectively, so such a distinction cannot be sensibly made for these languages. For discussion, see Swedberg (2012).

[7] Trust may not be limited to social relations. For example, I may be confident that it won't rain today, simply by looking at the sky. For discussion, see Baier (1986).

[8] The trust-as-virtue literature is particularly prevalent among scholars studying social capital. This literature attributes intrinsic value to trust and studies the ways in which trust is necessary for the development of prosperity and economic growth. See, e.g., Coleman (1994), Fukuyama (1995), Putnam (2000), Hardin (2002). The most extreme case is perhaps Partha Dasgupta, who argues that trust is a commodity (Dasgupta 1988: 72). In philosophy, the trust-as-virtue argument has mostly been debated in ethics. See, e.g., Baier (1991). For criticism, see, e.g., Jones (2012).

when it makes cooperative behavior easier. In large societies, but also even on an individual level, it is not always possible to monitor those on whose actions we depend. This makes trust necessary and even desirable. The trust I have in my friend for being on time to go to the movies with me may thus also be an indicator for the trust levels within my community at large, where regular, honest, and cooperative behavior based on a set of shared norms (such as punctuality, a well-working public transportation system, affordable movie theatres and so on) is pervasive. A society in which individuals mistrust each other may be less cooperative, less efficient and more costly (Arrow 1974: 24; Coleman 1990: 91ff; Putnam 1993: 88ff). On the other hand, too much or unfounded trust may involve risks, vulnerability and even danger. The literature warning about the vicious aspects of trust is as voluminous as the trust-as-virtue literature. "Trust, but verify," says an old Russian adage, and there is indeed evidence that efficient social cooperation can also exist without trust (Cook et al. 2008).[9] According to these accounts, I would be smarter to impose some form of contract on my friend, binding him to punctuality at risk of a severe punishment, such as ceasing to invite him to movies were he to show up late. Sometimes contracts like this one can be legally binding; sometimes they are unwritten social contracts. In both cases, my movie companion and I may both have a motivation to be trustworthy that that weighs not only on self-interest (e.g., we may not like to be going to the movies alone) but on upholding a social contract (we both fear for our reputation if the contract is breached). From such considerations, lastly, come the observations of the trust sceptics (Luhmann 1968; Beckert:

[9] It is debatable whether contractual cooperation makes trust superfluous, as some scholars have suggested. First, even if contracts are set up to avoid breaches of trust, they are still highly dependent on trust, be it only in the negative form of enforcing social control where mere trust does not suffice, that is, when mistrust poses a risk. Second, another argument could be made that a non-negligible amount of trust still exists even in the most detailed legal contracts, for they, too, need to be upheld. A concept closely related to this last aspect of trust is the legal presumption of good faith in contract law. See, e.g., Deakin & Michie (1997). Only imagined environments of complete control, such as perfect markets, preclude trust. See also Castelfranchi & Falcone (2010: 197ff).

2005, 2006; Reemtsma 2008). These scholars focus on the power structures underlying trust relations. Imagine, for instance, that my friend is only on time, and thus only appears trustworthy to me, because I am always the one paying for his movie tickets. In this scenario I am still trusting my friend to be on time, but under very unequal conditions. Perhaps my friend would no longer want to go to the movie with me if I were to ask him to pay for his own ticket. In this sense, if I had the desire to continue to benefit from his company, my choices not to trust my friend are very limited. Some would say that in such a situation my trust is misplaced, and instead of searching for trust, I should be reassessing our friendship.

The most important takeaways from the trust literature, I would argue, are the insights that, in a social context, 1) trust is relational, i.e., it involves at least two parties, and 2) that the degree to which trust may be more or less warranted depends on the conflict of interest established by that relation.[10] The answer to the questions "when and how much trust is warranted?" can thus be seen as a puzzle. Surely, some degree of trust is important for social relations to work efficiently. However, when these relations are imbalanced or even abusive and as a result, trust levels decline, calls for increasing trust—somehow—may be counterproductive. In that sense, mistrust may be equally important in assessing the "value" of trust. This is particularly important for so-called vertical or hierarchical trust relations, i.e., trust relations in which trustor and trustee are on unequal footing.[11] The trust puzzle, then, is not only to figure out the magnitude of trust levels in any given trust relation, but to assess whether these levels reasonably reflect the different interests at stake in that

[10] These interests do not have to be rational or calculated, as proponents of the rational choice theory would like to have it, nor should they be dismissed as completely irrational, as is sometimes claimed by New Keynesian economists (Akerlof & Shiller 2009: 12). Rather, as is the case with any emotional process, the inclination to trust is also shaped by judgment and valuation. For discussion, see also

[11] Such as the vertical interaction between citizens and the state or other institutions. The distinction between vertical and horizontal trust comes from i.a. Uslaner (1999, 2018).

relation.[12] This problem is all the more bewildering because if trust can be blind, it may be hasty to assess higher degrees of trust as positive. Conversely, lower degrees of trust may be warranted when they express conscious considerations about possible risks or dangers. This observation may appear trivial. Nevertheless, awareness of it seems to be notoriously lacking whenever trust receives mention.

As we shall see at the end of this chapter, and in Chapter 3 in the context of central bank communications, the word trust makes frequent and varied appearances in central bank communications. When, in May 2002, Wim Duisenberg, the first president of the European Central Bank (ECB), stated in his acceptance speech of the International Charlemagne Prize that "the Euro, probably more than any other currency, represents the mutual confidence at the heart of our community," what did he mean? Did he mean that, on average, more individuals in the Eurozone trust the issuer of their currency (since they replied net positively to the question of whether they tend to trust the European Central Bank) and that, in return, the ECB trusts its citizens? Or did he mean that the citizens of the Eurozone trust each other when money exchanges hands? More crucially, what does "trusting" signify in each of these interdependencies with regards to the "cardinal question" of whether "the trust [is] justified"? Perhaps Duisenberg was not even talking about a reality—an observable trust relationship between the users and the issuer of the single currency—but expressing his hopes for the future. How can one tell?

Trying to answer this question by consulting the relevant literature can be frustrating. The analysis of monetary trust has flourished in recent years. It spans sociology (Beckert 2005, Ingham 2012), economics (Aglietta & Orléan 2002, Borio 2019), political economy (Braun 2014, 2016), history (Fontaine 2008, Hosking 2010, van der Spek & Van Leeuwen

[12] This is, I believe, what Walter Bagehot referred to as "the cardinal question" in the quote preceding this chapter.

2018), international relations (Elhardt 2015, Nelson 2017), psychology (Wonneberger & Mieg 2012) and even literary theory (Mallen 2001). One way to cut through the medley of overlapping and recurring debates on trust in money is to distinguish between 1) theoretical (micro and macroeconomic) 2) political (institutional) and 3) empirical approaches. This distinction, which I roughly follow in this dissertation, mirrors the division of labor within monetary economics and traces its relation to matters of public policy and to central banking in particular. There is, however, at least one obvious caveat to separating monetary theory, policy and empirical research with regards to the study of trust and money. This separation impedes a holistic analysis of trust as a three-cornered relation between the users of money (markets), the issuers of money (central banks), and money spaces (states and societies). In other words, hierarchies of trust, which will be discussed in more detail in chapter 2.1.4, risk of becoming neutralized if the trust relation is analyzed solely horizontally, e.g., the trust economic agents have towards each other when *using* money as opposed to the trust citizens *place into* the institutions responsible for creating "trustworthy money".[13]

To regard trust in money in a hierarchical way implies a "philosophy" of monetary trust (Frankel 1977, Hart 1986) that can be distinguished from one in which trust is reduced to interpersonal, or horizontal, relations. The latter view, sometimes called Mengerian (Goodhart 1998) for its indebtedness to the Austrian economist Carl Menger (1892), holds that money, or the function of money as a medium of exchange, is the consequence of

[13] Another way of putting this is to say that the first strand understands trust as an agent-object-agent relationship, the second as an institutional agent-object-agent relationship, and the third as an agents-agents relationship. One of the few studies in monetary economics directly dealing with the topic of trust, *Money, Trust and Banking* by Guido K. Schaefer, calls for an "integrated approach" to the topic (Schaefer 2005: 1). Nevertheless, the chapter "The Problem of Trust Monetary Theory" (Ch. 2), while providing a cursory overview on the developments of monetary theory in the second half of the 20th century, fails to live up to the promise of its title. Not a single paper cited there actually mentions the word trust, nor does the author establish which determinants in the models could be equated with trust. The problem of trust in monetary theory, if there is one, is a problem it shares with money itself: it is too often presupposed.

uncoordinated behaviors of rational agents trying to minimize their transaction costs. Trust, here, is defined as the belief in the acceptance of money: if one agent accepts money, then another agent will accept it as well. There is a nagging circularity to this definition. Trust simply replaces what it is supposed to explain. Why do agents exchange commodities for tokens with no intrinsic value? Because they trust each other. Why do they trust each other? Because they accept useless money tokens.[14] This problem persists in some of the most widely used general equilibrium models (Kiyotaki & Wright 1989). The assumption that agents must trust each other in a general equilibrium model of exchange also makes the function of money as store of value useless. If there were complete trust, there would be no reason for economic agents to hold money, as all exchange could be organized through credit arrangements (Goodhart: 1989; Kiyotaki & Moore 2002). All exchanges of goods could, at least in theory, be repaid at some future date by promising payment of equivalent present value. Once again, there would be little need for money in such a model. This problem has resulted in incorporating money balances into the utility function, and to a complete reversal of the trust assumption. The demand to hold money is now imposed by a lack of trust for which money is seen as a substitute (Gale 1978, 1982; Grimes 1990). However, in

[14] The debate between these two philosophies, vertical and horizontal trust, is closely related to a debate between those who locate the origins of money in a private sector, market-oriented response to overcome the transaction costs inherent in barter, and those who argue that society and the state have generally played a central role in the evolution and use of money. A word of caution with regards to the ideological separation between these two camps: the Mengerian approach used to explain the origins of money, understood as an efficient way of solving the barter quid pro quo—the double coincidence of wants—has long been debunked by historians and anthropologists of money within and outside of economic faculties. While some (Ingham 2004: 19; Graeber 2011: 21; Braun 2014: 190) like to lecture mainstream economists on this working fiction, few economists still hold on to this idea. Thus, already in Issing (1988: 1ff), one can read that the co-called "conventional theory" of the origins of money has been invalidated. Even in Laidler (1999), the first part on "The Origins of Money", which reprints Menger's text, at least questions the "conventional theory" with a contribution by Toni Gravelle (1996), who draws on Simmel and Knapp to provide an alternative to the Mengerian approach. N.B. that Menger himself acknowledged the institutional origins of money in his *Untersuchungen über die Methode der Sozialwissenschaften* ((1969) [1882]: 173ff). It may be much easier to debunk the barter myth than to ask what use there is in introducing money in the utility function.

order for fiat money to be a valued medium of exchange, agents still need to hold a sufficiently strong belief that it is acceptable to a sufficiently large number of other agents. Regardless of whether economic agents trust each other or not, the assumption that they need to trust in money as an acceptable means of exchange thus persists and the circularity problem resurfaces.[15] The first part of this chapter (2.1.1) will be looking at the role trust plays in neoclassical monetary theory. These theories will provide the basis for the micro- and macroeconomic approaches that will be discussed in the next section. The models providing the basis for the microeconomic foundations of monetary economics are divided into search-theoretic models (2.1.2.1) and game theoretical approaches (2.1.2.2), while the macroeconomic models are divided into Overlapping Generations Models (2.1.3.1) and an analysis of trust in the Keynesian setting (2.1.3.2). The choice of these models and theories may appear restrictive or even arbitrary, and there are many more schools of monetary economics that may be more relevant to understanding the overall role of money in the economy. The limitation can, however, be explained because these approaches have, in one way or another, explicitly integrated an analysis of trust in their framework.

At least since the days of Menger, the "circularity problem" (von Mises 1912 [2005]: 99) or *circulus vitiosus* (Simmel 1898 [1958]: 94) has been extensively discussed and criticized. Contemporary criticism is levelled not only from outspoken opponents of the neoclassical tradition (Ingham 2004: 23) but also from free marketeers (e.g., Dowd 1996: 247ff.; Selgin 1994: 809-11).[16] While the former see in it the failure of neoclassical

[15] It is interesting to note that academic debates on trust and money in equilibrium models seem to have always accompanied the history of economic thought until 1990s, when the International Monetary Fund and the World Bank began prescribing independent central banks and the framework for price stability known as inflation targeting to the world economies. If trust "works best when it can be taken for granted" (Carruthers & Babb, 1996: 1556), then the outsourcing of the "cardinal question" from monetary economics to economic sociology can be seen as an indication of the success of these policies, regardless of the question whether it *should* have been taken for granted.

[16] For discussions coming from the neoclassical economists themselves, see, e.g., Kiyotaki & Wright (1992).

economy to account for the political, i.e., hierarchical organization of fiat money, the latter find artificiality in the absence of multiple potential equilibria, which could involve the use of multiple monies or, indeed, no money at all, and hence pave the way for free-banking and/or a cashless society. Both sides—although communication between them is rare—agree that trust or confidence is a badly chosen denominator for a phenomenon more adequately described as coercion, the truth being that, for most of us, the use of money does not feel like much of a choice.[17] In a more hierarchical understanding, trust in money is established not primarily by the readiness of money-users to exchange goods, but by the authority of a sovereign, state or central bank. Thus, hardly any textbook of monetary economics fails to observe that modern fiat money can only exist if there is some trust in the authorities that issue it (e.g., Belton & Rodriguez 2017: 36; Issing 2011: 263; Mishkin 2019: 103).[18] In the oft-quoted words of Hyman Minsky, "everyone can create money; the problem is to get it accepted" (Minsky 1986: 228). Clearly, the state has generally played a central role in the origin, evolution and use of money, i.e., in getting money accepted.[19]

Chapter 2.1.4 will look at the role trust plays in state and credit theories of money. So-called chartalists and proponents of its contemporary modern monetary theoretical (MMT) variant have thus argued that trust in money is secured by the government, which accepts money as the only form of payment of taxes and issues it as payment for the goods and services of its citizens (Knapp 1905: 378; Wray 1998: 12). This state theory of money is closely related to the credit theory of money, which was developed at the end of the 1800s (Macleod 1889, Mitchell-Innes 1914), and provides further insight into the role hierarchical trust plays in the creation of money. Credit theories understand money as a debt contract—

[17] An exception can be found in Dow & Smithin (1999).

[18] Readers of Issing (2011) can find explicit mentions of Knapp's state theory of money in the form of an unusually lengthy discussion in Belton and Rodriguez and of a recommended further reading bibliography in Issing (2011: 17). For more detailed discussions of institutional trust with regards to the ECB, see Issing (2008: 77ff).

[19] For a historical overview, see Graeber (2012).

a promise to pay in the future for something bought today. In this literature, trust is defined first as private trust, such as trust in the debtor to make payments, and second as systemic trust, since debt obligations may be transferred. As a result, a hierarchy of these promises evolves, in which each debt is backed by (or made convertible into) a promise higher up in the hierarchy (Minsky 1986: 226; Wray 1993: 28; Bell [Kelton] 1998: 14). The process of gradual debt transformation is enabled by the banking system, which progressively raises the liquidity of instruments used to discharge obligations. The possibility for banks (and other financial institutions) to transfer debt obligations into liquidity requires a central bank, first to provide a clearing service and second to act as a lender of last resort. Lastly, at the top of the pyramid towers the government, which creates its own liabilities simply by requiring that taxpayers deliver government liabilities in payment of taxes, thereby determining the unit in which all money in the hierarchy is denominated.[20] In this hierarchy of credit obligations, trust is everything but voluntary or naïve. Unequal monetary power relations between state and non-state actors has prompted some scholars to speak of violence (Aglietta & Orléan 2002) and others of coercion (Kirschner 1995, Cohen 1998). But why, then, still use the concept of trust to explain relations in which mistrust would be justified? The observation that social relations of trust persist *in spite of* externally-

[20] Versions of this theory have been said to exist only at the margins of economics, concentrated around a group of "heterodox" economists and economic sociologists (Lerner 1947, Minsky 1986, Foley 1987, Bell 2001, Wray 1990, Aglietta & Orléan 2002, Ingham 2004, Mehrling 2012). Some of these authors (Kelton 2020, Wray 2012) have become better known as propagates of Modern Monetary Theory, which has been widely criticized by mainstream economists such as Kenneth Rogoff (2019), Sebastián Edwards (2019) and John K. Galbraith (2019). As is so often the case, however, the heated debates around this theory appear to be guided more by a peculiar form of academic identity politics and/or politization of ideas—the latter most visibly in the endorsement of MMT by Bernie Sanders and Alexandria Ocasio-Cortez and counter-attacks by i.a. Lawrence Summers (2019)—than by disagreements with the theory itself. Meanwhile, it is easy to find mainstream economists who have defended similar hierarchical views on money. As Robert Shiller (2019) has pointed out, one can find among them Keynes's *The General Theory of Employment, Interest and Money* (1936) and Barro's 1979 study, "On the Determination of the Public Debt". Even Livio Stracca, of the ECB, acknowledges "hierarchies of money" in his *The Economics of Central Banking* (2018: 9ff.). See also Skidelsky (2018) for a Post-Keynesian take on credit and state theories of money.

instituted power relations has prompted some scholars to understand trust as the art of persuasion by, or rather dissimulation of, the monetary authority (Hall 2008, Walter 2011). In these accounts, "trust" is seen as a kind of performative apparatus keeping the unequal processes of money creation hidden (Braun 2014).[21]

While this chapter will thus provide an overview on how the concept of monetary trust has been theoretically analyzed and interpreted in monetary economics, one criterion for evaluating the literature is particularly important for the purpose of this study. This criterion pertains to the literature's awareness of the trust puzzle, defined as the degree to which trust may or may not be warranted amidst the conflict of interest inherent in any given trust relation. This requires an investigation of those factors that determine how conflicts of trust may or may not be resolved. Following different, and sometimes opposing, strands of literature, I hope to show that the trust relation in monetary theory is most often expressed as an interpersonal (horizontal) relationship, and that the institutional dimension, with vertical trust relations implying hierarchies and conflicts of interest, is neutralized or superseded by a view of institutions that adopts interpersonal (horizontal) trust relationships as the institutional framework. In this way, horizontal theories of monetary trust defend a view in which the institutional dimension of money is at once acknowledged and diffused. Monetary theory, and in particular neoclassical monetary theory and its microfoundational developments during the second half of the twentieth century, can thus itself be regarded as a trust-inspiring apparatus in the sense that they foster the belief that money is "natural" and works best without institutions. This conclusion is a necessary step towards understanding the central banks' communicative challenge (Chapter 3) of maneuvering between the diverging interests of its different audiences: the state, the markets and the people.

[21] Niklas Luhmann's notion of trust rests as on such a "presentational" base ensuring that everything seems in proper order. See Luhmann (1968).

2.1 Trust and Monetary Theory

It is a peculiar feat of the conceptual unclarity of trust that economists have again and again defined money as a condition of both trust and distrust. Textbooks of monetary economics thus often point to the fact that in any exchange economy, economic agents must trust each other in order to keep their promises to trade commodities for pieces of paper which do not have intrinsic value.[22] While some texts speak of trust and others of confidence, yet others describe the concept by the action it is supposed to represent in a monetary context such as "keeping a promise to pay," "believing that others accept money," "upholding a contract," etc. Explicit discussions of what is meant by trust beyond such pleonastic statements are rare, which makes trust yet another assumption of economic analysis. Here is a typical non-technical passage from the *Core Economics Project* taught in numerous universities around the globe:[23]

> For money to do its work, almost everyone must believe that, if they accept money from you in return for handing over goods or services, then they will be able to use the money to buy something else in turn. In other words, they must trust that others will accept your money as payment. (Core Team 2019: Chapter 10.1, "Money").

[22] A more utility-based version of this states that money is useless because it cannot be consumed (Hellwig 1993).

[23] According to the CORE website, more than 371 universities have now adopted the book for their introductory economics lectures, among them those visited by the undergraduate students of the present author. See https://www.core-econ.org/universities-using-core/ [last accessed 27.06.2021]. To be fair, the passage continues by pointing to the fact that "Governments and banks usually provide that trust," but introductory textbooks often amalgamate conflicting theories while pointing to neither their incompatibility nor their place in the history of economic thought. In a peculiar instance of such textbook diplomacy, the chapter on money thus starts off with an earnest outline of the double coincidence of wants problem, adding an uncommented reference to Graeber (2012), perhaps the most outspoken critic of the barter myth, in a footnote. What an undergraduate student is supposed to make of this is anyone's guess.

This passage makes a statement about two distinct horizontal trust relations. Economic agents trust *each other* when using money. But they presumably also trust *in money*—"they make money work"—*because* of this interpersonal trust. The sense of obligation—"they *must* trust"—is not derived from institutional, legal or conventional authority but from behavior, belief or preference, —trust in others—the latter again defined as the willingness to accept money. There appears to be an "impregnable circularity" (Robsinon 1962: 48) to such a claim. Why do people trust money? Because they trust each other. Why do they trust each other? Because they trust in money.[24] Economists have traditionally sought two different solutions to breaking the circularity of this argument. Both solutions have been interpreted on the basis of the works of neoclassical economists.[25]

In the first approach, pioneered by Léon Walras (2.1.1.), the circularity of the argument is dismissed or, better, embraced, on the grounds that money is essentially neutral. The goal of Walras's monetary theory was to investigate whether a rise in the quantity of money changes the relative prices in an economy in which money pre-exists agents.[26] This gives a rational foundation to his theory of the control of money supply. To integrate money into

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[24] This type of methodological circularity is not uncommon in economics and has been the result of much debate from Marx, who criticized that economics (*Nationalökonomie*) "…takes for granted what it is supposed to explain" (Marx 1844 [2008]: 55 and [1964]: 106 for the English translation); to Joan Robinson, who famously observed "*utility* is the quality in commodities that makes individuals want to buy them, and the fact individuals want to buy commodities shows they have *utility*" (Robinson 1962: 48); to Amartya Sen, who stressed that "Behavior, it appears, is to be explained in terms of preferences, which are in turn defined only by behavior'' (Sen 1977: 325).

[25] For a historical discussion, see Ritzmann (1999). Arena and Gloria-Palermo (2008) and Álvarez and Bignon (2013) provide a useful illustration of the differences between Mengerian and Walrasian theories of money. Here and below I use the term "neoclassical" in the sense of Veblen (1900), who coined the term to include both Austrian economists and marginalists. For a useful distinction between different schools of marginalism, see Pribram (1986). Although I do not pretend to adhere to Streissler's argument to de-homogenize Jevons, Menger and Walras (Streissler 1972), I will try to allude to differences and similarities where applicable. See also Jaffé (1976) for discussion.

[26] Steiger and Patinkin (1989) initiated a research program to search for the origins of the term "neutrality of money" as used to state that relative prices are unaffected by a rise in absolute prices. Shortly after, Boyanovsky (1993) showed that the term "Geldschleier" was first used by Böhm-Bawerk in his *Positive Theorie des Kapitals* (1889).

value theory has come to be known as the Walras-Hicks-Patinkin tradition (Ostroy & Starr 1990). In this tradition, money is seen only as an exchange technology and a measuring rod or *numéraire* representative of the value of the commodities against which it is exchanged.[27] Money does not emerge from the trading situation, but is exogenously introduced to facilitate transactions. Trust certainly does not play any explicit role in this tradition. However, unlimited trust between economic agents has been considered an implicit condition for the Walrasian framework "to work," even if it may also make money unnecessary (Hahn 1973a, Arrow & Hahn 1971). From a methodological point of view there is no circularity, however; rather, there are several deductive justifications, each relying on their own assumptions.[28] Alongside perfect foresight, continuity, convex and monotone preferences, etc., trust is just another one of those assumptions, a psychologization of the equilibrium configurations of the model. That is why in the Walras-Hicks-Patinkin traditions, trust is also sometimes considered to act *like* money. Money supposedly lubricates economic life (Samuelson 1968: 3) in a similar way that trust lubricates social life (Putnam 1993: 38).[29]

In the second approach, pioneered by Carl Menger, the circularity charge is recast as a problem of infinite regress. If everybody trusts because everybody else trusts, who started trusting first? Clearly there must have been a point in history that started this process. For Menger, money evolved from a coordination process based on trust which, at first, was to be found between traders who were acquaintances, but eventually came to be a trust between traders and society itself. In this theory, money emerges endogenously out of a

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[27] Adam Smith, who mastered the art of economic metaphors, referred to this as the "wheel of circulation" (1776 [1976]: 289 and 291].

[28] Whether the assumptions in Walras's model are empirical (realist) or theoretical (pure) is of course decisive and the object of much debate with, e.g., Bridel (1997) representing the theoretical camp and Walker (1996) the empirical one.

[29] Hans-Michael Trautwein has synthesized this idea nicely when discussing "the standard view of money as a requisite, but essentially neutral lubricant of economic activity" (1993: 65).

trading situation in which the most liquid (or "*saleable*" in Menger's original term) asset becomes money. Here, horizontal trust relations between agents are granted an explicit explanatory role, describing a behavior (money exists if it is collectively accepted as money) and a belief (money is collectively accepted as money only if it is money). Building on Menger and his idea of interpersonal trust, a renewed interest in modelling monetary trust as an evolutionary process started in the 1980s and '90s. Kiyotaki and Wright's search-theoretic approach (1989, 1991, 1993) is the most famous of several attempts to model an environment in which agents are willing to accept fiat money under the condition that they expect others to accept money as well (Jones 1976, Iwai 1988, Oh 1989). In equilibrium, no one has an incentive not to accept money if all others do.[30] Loosely following Goodhart (1998), I will call this line of thought the Menger-Kiyotaki-Wright (2.1.2.1.) tradition. In this tradition, trust *creates* money in a positive feedback loop. The more people believe that other people can generally be trusted, the more they trust in money.

Understanding money as trust has a longstanding history in monetary theory, but one that did not go uncontested. Indeed, before the neoclassicals had determined that money transactions would collapse without trust, a different breed of *homo œconomicus* was prevalent, one whose distrust in the users of money gave rise to the thing itself. For Rice Vaughan (1675 [1933]), John Locke (1691) and Henry Thornton (1802), humans were considered too frail, prone to sin, corruptible—in short, untrustworthy—to trade without some form of protection. Money, it seemed, shielded the market against dishonest, irresponsible persons, inefficient laws and corrupt governments. With the notable interruption of neoclassical theory, the idea that money exists because of a lack of trust would play a role

[30] Of course, forcing a model's agents to positively value fiat money in order to trade not only evades the question (shouldn't rational agents object to coercion?) but also sacrifices the barter equilibrium. As we shall see below, models that introduce a probability function representing the degree to which economic agents are willing to accept money are essentially non-Walrasian (and question-begging).

again some three centuries after Vaughan when, in 1978, Douglas Gale proclaimed that there is no reason for economic agents to expect benevolence from utility maximizing individuals. Something must ensure that transactions are carried out in full, that promises of payment are kept and commodity contracts fulfilled. That thing is money. The non-cooperative solution of game-theory (Shubik 1975, 1999), in particular, was thought by many to finally provide the necessary microfoundations for monetary theory that had eluded the Walras-Hicks-Patinkin tradition. Kiyotaki and Moore finally concluded that "evil is the root of all money" (2002: 64).[31] Reminiscent of pre-industrial thought, we can thus now also find textbooks that claim, "Money would not be required in a world where everyone was known to be utterly trustworthy" (Dasgupta 2008: 912). I will refer to this approach as the Vaughan-Gale-Shubik (2.1.2.2.) tradition.

In both the money-as-trust and money-as-distrust approach, two different claims about trust and money are being made. The first claim regards the trustworthiness of other people, where one theory holds that people can generally be considered trustworthy exchange partners and the other theory says that they cannot. According to the Menger-Kiyotaki-Wright variant of the first theory, it is only because economic agents learned to trust each other that they invented money and that others accepted it in turn. Here, money is not so much a security against risk and the unpredictability of others but a consequence of a rational weighing up of costs and benefits, where trust and the use of a single medium of exchange provide a computable advantage over mistrust and, of course, barter. According to the second theory, money is necessary as a guarantor for transactions to be upheld when it may be more reasonable to assume that they would not otherwise be. This, the theory holds, may not have been a problem in small communities or societies, where it was possible to know whom to trust. In large societies with anonymous markets, impersonal trust entails that

[31] In apparent contradiction with their earlier claims and the Mengerian tradition.

market actors have to voluntarily accept being vulnerable to others while renouncing control to the person to whom delegation has been given (Hardin 1991, Shapiro 1987). Money solves this problem *qua* its status as a contractual obligation.

Both theories also make a claim on monetary trust that appears to be independent of the interpersonal trust between the users of money. The theories agree in that all economic agents have to trust *in money* regardless of whether they trust *each other* or not.[32] And so the circularity problem returns. Before economic agents can use money, they must trust in it, but before they can trust in it, they must be assured that it can be used. As such, neither theory can give an account for who or what guarantees that trust other than the observation that money is, indeed, being used (if at all). But this, it seems, is precisely the point. In both theories, trust in money thus emerges as, or is assumed to be, a necessary byproduct of trade. Money, in other words, did not acquire trustworthiness by command but through "natural" economic activity and is not, therefore, a phenomenon deriving from the state or social institutions but from economic activity itself. It is hard not to find here a deliberate effort to attribute institutional responsibilities to individuals or to reduce the work of institutions to ensuring that individuals can engage in economic activity in a way that will naturally bring such institutions about.[33] For this reason, monetary trust has been described as the result of a performative "naturalization of money" (Carruthers & Babb 1996: 1558; Ingham 2004: 79-80; Braun 2014: 195ff; Beckert 2016: 107ff), i.e., the institutionalized belief that money works best without institutions.[34]

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[32] As mentioned above, such confusions about the direction the specific trust relation is pointed towards—the trust economic agents have towards each other when *using* money as opposed to the trust citizens *place into* "trustworthy money"—sometimes makes it difficult to conceptually distinguish between different theories.

[33] A plethora of biological metaphors continues to plague monetary discourse. See, e.g., Hodgson (1993) and Mirowski (1991) for the influence of natural sciences on neoclassical economics.

[34] All of these authors rely on Mary Douglas' *How Institutions Think* (1986), where she claims, e.g., that the "high triumph of institutional thinking is to make the institutions completely invisible" (1989: 98).

The exchange theory of neoclassical economics managed to "naturalize" monetary trust by focusing on horizontal trust relations between individuals. Most importantly, and in spite of its variations, it can neither give an account of the credit-nature of money nor of the hierarchical structure of the monetary system. The idea of a stable monetary invariant guaranteeing the predictability of price levels lies at the end of a chain of reasoning in which monetary trust exists without authority, disembedded from any social institution. However, in order for these horizontal trust relations "to work," they need to be themselves established and maintained as social and institutional facts. As a "narrative," the horizontal account of monetary trust effectively conceals how money really works. In that sense, the political project of outsourcing monetary trust away from governmental control and accountability towards a regulatory body that could conceal or do away with the process of money creation—"the industry of credit and discount," in Walras's terms—thus starts with the neoclassical attempt to "naturalize" the social relation of money.[35]

This view can be contrasted with theories in which money is not neutral and monetary trust a question of vertical or hierarchical relationships. These theories recognize that money and monetary policy directly influence the economy. The circularity of the question of why people trust money is broken on the grounds that trust is a question of monetary authority. This turns monetary trust into a political problem instead of an interpersonal solution. John Maynard Keynes's monetary theory, although never fully developed into a theory of monetary trust, recognizes the importance of sovereignty in determining the rules of the monetary system, which in turn impact the confidence of the population (2.1.3.2). Keynes's observations on the interest rate as based on a "state of confidence," itself determined by economic policy and conventions employed in financial markets, departs from

[35] Mirowski has called this a "working fiction" (1991: 580). See also Crosser (1958) for a similar idea.

the neoclassical framework of analysis. Unlike the interpersonal trust relations of the neoclassical tradition, Keynes's discussion of confidence and monetary policy thus stressed the social and institutional dimensions of trust and the importance of uncertainty, expectations and authority. However, Keynes was ambiguous in his formulation of this "state of confidence," which he sometimes saw determined by the monetary authority (implying hierarchical trust) and other times by "animal spirits" and the portfolio decisions of individual market actors (implying vertical trust). The latter interpretation gave rise to a neoclassical interpretation of Keynes, while the former was at the heart of post-Keynesian analysis. Keynes's dilemma was to bring together two opposing concepts of money, one in which money was to function as a social link and public good whose value represented cohesion and the good functioning of society; and one in which money represented individual power struggles such as microeconomic risk management, capital accumulation, financial competition, and the struggle over output and pay. By taking a closer look at Keynes's ambiguous formulations on the "state of confidence" in his *General Theory*, this section analyses how this dilemma can only be resolved by acknowledging the political power of the monetary institution and instituting the corresponding project of Keyensian welfare economics.

Though markedly influenced by Keynes, state and credit theories of money go even further in their understanding of trust as fundamentally constituent of monetary theory. Economists of the French school have notably elaborated their theories with trust and confidence at the center, distinguishing three conceptual divisions of methodical, hierarchical and ethical confidence. The final section of this chapter (2.1.4.) discusses these theories in relation to contemporary Anglo-Saxon credit and state theories of money, along with the sociological and anthropological traditions that have nourished theories of trust in economics. Two conclusions can be identified that are shared by most scholars working in this field: first, that monetary trust is not simply interpersonal (horizontal) but is in fact principally

impersonal and hierarchical (vertical). If money is seen as a form of state-legitimized debt, trust is above all a question of institutionalized social relations, hierarchically structured according to liquidity and enforceability of monetary obligations. This hierarchical organization of creditor-debtor relationships is not functional but implies competing interests among social groups within the hierarchy. Second, where trust relations are neither horizontal nor interpersonal, but is essentially vertical in their social and institutional dimension, trust in money becomes a question of making the resultant hierarchies socially acceptable—a matter of trust-building.

2.1.1 Trust and Neoclassical Monetary Theory

As is well known, the neoclassicals started from the idea that money solves a double coincidence of wants problem, an idea that survives in numerous economics textbooks (such as the one quoted in the opening of this chapter) as well as in "what-is-money" briefs that central banks provide for the general public (Banque de France 2009: 4; Bundesbank 2017: 9; ECB 2009: 12).[36] Dismissing the Aristotelian notion that monetary trust is a question of law or convention, the neoclassicals argued that money emerges as a spontaneous solution to the problem of a double coincidence of wants in a barter exchange system.[37] Once money is introduced into the economy as a pure medium of exchange, the trust problem emerges. Economic agents must trust *each other* in order to keep their promises to trade commodities for pieces of paper which do not have intrinsic value, and for that reason they must trust *in money* since money seemingly does not have any value on its own. This idea of the necessity of trust can be traced back to the founders of neoclassical economics: Stanley Jevons, Léon Walras, and Carl Menger. For these early thinkers, trust seemed to provide one possible answer to the quest for money's foundations, one that was more closely in line with the newly discovered theory of marginalism.[38] Instead of defining money through social structures or historical contingencies, like the classicals had done, this approach allowed economists to derive models from first principles such as utility, scarcity or marginal products. Classical economists like Adam Smith, David Ricardo and Karl Marx had, of course,

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[36] The Banque de France and the ECB have since abandoned the historical version of the barter myth (as of 2021). Only the Bundesbank appears to hold on to it.

[37] For a detailed account on monetary trust in ancient Greece, see, e.g., Seaford (2004: 145ff) and Schumpeter (1954 [1981]: 62ff) for Aristotle's impact on 19th century economic thought.

[38] It is interesting to note that such foundational quests and the circularity problem they exhibited were a sign of the times. One cannot fail to note the similarities in the developments of mathematics during the last third of the 19th and early 20th century, of which the *Grundlagenstreit* was one culmination.

derived the value of money from the costs of production, principally labor.[39] For the marginalists, however, money's value was underpinned not so much by working hours, commodities or the physical properties of money as by an implicit guarantee given by the community as to the acceptability of money in a stable ratio of exchange for goods and services. In this respect, I also hope to show that neoclassical monetary theory is not only a commodity theory of money, as is often claimed. The appearance of credit money in the 19th century made it increasingly difficult to sustain the idea of money as a universal, invariable standard. Walras could not have been clearer when he remarked, "The word franc… is the name of a thing which does not exist" (Walras 1874: 188). Neoclassical ideas on what makes people accept intrinsically useless fiat money; what, if anything, gives fiat money its value; and what institutional conditions need to be fulfilled for fiat money to become widely accepted continue to shape contemporary monetary theory. Indeed, as Schmitz (2001), Bridel (2002), De Vroey (2004), Cartelier (2018) and others have shown, the development of recent monetary theory parallels the development experienced in neoclassical theory.

It is often claimed, and not without regrets, that the neoclassical exchange model barred money from playing a role as a *social* institution (Bridel 1997, Maks & van Daal 2012, Dodd 2014). For one, the methodological individualism of the neoclassicals—a shift in focus away from objective forces of production towards the subjective nature of individuals' "preferences"—was programmed to preclude institutional analysis from the agenda. Furthermore, the advent of "pure economics"—the one-sided focus on grounding economics on solid mathematical foundations—removed the "politics" from Political Economy, as the discipline was still called in the late 19th century (Strange 1984) leaving little room for

[39] See De Brunhoff and Foley (2006) for an assessment of Marx's indebtedness to Smith and Ricardo as well as references therein.

studying the relationship between economic and political institutions.[40] However, to acknowledge that money, when integrated into value theory, is only used for the circulation or transactions, that it is reduced to a neutral veil, that it is an "optional add-on" (Ostroy 1989: 188), etc., is one thing. To say that this precludes money from playing an institutional role, or relegates it to "no role" at all (Hahn 1984 [1973]: 160), is quite another.[41]

Indeed, none of the three founders of neoclassical economics ignored the institutional implications of their theory. On the contrary, they were well aware that the "ideal" exchange model requires a "real" institutional and political set-up in order to work.[42] This institutional setup did not resemble a *laissez-faire* economy, nor was it determined by a government monopoly position. Walras argued at length against the principles of laissez-faire. For markets to maintain equilibrium, which Walras thought threatened by nothing less than "the industry of credit and discount" (Walras 1898: 368), required a framework of rules underpinned by legislation with a "universal" legal-tender money (*billon régulateur*) controlling the price level.[43] Similarly, Jevons wanted to endow a government commission with the judicial power to publicize a "tabular standard" (an early form of price index) and install a "true international money" (Jevons 1875: 33). Even Menger, although he was arguably opposed to the idea of an equilibrium and far more skeptical of the government than either Jevons or Walras, thought that active cooperation among states was necessary to maintain

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[40] In this regard, it is telling that William Jaffé's 1954 English translation of Walras's *Éléments d'Économie Politique Pure* omits the political from the translated title (*Elements of Pure Economics*). In the second edition of his *Theory*, Jevons wanted to change the title of his book "to discard, as quickly as possible, the old troublesome double-worded name of our Science" (1879: xiv-xv).

[41] See also (Cartelier 2018: 9).

[42] As so often, Schumpeter was aware of this (1954 [1981]: 1044).

[43] In the original: "Donc l'industrie du crédit à l'escompte avec émission de billets de banque n'est pas une industrie comme une autre; c'est une industrie qu'il faut réglementer et non laisser libre."

price stability.[44] All three authors thus advocated for a regulatory authority responsible for maintaining a stable price of money through a permanent mechanism of monitoring and intervention of the money supply.

This can hardly be called a theory without institutions. It is, however, an institutional arrangement of a peculiar kind. It is true that neoclassical economics focused first and foremost on horizontal relations between individuals: a collective consensus maintained in an equilibrium of self-interested competition. In this sense the institutional organization of neoclassical economics was minimally characterized as informal, horizontal, and decentralized. Yet these decentralized relationships were themselves dependent on a set of centralized rules which the theory could not account for on its own. These rules regarded the assumption of a unique medium of exchange, a centralized authority of information to suggest prices, and another (or the same) authority to change prices according to the principle of supply and demand. It is not hard to see how these rules are reflected in the "real" institutional framework outlined above. In its extreme formulation, it tended towards a single world currency, an omniscient index to communicate prices and a centralized authority to control the quantity of money. To maintain that such an economy is informal, horizontal, and decentralized in the presence of such rules is problematic, if not self-contradictory. It contains a strong element of "naturalization," in the sense that the institutional setup is supposed to follow from theoretical results expressing "natural" economic activity even though they are both clearly dependent on artificial rules.

This has resulted in a paradox, a form of "benign neglect," in which "the institutional dimension in neoclassical theory is both acknowledged and defused" (De Vroey 1990: 236

[44] Menger's reputation as a liberal anti-statist economist is certainly due to Friedrich Hayek's reception of his works, the limited availability of English translations of his publications (in particular the revised editions of his *Principles*), as well as a one-sided reading of his works by certain academics. Hodgson (2001), Campagnolo (2005) and Ikeda (2008), among others, have tried to rectify this.

and 1998: 215). Some would even see in it a deliberate effort to "forget about" (Carruthers & Babb 1996) how the economy really works, in particular with regards to the process of money creation in the presence of large-scale credit systems and the capacities of a centralized authority to control the money supply. Either way—neglected, taken for granted or forgotten—neoclassical monetary theory certainly opened the doors for a certain idea of money, one in which trust in money was a question of mutual trust among the users of money and the "neutrality of money" a political responsibility delegated to regulatory bodies or non-majoritarian institutions.

In the first chapter of his *Money and the Mechanism of Exchange* (1875), William Stanley Jevons asks how it is possible to exchange "worthless bits of material" (1875: 32) for goods, and why, given the obvious benefits to its users, did this development, the invention of fiat money, take so long?[45] The reason why money exists, Jevons famously quipped, is because it solves the "double coincidence" problem (1875: 4-5). That is, without money, trade is restricted to barter transactions. Since it is difficult to find a trading partner who happens to want precisely what someone else has to sell and vice versa (a double coincidence), barter exchange is inefficient. While this story has been retold to the point of tedium, so has its criticism.[46] Suffice it to say that irrespective of the evolutionary narrative (first barter, then money), the rational narrative in the argument (money lubricates economic transactions) may still hold true. Money may facilitate transactions even in the absence of anyone having ever observed "uncivilized races" swapping "sago cakes for fish"

[45] This would later be known as Menger's paradox, i.e., "an answer to the question of why someone should be ready to exchange his goods against apparently useless little metal disks" (Menger 1892: 239; 1909: 26). The term appears to have been coined by Jones (1976: 757), although he writes "mystery," but is attributed by Clower as "Menger's paradox" (1977: 206). See also infra.

[46] As for criticism, in primitive societies, exchange was not done principally, or even at all, for economic reasons and so the nonexistence of a double coincidence of wants was not a problem. The distinction between "general-purpose money" and "special-purpose money" follows (Polanyi 1957). There appears to be sufficient reason to believe that, pace Jevons et al., money came into existence precisely through obligation, and most often by force, of states. See, e.g., Einzig (1966), Humphrey (1985), Ingham (2004) and Graeber (2011).

(Jevons 1875: 2).[47] Instead of relying on historical assumptions, as we shall see, this argument relies on a set of psychological, behavioral and institutional assumptions that conform to the horizontal trust relations described above, i.e., mutual trust *between* economic agents and trust *in money* based on these relationships. If, then, the idea that a monetary economy is more efficient than a non-monetary economy is also a fiction, it needs to be one of a different kind.

Still in the first chapter, Jevons goes on to observe that "Since money has to be exchanged for valuable goods, it should itself possess value, and it must therefore have utility as the basis of value." (1875: 32). However, to incorporate money into marginal utility analysis proved to be more difficult. In Jevons's exchange model the marginal utility of some commodity to be sacrificed is evaluated by comparing it to the anticipated pleasure of another commodity that can be obtained in exchange, and so on and so forth. For instance, barterers can compare the marginal utilities of more t-shirts and less jeans because these commodities can be directly consumed and afford expected satisfactions that can be ordinally and cardinally scaled. The same does not hold for money. In neoclassical economics, money can only satisfy a need or a desire through the fact of being exchanged, and the neoclassical consumer can appreciate the loss of utility of spending more money only by imagining the other commodities he or she could have purchased with each money unit that had to be renounced in order to procure, for example, the *N*th pair of jeans. Applying this mechanism to money, however, yields circular satisfaction. The marginal utility of money cannot determine the value of money because the marginal utility depends itself on that value. The barterer cannot tell how much utility he will obtain from an extra unit of

[47] This distinction hardly ever gets made, e.g., in Graeber (2011). In this regard, it should also be noted that the initial "barter myth" in Adam Smith's *Wealth of Nations* (Smith 1776 [1976]: I.IV "Of the Origin and Use of Money") may not have been intended as an empirical observation at all, but as what Dugald Stewart called "theoretical or conjectural history" (Stewart 1793 [1980]: 293), in which observations about the past serve the purpose of rational reconstruction and evidence is irrelevant. Hahn's term "theoretical history" (1987: 24) makes a similar point.

money unless it is known what the extra unit can buy. If money is exchanged, it is thus not money itself that is priced, but the commodities it stands for.[48] This circularity problem was well-known to economists of the time who tried to apply marginal utility to the theory of money. The first one to addresses it was Karl Helfferich, a student of Georg Friedrich Knapp, who in the volume *Geld und Banken* for the *Hand- und Lehrbuch der Staatswissenschaften* tacitly observed that "marginal utility already presupposes a certain market value of money, so that the latter cannot be derived from the former" (1903: 488). Others critics soon followed.[49] But even before Helfferich, Jevons abandoned the idea that money has marginal utility. Directly following the passage quoted above, he thus continues, "Money…is only received in order to be passed on, so that if all people could be induced to take worthless bits of material at a fixed rate of valuation, it might seem that money does not really require to have substantial value" (1875: 32). This enabled Jevons to

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[48] Alfred Marshall was the first author to derive demand curves from utility functions. In Mathematical Appendix II of his *Principles of Economics* (1890: 690), he gives the equilibrium condition for the consumption of a commodity x as $MU_x = p_x MU_n$. Taken across all goods this gives the equimarginal principle (1.1)

$$\frac{MU_x}{p_x} = \frac{MU_y}{p_y} = \frac{MU_z}{p_z} = MU_n,$$

where MU_n, is what Marshall calls "the marginal utility of money." This is misleading, however, because Marshall's equation does not express the marginal utility of money but of commodities and their prices (money being spent). Expenditures, of course, are nothing other than purchases, and expected expenditures are planned exchanges. And so "the marginal utility of money" is but a fancy way of denoting the ordinary "marginal utility of expenditure." Since exchanges aim at satisfying consumption, it amounts to saying that money is a substitution operator. Like in Jevons's original model, the consumer does not contemplate the marginal utility of the units of money that he or she has given up in order to purchase a pair of jeans because neoclassical money exists in order to be spent. Money is not desired in itself—it has no intrinsic utility—but only as a means of procuring other things. This will be the path taken by Walras (see infra).

[49] The competing German monetary theories of the time are summarized in Howard Sylvester Ellis's still-excellent *German Monetary Theory 1905-1933* (1934). See also Knut Wicksell: "Money itself has no marginal utility, since it is not intended for consumption" (Wicksell 1906 [1934]: 20); and Joseph Schumpeter, who remarked that the marginal utility theory of money "presuppose[s] certain exchange relations between money and commodities, i.e., the purchasing power which they are supposed to explain" (1908: 649). Schumpeter thought that only a state theory of money could break the vicious circle. An overview can also be found in Hirsch (1928: 114ff).

simultaneously devise a way to measure utility by means of the "familiar measuring rod of money" (Stigler 1950: 317) and to deny that the value of money can be measured through utility.

And so, the question of what "induc[es] people to accept money" remained unanswered (1875: 32). In a later chapter on "Coins," Jevons provided a more political explanation. He observes that "Every civilized community requires a supply of well executed coins, and there arises the question, how should this money be provided?…Can we trust to the ordinary competition of manufacturers and traders to keep up a sufficient supply of such coins, just as they supply buttons or pins and needles? Or must we establish a government department, under strict legislative control, to secure good coinage?" He then discusses Herbert Spencer's case for free banking, the belief that "coinage should be left to the free action of competition" (1875: 64).[50] Continuing his trust analogy, he asks whether, "as we trust the grocer to furnish us with pounds of tea, and the baker to send us loaves of bread, so we might trust Heaton and Sons, or some of the other enterprising firms of Birmingham, to supply us with sovereigns and shillings at their own risk and profit." (1875: 64). For Jevons, private banks should not be granted the role as issuers of money. "The matter had best be left…to the executive government and its scientific advisors" (1875: 65-6). Here, Jevons clearly locates the establishment of trust in money in the realm of the government, although one should take note of the unelected body of "advisers". For Jevons, the "decision of experts" inspires more confidence than "party struggles or public opinion" (1875: 66). However, this form of hierarchical trust does not seem to play a role in his utility theory (of money) and it remains the only passage in *Money and the Mechanism of Exchange* in which trust is explicitly mentioned and understood as a role of the state or, even better, of a government-sanctioned committee of experts. In other parts of the book, he prefers to write

[50] See in particular Chapter 29 of Spencer's *Social Statics* (1851).

about "acceptance" (1875: 79), "persuasion" (1875: 204) and most often about a "force of habit" (1875: 78ff) or "custom" (1875: 74), where it is ambiguous whether these customs have political or individual motivation. In the section called "The Force of Habit in the Circulation of Money," he appears to foreshadow Menger's theory of money as a network effect. He states, "The sole question…on receiving a coin is whether similar coins have been readily accepted by other people" (1875: 78), but does not further pursue this idea.

In the last analysis, Jevons still believed that trust in money had to be explained through the exchange model. He clarifies, "The essential point is that people should be induced to receive money, and pass it on freely at steady ratios of exchange for other objects" (1875: 32). He explicitly refuted state and legal theories of money, writing, "Certainly, in the early stages of society, the use of money was not based on legal regulations, so that the utility of the substance for other purposes must have been the prior condition of its employment as money….It is doubtful whether the most powerful government could oblige its subjects to accept and circulate as money a worthless substance" (1875: 32-33). This appears to contradict the passage in the chapter on "Coins" quoted above, where the responsibility for money's acceptability was in the hands of government and technocracy. Why, then, did he insist on this narrative? It enabled Jevons to deduce the existence of money, qua social evolution, from the exchange model. If money originated *because* of the need for more efficient economic exchange, money no longer had to be introduced as a technology of exchange or institutional set-up *exogenously*, or outside of the exchange model. To grant money such an outside role conflicted with the requirements of "pure theory" and the scientific methodology of the neoclassicals, in which each term in the model was to depend on the model's own arguments.[51] "Economics," Jevons announced at the beginning of his

[51] It is interesting to note that Jevons was, in part, arguing against the traditions of the English historical school of economics, which argued that inductive historical investigation must come

Theory of Political Economy, "if it is to be a science at all, must be a mathematical science" (1871: 3). Later, Léon Walras would surpass Jevons in providing an exchange model that fulfilled this task. Integrating money into Jevons's own model proved to be untenable, as we have seen, where it ended up being neither exchanged, supplied or priced. But clearly, he wanted money to be more than a fixed circulation device. The evolutionary narrative appeared to bridge the gap between the methodological constraints of Jevons's economics exchange model and his desire to make sense of the existence of money from the point of view of economic transactions.

Nevertheless, it would be hasty to conclude from this that money has no role to play, that it is useless or "that no attempt is made to specify a medium of exchange or to discuss the function of government" (Schabas 1990: 39, 95). On the contrary, Jevons was well aware that his theoretical exchange model came with its own set of institutional assumptions. In the chapter on the "Theory of Exchange" of his *Theory*, he cites among these assumptions "a pure regard to his own requirements or private interests," "perfectly free competition" and "perfect knowledge of the conditions of supply and demand" (Jevons 1871: 85-6). These assumptions are not hypotheticals. Jevons explains that "The theoretical conception of a perfect market is more or less completely carried out in practice" by "complete *consensus*" (1871: 87, emphasis mine) among participants. The institutional setting of Jevon's exchange model is thus defined as a tacit constraint, which ultimately defines various equilibrium positions and provides a workable mechanism for Jevons's theory to become operable. It is not itself officially organized or regulated but is predicated on the benevolent cooperation of individual participants.

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before the mechanics of self-interest and utility. See, e.g., Peart (2001). This connects Jevons to Menger and the *Methodenstreit*. See Grimmer-Solem and Romani (1998) and Hodgson (2001) and infra.

After having thus established a foundation for both money and his exchange model, Jevons gradually moves up the ladder of economic activity. There is a clear teleological narrative in *Money and the Mechanism of Exchange* in which money becomes more and more "representative" until it is institutionally rendered unnecessary by the gradual extension and perfection of a "clearing system" (1875 [1884]: 298).[52] Starting with barter, money is first introduced to facilitate exchange between two individuals. Here, as we have seen, monetary trust is underpinned by economic agents seeking efficiency, but also by the inherent properties of the currency in use, the most "stable" of these being precious metals such as gold. As markets become more complex, other money forms are introduced, such as gold-backed fiat money, promissory notes as well as different kinds of checks and credit documents. Large global markets and the banking system make "true international money" necessary, coupled to "a national tabular standard of value" (Jevons 1875: 329ff) in which "gold will cease to be the medium of exchange".[53] Once proposed, Jevons thought that this monetary system would be adding "a wholly new degree of stability to social relations" (Jevons 1875: 333). He also believed that the idea would be adopted voluntarily and rapidly, with government's role in the matter limited to the regular publishing of index numbers and indexed contracts recognized by law. At the end of this narrative lies a clearing system, a set of relationships among banks that causes all of the checks and bills to a be settled in a single place, a "room of moderate dimensions" located in the London Clearing

[52] In *MME*, Jevons only briefly discusses his ideas on the "tabular standard" in Chapter XXV (1875: 326ff) and "international money" is mostly referred to with regard to an international gold standard. As Laidler (1982: 330ff and 1991: 173ff) has shown, Jevons was conservative with regards to monetary policy, defending the Gold Standard and the Bank Charter Act of 1844, which restricted note-issuing to the Bank of England and secured the convertibility of bank notes into gold. However, in his posthumously published "An Ideally Perfect System of Currency," he clearly defines international money as a fiat currency stabilized by his tabular standard. The same can be said of Walras, whose "*billon régulateur"* was not intended to be equal to its intrinsic metallic value.

[53] Jevons's bases for the "tabular standard" are the works of Joseph Lowe (1822), George Julius Poulett Scrope (1833) and George Richardson Porter (1839).

House (1875: 263ff). In the Clearing House, all transactions are claims denominated in a single unit of account, but customers no longer need to transport coin (or other precious metal) themselves when making/receiving payment in settlement of a purchase/sale of goods and services.[54] This "vast system of relations" reflects the institutional assumptions from his theory of exchange. Jevons remarks that "it has grown spontaneously, uninvented, unauthorized by the legislature, and only recognized by the judges when firmly established as a matter of business custom," adding that "no Act of Parliament has been passed to facilitate the operations of clearing" (Jevons 1875: 283).[55] This "perfect" system, in which moneyless bookkeeping functions as money matches the "perfect" system of monetary representation in Jevons's exchange model (Jevons 1875: 260). Nothing, not even gold, whose value could not only greatly "vary" but also be "misapplied, purloined, or lost," would ever exchange hands (Jevons 1875: 45, 293).

And so, we have come full circle. Money "double[s] the trouble" (Jevons 1875: 3), as Jevons had feared in the opening pages of his book. Ultimately, money is most "perfect" when it is merely a "harmless voucher" (Weber 1921: 41), or the quantity of the good used as the nominal unit of account.[56] Economic activity is as efficient, and perhaps even more efficient, without monetary relationships as it would be with them. There is, then, an obvious "paradox" in the institutional setup of this economy. Although it relies on a *universal* standard of value and a *centralized* system of accounts, it is supposed to be spontaneous, horizontal and decentralized. Monetary trust is assumed to be a conventional behavior that

[54] For a history of how central banking evolved out of the development of clearing houses, see, e.g., Norman, Shaw and Speight (2011) and Gorton (1985).

[55] It is interesting to note that the voluntary development of Clearing Houses (Jevons's fascination for "spontaneity") is understood by some as empirical evidence for the self-regulating power of markets; see, e.g., Timberlake (1984: 14). As, e.g., Goodhart (1988) shows, what held banks serving as clearing houses back from becoming full central banks was a conflict of interest between their public roles and their commercial incentives, and the reasons for state intervention stemmed from a desire to bolster trust in the integrity of the monetary and financial system.

[56] Like Schumpeter, Max Weber uses the German word *Anweisung* (claim).

does not rely itself on any centralized institution or coordination process. In that way Jevons "naturalized" economic institutions. Understood in purely horizontal terms, their norms simply replicate the lower bonds of the economic sphere. Modern economics institutions such as central banks, from this perspective, become depoliticized entities embodied in horizontal networks of economic activity, in which participants are interdependent, but formally autonomous. This institutional arrangement is minimally characterized as informal, decentralized and horizontal, yet bound by a centralized system of rules that tend to simultaneously originate from, create and sustain durable and routinized patterns of "natural" behavior. One effect of this paradox is that it hides or forgets that this behavior is itself embedded in institutions. In the case of asymmetrical relations of power, it can even make it easier to pretend that they are natural and objectively real, while benefiting some and harming others. That it may be easier to believe in a "complete consensus" than in the power of "the law…to restrict…the freedom of making and selling promises" when it "gives scope to illegitimate speculation, or otherwise injures society" (Jevons 1875: 211) did not occur to Jevons. Yet, his monetary theory appears to be designed in such a way as to sacrifice the latter in the name of the former. It is an institutionalized "non-institution" (Mosselmans 2002: 52).

In no other work is this paradox more striking than in Léon Walras's *Éléments*. Similar to Jevons, Walras started from the idea that money simplifies economic relations via a discussion of the double coincidence of wants problem. In the first edition of his *Éléments*, he observes that "money substitutes two very simple and rapid exchanges with a single exchange which would otherwise be very difficult and very long, if not entirely impossible" (Walras 1874 [1988]: 544).[57] In this applied sense, money makes things easier; it is a

[57] All references to Walras's works refer to the French edition of his complete works. English quotations from the fourth edition of *Éléments* are taken from Jaffé's translation (Walras 1954) and are my own for untranslated works such as the previous editions.

"practical simplification" (Walras 1874 [1988]: 544). Again, similar to Jevons, Walras also acknowledged that for the same reason that money "substitutes two exchanges in one," it also complicates things (it "doubles the trouble" in Jevons's words), since it represents an indirect exchange where, from a theoretical point of view, direct exchange would be much simpler. Money is thus also a "theoretical complication" (Walras 1874 [1988]: 544).[58] However, where Jevons had started with barter and ended with a pure system of moneyless bookkeeping, in which a central clearing house delivers final allocations, Walras's point of departure is a centralized unit of account, or *numéraire* economy without money, and his final destination a decentralized, indirect exchange economy with money. As William Jaffé put it, "Instead of climbing up from marginal utility to the level of his general equilibrium system, Walras actually climbed down from that to marginal utility" (Jaffé 1976: 513). In the final, fourth edition of his *Élements* published in 1900, Walras thus achieved what Jevons never dared to pursue, namely to integrate money into value theory.[59] However, while his last monetary model gave a rational justification to the existence of money as a medium of exchange, it did not say anything about why money is the chosen technology of exchange. Indeed, Walras not only realized that the question of "why money?" was different from the scientific problem of "how to integrate money into value theory"; he also saw that in order to answer the later question it was necessary to let go of the former.[60] Walras's monetary theory was developed over the course of twenty-five years, in which he struggled with the problem that the neutrality postulate makes money inessential. In the end, Walras

[58] Walras had made a similar point in his lectures at the *Académie de sciences morales et politiques de Paris* (Walras 1993 [1874]: 33).

[59] There were five successive editions of *Éléments*, dated 1874-77 (two instalments), 1889, 1896, 1900 and 1926, the last being the definitive edition (published posthumously). Lessons 29 and 30, where Walras introduces money into his equilibrium model, are first presented in the 1900 edition.

[60] In this Walras was more consistent than many of his followers. Cartelier (2018) blames Hahn for this, who mistook the Arrow-Debreu model for a Walrasian money-in-the-utility function. See also Grandmont and Younes (1972).

choose neutrality over essentiality. Nevertheless, even in Walras's static theory of exchange, in which "he had to give up all pretense to realism" (Bridel 2002: 282) and money was just an "optional add-on," a set of institutional assumptions needs to hold for the model to work.[61] Like in Jevons's exchange model, these assumptions regard the framework of exchange activities in the general equilibrium setting and in particular the "behavioral feasibility" (Ostroy 1973: 598) of how information and coordination are organized. Most importantly, Walras's general equilibrium theory attempts to demonstrate the viability of a decentralized economy, yet relies on centrally communicated information and *a priori* coordination of decisions. While this paradox and the centralized economy in Walras's general equilibrium theory has been recognized, it is striking that it has not lead to more profound reconsiderations of the Walrasian system.[62] Michel De Vroey has called this "benign neglect," making plain that "we have the paradoxical result that the institutional dimension is both acknowledged and defused" (De Vroey 1990: 236 and 1998: 215). One way of explaining this "neglect" is to acknowledge, again, that the hiddenness, invisibility, process of forgetting or taken-for-grantedness of the institutional setting is strongly affected by the theoretical focus on the formalization of the decentralized trade setting. In this respect, Frank Hahn's oft repeated observation that "money has no role to perform" in a Walrasian equilibrium setting should be amended.[63] The performative role of money is not to have any role.

In the fourth version of his pure economics, Walras introduces an explicit monetary analysis of the exchange process. In the first edition, he had not dealt with money, aside

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[61] The fact that the model does not require an appeal to price or expectations formation does not eliminate these assumptions. These assumptions also need to hold regardless of the question whether the model itself is or was intended to be a convenient theoretical fiction, a political reform proposal, an extrapolation of existing trends in the financial system, a combination of these or all of them together.

[62] See, e.g., Ostroy and Starr (1974), Clower (1984), Hahn (1984) and more recently Álvarez and Bignon (2004).

[63] See Hahn (1973a, 1973b and 1982) and Arrow and Hahn (1971).

from the observation that it solves a double coincidence of wants problem ("a practical simplification") and that the use of money must be neutral; that is, it should not change the relative prices in an economy ("a theoretical complication"). The money-is-better-than-barter idea gets expressed in the first and second edition of the *Éléments*, where the need for a medium of exchange appears to result out of the division of labor and specialization of production. He observes that "we sell our services to entrepreneurs who do not produce the goods we need, and we buy goods from entrepreneurs who do not need our services. Hence the necessity for a medium of exchange" (Walras 1988: 442). At this stage of his theory, however, Walras mainly considers money as a practical means of exchange. Nothing is said about individuals' money demand, how money is distributed between "us," i.e., the consumers and the "entrepreneurs," or why either may be inclined to hold money at all. The demand for money is determined at the macro-level as a *circulation à desservir* similar to a Fisherian exchange equation. Money, in sum, was just a *numéraire* expressing the value of commodities in prices. It was a simple transactions technology defined under the negative rules that "money cannot itself be a good" and that "goods cannot be exchanged with each other" (Walras 1874, *OEC VIII*: 464-6).[64]

Like Jevons, Walras also wanted to understand how useless objects obtain value. In the second (1889) and third (1896) edition of the *Éléments*, he explains, "for pure theory it is obviously advantageous to investigate how something gets value when it becomes money" (Walras 1988: 452). Two conclusions can be drawn from this. First, Walras was above all interested in explaining the existence of fiat money. Second, it was necessary for him to show that money has value, i.e., that there exists a positive price for money at equilibrium. If money did not have a positive price, there would be no reason to suppose that a change

[64] This anticipates the cash-in-advance constraint (Clower constraint) proposed by Robert Clower, where "*Money buys goods and goods buy money; but goods do not buy goods*" (1967: 5).

in the quantity of money proportionally changes the prices of goods and services in the economy. The question of determining the value of money, should therefore not be confused with the question of why money exists, which is how Menger would understand the problem.[65] Walras was not interested in explaining the origins of money. In order to show that there is a positive demand for money, Walras gradually "climbed down" from general equilibrium to marginal utility. Recall from Jevons, however, that deriving the utility of money from its exchange value, that is from the things it can buy, yielded circular satisfaction. The *numéraire*, of course, falls victim to this circularity charge if it is supposed to derive its utility from the commodity market. In order to function as a medium of exchange, money has to be endowed with a positive purchasing power before this power can be exerted on the market. If, however, the *numéraire* is determined "in principle" (Walras 1900: 441), as was to case in the first edition and would be the case again in the fourth, there is no circularity since the *numéraire* is a primitive, along with initial endowments and preferences and so, by definition, stays undefined.

Clearly, Walras was unwilling to leave it at that. While he maintained money "to be an object without any utility of its own" (Walras 1900: 448), he also attributed an indirect utility to such things as consumer services, raw materials or capital goods, the latter of

[65] As shown by van Daal and Jolink (1993: 93ff), this could have already been established in the first installment of the *Éléments* by combining the macro-model of his first edition with the equation of exchange. In familiar notation, following Cartelier (2018: 18ff), consider the exchange equation (1.2) $D(p) = S(p) \rightarrow Z(p^*) = 0$, with $D(p)$ and $S(p)$ representing aggregate demand and supply functions for commodities, $Z(p^*)$ the market excess-demand vector function, and p^* the vector of equilibrium price and $q = q^*$ the quantity vector given by $D(p^*)$ or $S(p^*)$. The value of money is thus p^* and q^*, which can be defined with a *numéraire* T. But the *numéraire* does not circulate in this equation, which is why an *équation de la circulation* à la Fisher is needed: (1.3) $MV = PT$, where M is the money supply expressed in money units, V the velocity of money, P the price level and T the value of total transactions expressed in a *numéraire*. Now we can integrate money into value theory by combining both equations and have commodities circulate with money. As we shall see, Walras's last edition is a return to his first edition. See also Bridel (1997).

which he sometimes considered to be money.[66] In the second and third editions of the *Éléments*, Walras thus appeared to attach an indirect utility to money for the service it provides as a means of exchange. This idea is first introduced via demand for an *encaisse désirée* (cash-balance) equation, effectively allowing consumers and producers to appreciate money holdings.[67] However, it was incompatible with general equilibrium theory, at least in Walras's view, because, simply put, changes in the supply of money disturb the optimal relation between the purchasing power of cash holdings (real balances) and relative prices, resulting in a real-balance effect, e.g., the "entrepreneurs" can suddenly buy more with the same amount money thus threatening the neutrality postulate.[68] Walras calls this "unsettling of the economic equilibrium…a crisis" (Walras 1889: 547). In the end, Walras observes that "it remains to be demonstrated how this direct proportionality of the prices to the quantity of money and this indirect proportionality of the prices to the desired cash balance tend to maintain themselves in a regime of free competition" (Walras 1889: 460).

In the final edition of the *Éléments*, Walras replaced the *encaisse désirée* with a *service d'approvisionnement* (service of availability), thus making it clear that the only utility, or service, of money holdings is to overcome transactions difficulties (making goods circulate), not from the liquidity advantage of holding money *per se*.[69] He then goes on to explain "how we intend to formulate the problem of circulation…and link it with the problem

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[66] See, e.g., "From the social point of view, money is capital since it is used in society more than once for making payment" (Walras 1900: 203).

[67] Walras introduces an interest rate in this context, so the utility of the cash-balances can be defined as the opportunity costs of money in terms of interest-bearing assets.

[68] This violated the homogeneity and dichotomy postulates and implies a dynamic market, "perpetually tending towards equilibrium without ever actually attaining it" (Walras 1877: 580). Of course, in the Hicks-Patinkin tradition this is what is looked for; the *encaisse désirée* (cash-balance) is an essential part of the neoclassical synthesis providing a rationale for Keynes's liquidity preference.

[69] As Rebeyrol has shown, "Walras took the idea that money is the instrument of exchange to its extreme limit. The problem of money has nothing to do with the intertemporal allocation of resources; it is linked entirely to the difficulties of carrying out transactions. It is for this reason, and not for its store of value function, that the cash balance is desired" (Rebeyrol 1998: 354).

of exchange" (Walras 1900: 316). During a first stage, a set of perfectly organized markets allow the confrontation of demand and supply to determine the vector of equilibrium prices. Walras calls this mechanism *tâtonnement sur bons*, a computational technique determining the quantities offered and demanded by each individual.[70] No trading takes place during this period, so that it "should not seriously affect" the equilibrium in other markets, "eliminat[ing] all occasion for *uncertainty*" (Walras 1900: 318). This avoids disequilibrium consequences such as the undesirable distributional implications of the cash-balance effect. The equilibrium prices, denominated in the *numéraire*, are then communicated to the agents, who know when commodities will be delivered and payments have to be made. Walras explains, "Once equilibrium [is] achieved in principle, upon completion of the preliminary mechanism of *tâtonnement* by means of *bons*, the actual transfer of service will begin immediately" (Walras 1900: 317). Since equilibrium prices are known from the start, agents can easily calculate how much money they need in order to meet their commitments during the trading period. Thus begins phase two. No clearing-house is assumed and money has to solve the problems linked to the allocation of goods in a decentralized context. The presence of the *numéraire* alone is not sufficient. To guarantee the allocation of equilibrium quantities, a transactions technology, the *service d'approvisionnement*, is needed as well. An economy with a *numéraire* only would need a central clearing house such as the one described by Jevons, which ensured that budgetary constraints are respected. This economy, as we have seen, does not need money.[71] In Walras's decentralized economy, money is thus a necessary condition for the realization of the general equilibrium allocation. Of course, now one can still ask why money and not, for instance, some other good or credit

[70] It is important to stress that this mechanism is not a process, as it does not take place in "real" but in "logical" time.

[71] Neo-Walrasian models such as Debreu's (1959) or Arrow and Hahn's (1971) are not truly Walrasian in this sense since they suppose a clearing house or an auctioneer instead of money, respectively; neither are the cashless models à la Fama (1980) and Black (1970).

arrangement, like a piece of metal, an IOU or even ice cream?[72] Indeed, nothing in Walras's model can stop us from choosing any other transaction technology or, for that matter, from changing the technology after each trading period.[73] However, the point, again, is not to explain why money exists, but to ensure that the monetary model has a solution in which the demand for money is positive. The positive demand is guaranteed by the *service d'approvisionnement*, and the assumption that it is the unique generally accepted medium of exchange.

Walras's model thus succeeded in integrating money into value theory. But it obviously came with a price; namely, it could not show what Neil Wallace (2002) has called the "essentiality of money," the proposition that money sustains final equilibrium allocations. In Walras's model, the choice of a unique medium of exchange is simply posited. Does this mean that Walras ignored the why question altogether? In his *Études d'économie politique appliquée* he takes up the topic under section IV, entitled "Rules and conditions of the numéraire and money." There, he refers to the "institution of money," which reiterates that only one unique *numéraire* must be chosen and that this *numéraire* must also be the money unit (Walras 1889, *OEC* X: 94–95). These rules of the "institution of money" are completely in line with the primitives of his theoretical model. Only that they are now supposed to be institutionally fixed. This appears to contradict with Walras's intention of a decentralized economy, however, in which the key force leading to equilibrium was supposed to be competition. It is not the only way that the model relies on a centralized organization. The *tâtonnement* mechanism also appears to come in the form of a highly centralized activity of coordination and information. It assumes that an outside actor has full knowledge

[72] For ice cream, see Cuadras-Morato (1997), although his model applies to the search-theoretic framework (see infra). As Jean Cartelier has rightly observed, "nothing would prevent us from thinking of money as IOUs issued by individuals by means of a bank, these IOUs being cancelled at the end of the market" (2018: 21).

[73] For multiple equilibria, see, e.g., Diamond (1982) and Howitt (1985). Walras did not believe that multiple equilibria are possible, although he could not prove this.

of the economy, including all utility and production functions and all demand and supply schedules.[74] Obviously, there is no need for a central clearing house to set final allocations if the rules are such that agents simply perform a task set during a centralized *tâtonnement* mechanism in which they did not take part. This recalls Jevons's "room of moderate dimensions," only that the agents in Walras's model convene in a "big hall," as is often claimed, where they are only allowed to start trading once equilibrium prices have been reached.[75] The centralized institutional constraints imposed on the economy thus contradict the idea of free competition and a decentralized exchange process.

Like Jevons, Walras did not want to leave monetary matters to free competition. In his *Études* he insisted that "Money is a state responsibility and, moreover, an international concern" (Walras 1886, *OEC X*: 12). He thus advocated for an interventionist monetary policy, contrary to "the dominant tendency towards laissez-faire" (Walras *OEC X*: 12).[76] While particular prices should not be controlled or prescribed, measures should be taken for the price system as a whole to be stable. Money supply must be regulated and stabilized and monetary policy in charge of guaranteeing that the quantity of money in circulation does not exceed the necessities of the real price system derived from the general equilibrium equations. Like Jevons, Walras was acutely aware of the fact that, in the real world, money was also created by debts such as "credits on books…, exchange letters…, bank notes" (Walras 1988: 517–19). Realizing that these "payment instruments" could potentially offset the economy, he advocated for abolishing all kinds of bank notes.[77] Walras

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[74] The argument would not change if one were to assume that agents themselves were endowed with the power of the auctioneer.

[75] For the "big hall" metaphor, see, e.g., Negishi (1989: 284) and De Vroey (1998: 207).

[76] The francophone free banking school of the time was grouped around the *Journal des Économistes* (Frédéric Bastiat, Michel Chevalier, Yves Guyot and Gustave de Molinari). For Walras's positions with regards to the *école française*, see, e.g., Gallois (2011).

[77] With regards to the question of "ideal" and "real" (*Éléments*, Section 30) types and the incompatibility between Walras's pure and applied economics, his monetary theory clearly bridges any gap. See also Baranzini (2001) and Álvarez (2019). It is interesting to note that Walras also

thus defended a permanent intervention based on mathematical rules that should be overseen by the government. This could best be achieved with the introduction of a so-called *billon régulateur*, a system conceived in order to stabilize the purchasing power of money (Walras 1886, *OEC X*: 109). Unsurprisingly, the *billon régulateur* follows Walras's monetary exchange model; it is at once *numéraire* and transaction technology. He clarifies that "it is entirely founded upon a theorem of pure political economy that I mathematically proved in my previous books" (Walras 1886, *OEC X*: 109). The quantity of *billons* in circulation could be regulated by a price index, also expressed in *numéraire*, representing the "the average price of the social wealth" (Walras 1886, *OEC X*: 112–3). Walras called this the "multiple standard," explicitly borrowing from Jevons's "tabular standard," whom he lauds for "strictly [adhering] to this system" (Walras 1886, *OEC*). Via "open-market policy avant la lettre" (van Daal 2006: 59), the government or, better, "the rules" could thus regulate prices by closely following the "ebb" and "flow" of the economic tides oscillating around a long-run "natural" equilibrium. Consequently, the money supply denominated in *numéraire* changes in proportion with variations in the price index; relative prices remain unchanged and money stays neutral. Ideally—and here, too, Walras clearly echoed Jevons's proposition for an "international money"—the *billon* would be universally applied. Walras points out that "a system as mine could not be utilized by an isolated nation, or even by a limited union of nations like the Latin Union; to a certain extent it should be universal" (Walras 1886, *OEC X*: 109). In the end, the government disappears behind a fixed set of universal rules.

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discusses independent central banking in this context: "The production of bank notes ought to be made by the State, or by a unique bank endowed of monopoly power conditioned to a strict agenda, or by an undetermined number of free banks" (Walras 1880: 311). Ultimately, he negates all of these options in favor of his "rules." That the enforcement of these rules would be the role of an independent central bank did not occur to him. Perhaps he would not have trusted it.

Even more so than in Jevons, the Janus face of Walras's monetary theory could not be more upsetting. The institutional constraints of centralized information and coordination in Walras's theory are often discarded as a "fiction." A standard *Dictionary of Economics* thus defines the *tâtonnement* mechanism as "a fictitious device to explain the determination of equilibrium prices in a competitive economy" (Black et al. 2017: 19). Presumably, it could then be scrapped since, clearly, what mattered most to Walras was "the determination of prices under a hypothetical regime of absolute free competition" (Walras 1900: xi). "The fact of exchange value," he wrote, "has…the character of a natural fact" (Walras 1900: 27). This restrictive view effectively conceals the institutional arrangement necessary for Walras's theory to work. Again, we are confronted with the same "paradox" present in Jevon's work. Walras's monetary theory is considered, and arguably intended to be, spontaneous, horizontal and decentralized, despite the fact that it is based on a universal *numéraire* and a centralized system of coordination and information. The decentralized exchange mechanism is presented as a "natural fact," legitimized by mathematical rules; its centralized institutional arrangement as a convenient fiction.[78]Although in apparent conflict, the "natural facts" tend to mask the institutional background in which they are supposed to take place and which *necessarily* pre-exist the former.[79] This results in a "benign neglect" (De Vroey 1990 and 1998), in which the institutional dimension is both acknowledged and defused. Consequently, money is taken for granted not only "by definition," but also by decree. The neutrality of money is guaranteed by "nature" *and* the polity. In Walras's *Études,* it is relegated to an unspecified shadow institution committed to the

[78] Hahn made this point very clear when he observed that "The auctioneer is a co-ordinator *deus ex machina* and hides what is *central*." (1987: 137, second emphasis mine).

[79] In a similar vein, Stephen G. Hall has observed "a conflict in Walras's 'Elements of Pure Economics' between the literary and mathematical treatment of the utility of money" (1983).

application of positive economic science, in which monetary forms such as private credit instruments that are constitutive of financial capitalism are *de facto* and *de jure* ruled out.

It is now possible to understand "the role" trust plays in this tradition. Indeed, unlike Jevons and Menger, Walras never asked what induces people to accept money and there is no mention in his work of trust, confidence, acceptability, belief, etc. in money.[80] This should not be surprising, since individuals are expected to act according to the fundamental rules of money. In the presence of universal rules and rule-following individuals, one would assume that there would be no need for trust or, better, that complete trust is simply taken for granted under the behavioral assumption of rational self-interest and complete and costless contracting (Bowles & Gintis 2000). This makes the trust relationship horizontal, in line with the decentralized economy of Walras's exchange model. One can see the parallels between money and this description of trust. If trust is seen as a form of contract enforcement in economic transactions that would nonetheless take place without it, trust, much like money, is simply assumed and cannot therefore provide a meaningful explanation to the role it is allowed to play. As one critic has put it, to say money is trust "has as much explanatory value as saying that credit comes from credere" (Ganßmann 1988: 293). The circularity charge returns: something other than the pre-defined rules of the model should explain monetary trust. In this way, the "benign neglect" of the monetary system making trust possible in the first place applies to the trust problem. Along these lines, Michel Aglietta and Jean Cartelier have written about "*méconnaissance*" (1998: 147), describing the fact that ignorance of the monetary system is constitutive of monetary trust.[81] In this view, Walras's economic theory would describe economic facts, which are valid because

[80] In a different context, Bourdeau (2006) analyzes the role of "confidence" in cooperative banking in the works of Walras. However, even in his article one looks in vain for a direct citation.

[81] Their work is inspired by Simmel and Simiand. See, e.g., Simiand, who wrote, "Ce n'est pas la représentation monétaire qui est un voile devant les phénomènes économiques véritables ; c'est l'effort pour se dégager et se passer de la représentation monétaire qui élève un voile obscurcissant…la vision et l'intelligence de ces phénomènes économiques véritables" (1932 [1987]: 448).

they are misunderstood or ignored by the economic actors, and which would no longer be valid if they were to see through them. Trust in money is then akin to "the belief in the naturalized image of money" (Braun 2014: 200). This "naturalized image" (Braun 2014: 198) of money obfuscates the hierarchy of money creation, greatly overstating the possibilities of a centralized rule-setting authority to control the money supply. With regard to the trust problem posed in the beginning of this chapter, this means that the ignorance of the conditions of vertical trust or their representation as horizontal trust relationships are constitutive of generalized trust.

In a letter addressed to Walras written in 1884, Menger criticized this program of self-evident or natural rules. "If we want understand the laws that govern the exchange of goods," he remarked, "it is necessary that we first go back to the motives that make men act when they exchange goods…which are in a causal relationship" (Menger 1884).[82] Menger correctly saw that Walras's model of price determination sacrificed the essence of exchange. "We should not only investigate relations between magnitudes but also the *essence* of economic phenomena," he suggested (Menger 1884). Menger thus rejected the mathematical method of Walras and its static equilibrium constraints and returned to the "why money?" question, the investigation of its causes.[83] Like Jevons and Walras, however, he started from the double coincidence of wants problem of barter.[84] In his evolutionary model made famous in his article "On the Origins of Money" (1892), money evolved

[82] In the original: "Si nous voulons parvenir à la connaissance des lois qui régissent l'échange des biens, il est nécessaire que nous remontions d'abord aux motifs qui font agir les hommes dans l'échange des biens, aux faits indépendant de la volonté de l'échangeur, qui sont avec l'échange des biens dans un rapport causal."

[83] In this regard it seems at least problematic to call neo-Walrasian general equilibrium models "Mengerian"; see, e.g., Goodhart (1998).

[84] See, e.g., "The difficulties hindering the development of barter…really lie…in the fact that…it is therefore anything but easy for a person offering a commodity to find another market participant who is offering the commodity he is looking for and at the same time wants the commodity he is offering" (Menger 1909: 27–8). Such search frictions are absent in Walras's final monetary exchange model.

from a coordination process based on trust which, at first, was to be found among a selected elite, but eventually came to be a trust between the masses and finally society itself. In this theory, money is not exogenously given, as in Walras's model, but emerges endogenously out of a trading situation in which the most liquid (or "saleable") asset becomes money. In Menger's theory this conformed to the explanatory procedure Schumpeter later described as "methodological individualism," the explanation of socio-economic phenomena exclusively in terms of given individuals and the interactions between them.[85] With this approach, Menger certainly managed to make Walras's assumptions explicit but, and in spite of Menger's criticism of Walras and their methodological differences, was unable to depart from the fundamental constraints of Walras's model; that is, his theory only considered individual behavior and could therefore not account for the existence of institutions or of institutional rules. At the very minimum, Menger's "explanation" required additional arguments to establish his individualist methodology. Like Walras, Menger thus also considered money to be an institution and struggled throughout his entire career with the paradoxical question of "How can it be that institutions which serve the common welfare…come into being without a common will directed toward establishing them?" (1883).[86] In subsequent revisions of his article on money for the *Handwörterbuch der Sozialwissenschaften*, the horizontal organization of his evolutionary theory was subsequently revised to integrate the question of monetary policy and governance. However, Menger's position on the theoretical design of an optimal currency regime was ambivalent, if not

[85] See Schumpeter (1908), chapter IV.

[86] Menger's first mention of monetary issues occurs in the first edition of the *Principles*, published in 1871. The third, final version of his "Money" article for the *Handwörterbuch der Sozialwissenschaften* appeared in 1909 and a revised posthumously published edition of the *Principles* in 1923, two years after his death. Meanwhile, he published two articles on the theory of money in English and French. The article in the *Economic Journal* (Menger 1892a) deals with the origin of money and covers the subject of sections I to V of his entry in the *Handwörterbuch*; the article "La monnaie mesure de valeur" (Menger 2005 [1892b]) is largely taken from sections X and XI of the *Handwörterbuch*. To make a long story short, it is hard to tell which theory is supposed to be the definite one—another problem he shares with Walras.

self-contradictory. Like Walras and Jevons, he was optimistic, albeit uncertain, that in some not-too-distant future index numbers could empirically measure the purchasing power of money and lead to stability "by deliberately influencing the circulating quantity of money" (1892b: 258). Again, like Jevons and Walras, he also believed that this required active cooperation among states. At the same time, he considered inherent instabilities a lesser evil than "the regulation of the exchange value of money by governments or political parties" (1892b: 86ff). In the end, we are confronted with the now familiar paradigm where monetary trust is assumed to be a spontaneous, decentralized and horizontal relationship. If it relies itself on any centralized institutional organization, it simply reiterates the "natural" lower levels of economic activity.

In his "On the Origins of Money" (1892), Menger famously asks "how it has come to pass that certain commodities…should be promoted amongst the mass of all other commodities and accepted as the generally acknowledged media of exchange" (1892: 241). In Menger's account, three conditions need to be fulfilled for the emergence of money. First, the acceptance of money by any one agent must be based on his or her belief that other agents will accept it as well. This idea is reminiscent of Jevon's "force of habit," but Menger goes through much greater lengths to develop it. Specifically, Menger argues that part of money's general acceptance in "mediate exchange" is due to its high degree of saleability or marketability (*Absatzfähigkeit*) (Menger 1892: 241).[87] This high degree of saleability in turn attracts more economic agents to exchange their less saleable commodities for this more saleable good (eventually to become money). Menger summarizes his first point by asserting that as time passes, the most saleable goods "[will] in every market

[87] I.e., the quality of being accepted in a market. The word is sometimes translated as *marketability* (as in J. Dingwall and B. F. Hoselitz's 1976 translation of the *Grundsätze*), sometimes as *saleableness* (as in C.A. Foley's original translation in the *Economic Journal* 1892) and sometimes as *saleability* (as in Campagnolo (2016: 289)).

become the wares which it is not only in the interest of every one to accept in exchange for his own less saleable goods, but which are also those he actually does readily accept" (1892: 284). For Menger, the medium of exchange arises endogenously in a trading situation as the most efficient and liquid carrier of value between transactions. The choice of one monetary medium over another reflects its inherent qualities in terms of low transaction costs, in the words of Jevons: portability, indestructability, homogeneity, divisibility, etc. (Jevons: 1875: 31); as well as the demand of the larger proportion of economic agents to obtain a broader range of commodities: "Possession of these more saleable goods clearly multiplies his chances of finding persons on the market who will offer to sell him the goods that he needs" (Menger 1871: 260). In this way, Menger integrated money into utility theory by allowing the commodities that serve as media of exchange to be demanded for their indirect utility.

Second, Menger describes the emergence of money "as the spontaneous outcome, the unpremeditated resultant, of particular, individual efforts of the members of a society" (1892: 250). While not directly following from the first condition, this point may have been of particular importance for Menger because he wanted to distinguish his theory from state, credit and legal theories of money. He thus writes that "No accident, nor the consequence of state compulsion, nor voluntary convention of traders effected [the use of money]. It was the just apprehending of their individual self-interest which brought it to pass" (1892: 254). He assumes explicitly that "Money has not been generated by law" (1892: 255). Rather, it is the unorganized efforts of individuals, each taking action in the hope of increasing their economic well-being. Again, this recalls Jevons's "consensus" hypothesis, as well as his insistence that in some undefined past, money had to be invented not by legal regulation but out of efficiency gains. Money is thus not some kind of social contract in which trust is enforced, but a commodity and its monetary functions (and its price) an outcome of a

market process. It is easy to see how the structure of this argument resembles the "invisible hand" approach of Adam Smith or Bernard Mandeville, where the rational self-interest of each individual miraculously benefits the majority. Menger makes this explicit in his question, already cited above, where "institutions that serve the common welfare… come into being without a common will directed toward establishing them."

Lastly, Menger suggests that "each individual would learn, from his own economic interests, to good heed that he bartered his less saleable goods for those special commodities which displayed…a wide range of saleability both in time and place" (1892: 248). He explains that as time goes on, agents become "enlightened" by the economic success of those who exchange their less saleable items for the most saleable objects. This positive feedback loop is not premeditated but a self-reinforcing learning process comparable with what are called network effects or network externalities today. Menger's third point thus emphasizes that the establishment of a generally acceptable medium of exchange is a learning process that is achieved over a long period of time. From here, the step to the entrepreneur—that particular gifted individual of Austrian economics—lies close. Menger's evolutionary model clearly posits a form of cumulative competitive advantage where the invention of money is similar to a technological innovation.[88] Generalization of this knowledge across the market through custom and habitual practice among agents leads to the eventual emergence of money. Money thus developed as the result of rational choices by individuals seeking to reduce their transactions costs. He explains that "In this way practice and habit have contributed not a little to cause goods, which were most saleable at any time, to be accepted not only by many, but finally by all" (1892: 249).

[88] Although Menger was clear that "no one invented [money], money is a natural product of human activity" (1871: 262), presumably to underscore his idea of money as a generative system.

Menger's point of departure—money is more efficient than barter—resembles that of Jevons and Walras. So, too, does his focus on money as a medium of exchange and unique carrier of value. Elements of Menger's theory can be found in Jevons's analysis on "the force of habit" and in the teleological character of his monetary system. But nothing in Jevons's fragmentary evolutionary comments implies joint determination, let alone a self-reinforcing feedback loop to establish the choice of money and the prices of goods. Walras had separated the institutional arrangement from the exchange process. In his model, economic agents could not choose which money is used (nor are they allowed to engage in disequilibrium trading). Menger's approach differed in the way that he emphasized causal explanation: from given individuals to the formation of institutions. While Menger refrains from using the word "trust" in this context, his approach has been called the "trust approach" (Bridel 2014: 624) because economic agents have to trust that the most convenient and liquid carrier of value between trades, which is to become money, will also be accepted by others.[89] He also assumed that the interacting agents make choices that do not involve conflicts of interest between them. Menger tried to locate this trust, in accordance with the subjectivism of the Austrian school, in a private, market-oriented response to overcome transaction costs inherent in a barter economy. But here, Menger's theory encountered the

[89] Menger himself rejected the confidence hypothesis. In a footnote of the revised version of his article for the *Handwörterbuch* (1909: 17), he criticizes Adolph Wagner, who, in his colossal *Theoretische Sozialökonomik* (1909: 117) follows Menger's theory in every aspect except that he calls Menger's third condition—the learning process leading to the adoption of a unique medium of exchange—a trust moment (*Vertrauensmoment*). Menger did not want to have it though, and rejected the hypothesis for its circularity ("as a result of the same confidence!") and psychological component, which Wagner attributed to Simmel, whose work Menger had already harshly criticized (1901: 160-1), even though Simmel took many of his ideas from Menger's theory. For Menger's influence on Simmel, see Frisby (1992). Laidler and Rowe have also emphasized that "Simmel seem[s] to have drawn heavily on the work of Carl Menger, but later economists…in their turn drew on him." (1980: 97). In this regard, Wagner can be considered a case in point. See also Frankel (1977: 34). For the purpose of this study, Menger's rejection of the word "confidence" is irrelevant though (and is probably driven by his skepticism towards psychology). NB, however, that Menger's theory would not change were we to define confidence or trust as "acceptability," "belief," "enlightenment," etc.

now-familiar circularity problem. It assumed that there exists a general belief, or trust, that money will act as money, which validates itself as soon as money acts as money. In other words, without an explanation of how this trust is established and acquired, Menger's monetary theory either needed to be interpreted as psychological and, worse, historical and so risked becoming unscientific by Menger's own scientific standards, or had to be dismissed as circular. At the very least, his theory needed to allow informational feedbacks from institutions to individuals and not only from individuals to institutions. But in Menger's theory, institutional information did not reconstitute or alter the goals or preferences of individual actors. This would have resembled the approach of the "younger" German Historical School, against whom Menger had been waging a methodological war.[90] Gustav Schmoller, for instance, introduced the idea of "circular causation" (1900: 107), where individuals and structures were mutually constitutive of each other.[91] Such an explanation did not fit into Menger's conceptual framework, however, which posited the individual as the fundamental unit of analysis. His origins-based history is thus no history at all. It cannot explain historical change.

The problem is how agents in a decentralized economy are supposed to acquire the information about other people's likelihood of accepting or refusing a particular form of payment. In the absence of complete information, where everybody knows what everybody

[90] Menger rejected explanations for the origin of social institutions based on social, psychological or institutional phenomena that could not be explained in terms of individuals' purposeful behavior. His methodological disputes in the context of the *Methodenstreit* draw another parallel to Jevons.

[91] Schmoller advocated for an interplay (*Zusammenwirken*) between causes and effects, which for him were essential to understanding the psychological dynamics of economic phenomena. See, e.g., Hodgson (2001), Chapter 9 for Schmoller's problems with Menger's atomist assumptions. A similar idea of interplay can be found in Thorsten Veblen's article "Why is economics not an evolutionary science?" (1898), where he introduces the term "cumulative causation" to describe the interdependence of economic, social and institutional phenomena. See, e.g., Berger (2009) for discussion.

else will do, unanimity would require a centralized trading procedure.[92] In the decentralized economy of Menger, on the other hand, an institution is required much in the form of a Walrasian *tâtonnement* mechanism, which would have the power to impose acceptability by a rule. Indeed, and in spite of his earlier claims that "political authority is not necessary for [money's] existence" (Menger 1871: 261-2), Menger subsequently modified his claims. In a passage entitled "The Perfecting of the Monetary and Coinage System by Government" for the last revised edition of his article "Money" for the *Handwörterbuch*, he thus observes, "An advanced economy's demands on the monetary system are not to be met by a system such as develops automatically" (Menger 1909: 45). Here, again, it seems that Menger is in agreement with Jevons and Walras, that "coining…makes government intervention more and more inevitable" (1909: 45). More than being responsible for the issuance of money, Menger also wrote considerably about how governments could stabilize the value of money. Here, too, his arguments closely followed those of his marginalist contemporaries. He thus observes that people's preference for an invariable measuring rod makes them "disregard movements of…the value of money" (1909: 81), i.e., they suffer from money illusion.[93] Measuring price changes, although "deficient in many respects…provide[s] a useful basis for practical purposes for answering the question whether goods prices have increased or decreased" Menger (1909: 77). To "neutralize" (*aufheben*) fluctuations in price levels, governments could "deliberately influenc[e] the circulating quantity

[92] If Menger's welfare claims are to be taken seriously, there is no reason to believe that the fact that one subset of enlightened agents choose barter over money or one form of payment over another automatically improves the status of everybody else. In the best case, the choice of one money over another would be a simple comparison between transactions costs (which is the most liquid carrier of value?). In the worst case, Menger's premise about elite entrepreneurs could reveal redistribution concerns resulting from the choice of one exchange technology over another or no choice at all (in the case of indeterminacy). This would violate the essentiality criterion of Wallace (2002) and hence Menger's welfare premise.

[93] Menger made the difference between inner and outer value of money (*äußerer* and *innerer* Wert) to describe the purchasing power of money and the effect of money on the prices of other goods, respectively.

of money, especially that of paper money" (Menger 1909: 75). Here was a clear responsibility for the state, not only to provide a unique legal tender but also to implement monetary policy on the basis of a quantity theory of money. Like Jevons and Walras, Menger thought that the implementation of monetary policies made international cooperation necessary. In his article for the *Revue d'économie politique* he explained, "A state or group of states may decree the quantity of currency they issue. Therefore, the idea of a good whose…value would permanently remain at the same level is not contradictory in itself" (1892: 258-9). And so Menger, like Walras, ended up separating individual behavior from institutional reality or, better, defining institutional reality in such a way that it could coherently fit onto his vision of a monetary market economy, i.e., with a single unique currency, an index to communicate prices and a centralized authority to control the quantity of money.

It seems, then, that Menger's evolutionary theory has more in common with the static nature of Walras's pure economics than he would have liked to admit.[94] The faulty argument can be expressed as follows: individuals manage to give money value by believing or trusting it has value. Because this belief or trust is of something existing ("trust *in money*"), it is not only a psychological (as in Menger) or theoretical (as in Walras) "fact," but is also in the business of altering reality. In the real world, money actually has value and its institutional arrangement important distributive consequences. But neither Jevons, Menger nor Walras allowed for this to happen, which is why they had to resort to a monetary theory in which money is seen first as pure medium of exchange and second as universal, invariable standard. With this narrative, they managed to effectively depoliticize the process of money creation, ensuring its smooth functioning by "forg[etting] about" (Carruthers & Babb 1996:

[94] Indeed, their differences appear to be more philosophical than theoretical. In this respect, some of the more recent literature that has tried to "de-homogenize" Walras and Menger have gone too far in positing differences, in particular regarding the institutional assumptions in their monetary theory. See, e.g., Álvarez and Bignon (2014).

1558) hierarchical institutional arrangements, which would require a different kind of trust. Contrary to what is often claimed, institutions thus do play a role in neoclassical monetary theory. Theoretically, institutions "naturalize" monetary relationships through an analytical framework that treats them as informal, decentralized and horizontal. Practically, the legitimacy of institutions as universal rule-setting authorities is determined independently from the interests of governments or political parties. Taken together, this leads to the institutionalized belief that money works best without institutions.

The neoclassical attempts to integrate money into value theory raised important questions on what makes people accept intrinsically useless fiat money; what, if anything, gives fiat money its value; and what institutional conditions needed to be fulfilled for fiat money to become widely accepted. Jevons's initial attempts to integrate money into his exchange model and his observation that the widespread acceptance of money depends on people trusting that it will be accepted by others were further developed by his contemporaries. In his last exchange model, Walras found a mathematical solution for integrating money into value theory, but it came with a price. Most importantly, it reduced money to a pure exchange medium and *numéraire* with a mechanism that was internally coherent but in which money had no *essential* role to play. It did, however, have *a* role to play. It demonstrated that within the constraints of his general equilibrium model money is neutral, i.e., that changes in the number of units of the item designated as money should not impact real economic activity. This role, even if it determined that money is theoretically *inessential*, nevertheless required an "ideal" institutional and "real" political arrangement to work. Walras went through considerable lengths to devise a policy framework in accordance with the ideal institutional setting of his model. It went so far as to exclude credit money from being counted as a *numéraire*. Walras never examined the implications his theory had on monetary trust. At best, trust in money was an implicit condition for his theory to work, a

psychologization of the equilibrium conditions of the model. Menger tried to make Walras's assumptions explicit by considering an evolutionary process in which money's acceptability was conditioned on the belief, or trust, that others will accept it as well. In his theory of the saleability of money, money emerges in a self-reinforcing process in which more and more people begin to use money in every transaction until it becomes the unique medium of exchange adopted by everyone. This theory presumably found an explicit "role" not only for money but also for trust. It gave rise to the idea that money cannot work without trust, where trust is defined as the belief that others will accept money. However, with this "explanation," Menger ran into a circularity problem. It assumed that there exists a general belief, or trust, that money will act as money, which validates itself as soon as money acts as money. In the end, Menger, too, had to take trust for granted. In spite of their differences, both theories had important implications for the way in which money was subsequently understood, which in turn influenced how trustworthy money gets defined. Two observations are crucial in this respect. The first is that money works best when it can be taken for granted, i.e., when it is considered only from the vantage points of its functions as a neutral measure of value and "lubricant" of economic exchange; the second is that any centralized institutional arrangement conditional for money to fulfill these two functions and, more importantly, to potentially influence the economy in any way is discredited as a "fiction," while the decentralized exchange process which it is supposed to lubricate is considered "real". These two observations continue to nurture not only theoretical debates, but also political discourse and popular perceptions of money. Together, they gave rise to the belief that money *is* trust.

2.1.2 Trust and Microeconomic Theories of Money

Walras's attempts to integrate money into value theory led to a generation of economists who tried to consolidate monetary theory with the Walrasian exchange model. The theoretical microfoundations associated with Neo-Keynesian economic analysis that started in the 1930s tried to solve this problem by introducing frictions such as real money balances and sequential trading into the agents' utility function, which could incite agents to hold money. These theoretical foundations were sought in general equilibrium Walrasian modelling techniques, giving a clear priority to money as a store of value over an assumed function as a means of exchange. Yet this school of thought, known as the Walras-Hicks-Patinkin tradition (Ostroy & Starr 1990), never managed to solve the initial problem of granting money an *essential* role. Not even ten years after Don Patinkin's *Money, Interest, and Prices* (1956), Frank Hahn demonstrated that "the assertion that the [real-balance effect] ensures the existence of an equilibrium is unproven" (1965: 201). In the second, abridged edition of his book, Patinkin had to concede, like Walras had over a hundred years earlier, that "Most discussions of monetary theory…simply assume (as I too do in this book) that money exists and serves as a unique medium of exchange in the economy." (1989: xxix).[95] Meanwhile, Menger's network theory of social trust found more approval, or reasons for debate, in sociology, and most notably in the work of Georg Simmel, whose *Philosophie des Geldes*

[95] The standard Arrow-Debreu exchange model explicitly ruled out money. "The centralized coordination of transactions, in charge of either an auctioneer or any other 'fiction' such as a 'clearing house', rules out any possibility of analyzing the role of a general medium of exchange: No theory of money is offered here, and it is assumed that the economy works without the help of a good serving as medium of exchange" (Debreu 1959: 28). The assertion of Hahn is problematic, however, because it implied that the Walras-Hicks-Patinkin tradition was not successful in providing a microfoundation of money, i.e., ensuring that money has a positive price in equilibrium. As we have seen above, this is false. Money has a positive price in Walras's theory; the problem is that money is not *essential*.

(1900) developed a monetary trust theory resembling that of Menger's.[96] Simmel made explicit the idea that monetary trust is determined by social trust. Describing credit relations as "social-psychological quasi-religious faith," Simmel observed that "Without the general trust that people have in each other, society itself would disintegrate…money transactions would collapse without trust …it is not only a money economy, but any economy, that depends upon such trust" (Simmel 1978 [1900]: 178).[97] While Simmel's trust theory, at first glance, bore much resemblance to Menger's network theory of monetary trust, where money was valued because it incorporated society's mutual trust, it added an important element to the latter. Most importantly, Simmel did not explain monetary trust through the question of whether money is accepted by others or not, but through a belief system whose stability relies to a great degree on treating money *as if* it were only a pure medium of exchange and measuring rod, while the non-neutrality of money exists but is relegated to what may best be described as the collective "unconscious" (*Unbewusstheit*, Simmel 1978 [1900]: 157).[98] This trust theory is in line with a tradition of sociological literature such as Michel Aglietta and Jean Cartelier's notion of "*méconnaissance*" referred to above, or Niklas Luhmann's view that trust is a "blending of knowledge and ignorance" (Luhmann

[96] Menger's theory also survived in the next generation of Austrian economists, most notably in the works of Friedrich Hayek, whose ideas on spontaneous order were certainly influenced by Menger's evolutionary theory; Hayek also incorporated some of Menger's ideas on *saleability* into his essay on the denationalization of money, where he argued for a financial system with competing private moneys, with specific mention of Menger's theory in section *XII. Welches Umlaufmittel würde das Publikum wählen?* Cf. Hayek (2011 [1967]: 185ff).

[97] This is not the place for an analysis on Simmel's monetary theory, which borrowed from different monetary theories of his time including those of Karl Knies and Georg Friedrich Knapp, who, like Menger, did not get mentioned in Simmel's work. Suffice it say that Simmel's comments should not be read out of context for risk of ambiguities, which may explain why Simmel has been embraced both by economists in the Mengerian (Walrasian) tradition as well as by sociologists and heterodox economists highly critical of the former.

[98] Simmel's observations on money's *acceptance* are certainly more inspired by Knapp. Cf. "The guarantee of the general usefulness of money…which the ruler or other representative of the community undertakes by the coinage of metal or the printing of paper, is an acceptance of the overwhelming probability that every individual, in spite of his liberty to refuse the money, will accept it" (Simmel 1900 [1978]: 179-80).

1979: 26). There is a great difference in defining monetary trust as the belief in others' acceptance of a universal invariant, and defining that belief itself as trust based on an incomplete understanding of the monetary system. In this sense it is ironic that economists have subsequently used Simmel's concept of trust in theories in which money is treated as a universal invariant. Two of these theories will be discussed below.

Accepting Hahn's argument, some monetary theories nevertheless argued that the general equilibrium framework should be transformed. One motivation for this continued reformation of the Walrasian program was Hahn's misguided conclusion that money had no role to play in it, which resulted in an ambitious research program set out to prove that it could, after all, be possible for money to play an *essential* role. Another motivation was a call for more rigor in economic modelling, which meant that monetary theory needed "proper" microfoundations.[99] In these theories, horizontal trust played a renewed role in merging the Walrasian and Mengerian traditions. Two theories in particular resuscitated Menger's trust theory of money in the quest to model microfoundations for monetary theory. The first theories of relevance in this context are search-theoretic models, in which an endogenously defined parameter was supposed to represent the belief that agents have about the possibility of others accepting money. This parameter was interpreted in reference to Menger's network theory and Simmel's notion of social trust. The second theories, prominent in game theoretic approaches to monetary theory, argue the contrary. In these theories, mistrust in others makes money "institutionally" necessary. In both theories, however, trust relations are entirely based on interpersonal trust between the users of money, and the institutional dimension of money is reduced to needs resulting from individual behavior. In that sense,

[99] See, e.g., Janssen (1993) for a history of this development. It is worth quoting Lucas to understand the scientific hopes attached to this project, who observed, "If [the general framework of 'microeconomic' theory] succeed[s], the term 'macroeconomic' will simply disappear from use and the modifier 'micro' will be superfluous. We will simply speak, as did Smith, Ricardo, Marshall and Walras, of economic theory" (Lucas 1987: 107–8).

both theories solidified the conclusion drawn at the end of the last section. The "institution of money"—and in both theories, money is acknowledged as an institution—can do nothing that individuals could not have done on their own. There is no role for the institution of money as a guide for monetary policy, nor as a creator of value, nor as a redistributor of wealth. By equating monetary relations with trust, or saying that money economizes in trust (Hahn 1986: 74; Hahn 2002: 262; Laidler 1997: 1214), both of these theories thus kept the neoclassical illusion of money as an institutional non-institution alive.

2.1.3.1 Menger-Kiyotaki-Wright: Money and Trust in Search-Theories

Menger never formalized his network theory of money. The first attempt to do so was made by Jones (1976).[100] Jones introduced search "frictions" into his model to study how the advantage of money over other commodities could be understood in a more realistic decentralized economy, i.e., one in which equilibrium positions are not posited *ab ovo* but are the intended results. With explicit mention to Menger, search-theoretic models tried to demonstrate that the transaction technique (barter, fiat money, I.O.U.s, etc.) should not be assumed, as is done, for instance, by a *tâtonnement* mechanism à la Walras or a moneyless central clearing à la Arrow-Debreu.[101] The exchange technology should be the outcome of the model. Nevertheless, and arguably contra Menger's intentions, search-theoretic writers also wanted to demonstrate that the chosen transaction technique should be determined by

[100] Jones's article opens with Menger's "little metal disks apparently useless" quoted above, as well as with a nod to Jevons's double-coincidence of wants problem. Jones himself believed that he "develop[ed] a possible explanation for the emergence of media of exchange through the unconverted market behavior of individuals, without decrees, centralized decisions, or explicit social agreements" (1976: 759). See also Iwai (1996).

[101] Frictions are, e.g., heterogeneous preferences, specialization in production, bilateral instead of multilateral trade, imperfect information, etc. See Ostroy and Starr 1974.

equilibrium conditions.[102] In Jones's model, agents choose between a direct trading strategy (barter) and an indirect trading strategy (money); agents meet pairwise and sequentially and they "learn" from their market experiences. The first thing they learn is that indirect exchange may be optimal in some equilibria, since it minimizes transactions costs. The second thing they learn is that there exists a probability which enables them to calculate the possibility of exchanging a consumption good for money. If the probability is high, they will accept money in exchange for goods; if it is low, they will stick to barter. They will thus accept money with a given probability as long as they believe other agents will accept it with a probability equal or superior to that probability. Jones's model was subsequently "perfected" by Iwai (1988), Oh (1989) and Kiyotaki and Wright (1993).[103] In all of these models, self-fulfilling beliefs of individuals are crucial in determining whether fiat money will be accepted in exchange. Search-theories thus emphasize the idea that the value of money is not derived from its physical attributes, but from a guarantee given by society as to its acceptability in future exchanges. The probability measure of money's broad acceptance has been interpreted as the trust others have in money.[104] Before taking a closer look at Nobuhiro Kiyotaki and Randall Wright's model, which is still the standard reference for more sophisticated search-theoretical approaches, the crucial question in all of these models of this tradition is how people learn to trust money; that is, who or what

[102] That is why they can be called Walrasian. The equilibrium conditions in Kiyotaki and Wright (1993) are steady-state Nash equilibria; i.e., agents choose the strategy that maximizes their expected payoff, given the strategies employed by others.

[103] One of the problems in Jones's model is that agents choose their strategies before trading. Thus, an agent who chooses indirect exchange will stick to this strategy even when it may be possible for the agent to engage in direct exchange. In Oh (1989), exchange strategies are conditional and agents can reject means of payment over barter, which leads to multiple equilibria with the monetary one being more optimal.

[104] Cf. Dowd (1996), who observes with regards to search-theory, "There is no 'trust' between individuals" (1996: 234) because there is no guarantee that the good with the lowest storage cost will actually be the one chosen as money. The crucial point is obviously how to determine the probability parameter, and it is no surprise that Dowd maintains that it cannot be determined or, better, that it *should* be determined by "free" competition.

determines the probability parameter in a way that individual behavior is socially optimal?[105] This question had already been answered by Menger a hundred years ago. Some kind of policy intervention, or centralized coordination of information, needs to be assumed to set probabilities.

In Kiyotaki and Wright's model, the economy is structured in such a way that agents live infinitely and each agent specializes in the production of indivisible consumption goods which cannot be consumed by the agents themselves.[106] The economy is "decentralized," i.e., there is a large number of agents, which makes it unlikely that they will meet more than once, and agents lack complete information about past or future transactions other than their own.[107] All products are equal in terms of transport and storage costs, and there is a symmetry of production and consumption. The intrinsic properties of the goods are irrelevant; what matters is agents' expected utility.[108] From the outset it is assumed that one part of the agents holds money and another part holds goods. If they do trade, agents holding money engage in one-to-one trades against consumption goods. Frictions are introduced in the market. Search-costs are defined as the difference between the probability of a double coincidence of wants being satisfied and transactions and productions cost. During the trading process, agents choose the optimal trading strategy based on their belief about the strategies of all other agents and in line with discount expected utility and rational

[105] For other search-models, see, e.g., Kiyotaki and Wright (1989, 1991), Trejos and Wright (1995), Ritter (1996), and Wallace (1997).

[106] The infinite horizon ensures that accepting money is individually rational (see Kocherlakota 1998: 244). There cannot be a positive demand for money if agents know that at the end of the final period, money would be impossible to get rid of; by backward induction there would be no demand for money in the first period.

[107] This eliminates credit arrangements, presumably because agents cannot be trusted to stick to commitments. See, e.g., the discussion in Wallace (1997), Townsend (1980: 269) and the discussion of Gale and Shubik infra.

[108] This contradicts Menger's *Absatzfähgkeit*, where liquidity was also a matter of the intrinsic properties of the good to become money and not entirely dependent on social or individual preferences.

expectations.[109] There are, then, two types of traders—money traders and commodity traders—and the crucial question is to figure out whether the commodity traders will give away their goods in exchange for money. The probability that an agent holding a consumption good will accept to exchange it for money is determined by a parameter. If this parameter is high enough, i.e., greater than the utility derived from staying a commodity trader, then the agent will accept money. A pure money equilibrium exists when the expected utility of becoming a money trader is greater than remaining a goods trader. In that case money becomes universally accepted. There are, in general, three possible equilibria in Kiyotaki and Wright's model: a barter equilibrium in which money is not accepted and not used; a mixed equilibrium in which money is accepted in some exchanges; and a money equilibrium in which money is always accepted.

The introduction of this probabilistic parameter is supposed to express the agents' self-fulfilling beliefs about whether a fiat currency will be accepted by others. This has been interpreted as a solution to "Menger's paradox" (Clower 1977: 206), the idea that money derives its value not from physical properties but from network externalities, in which questions about individuals' acceptance of money are underpinned by trust, belief or expectations about the acceptance of society at large. In this context, the model has been said to be able to measure the trust that individuals have in money (Gravelle 1996: 399; Álvarez 2004: 64; Mastromatteo & Ventura 2007: 212).[110] For instance, when the probability is 1, an individual contemplating whether to accept money in trade believes with absolute certainty that some future trading partner will in turn accept it. It has also been interpreted as a

[109] That means that agents will trade if and only if they "find" their desired consumption good.

[110] It is worth quoting Mastromatteo and Venura, who candidly observe that "indeed, lacking any direct utility, this money is used solely in consideration of the individuals' trust that it can be accepted by other agents in the system."

formalization of Menger's intuition that money evolved out of a horizontal, decentralized and sequential decision-making processes, i.e., without the presence of a centralized institution.

Everything, then, depends on how to determine the parametric degree of money's acceptability. In the absence of complete information, it seems plausible to assume that some institutional requirements are necessary to "make it work." Is there an opinion survey that regularly updates individuals about each other's beliefs? Is the setting of the parameter left to the "good faith" of the economist using the model? How can individuals figure out what others intend to do? Two scenarios are possible. If information about other individuals' intentions is freely available, then the economy is no longer decentralized. Complete information is not compatible with the assumption that individuals only know their own history of transaction and preferences. Nevertheless, assuming for a moment that everyone is able to compare his or her intentions with those of everyone else and that decisions are not unanimous, no equilibrium will be selected and indeterminacy ensues.[111] In the second scenario, a centralized mechanism, much like the Walrasian *tâtonnement* process, determines the probability parameter institutionally. If the mechanism prefers the monetary equilibrium, the parameter is adapted accordingly and vice versa for a non-monetary equilibrium. In that case, the model can hardly be said to provide a solid microfoundation for monetary theory, if any. Like Menger had conceded one hundred years earlier, the system appears to be in need of perfection by the government. It would, of course, also be possible to aggregate beliefs for all individuals (or a representative portion) via a centralized institution and calibrate the parameter according to the empirical results of this outcome. The

[111] To remedy indeterminacy, correlated equilibria (Rocheteau et al. 2005) and focal points (Duffy 2001) can be used in order to establish a single or dominant strategy via a signaling or belief-anchoring process. See, however, Binmore et al. (1993) for experimental evidence on how easily agents change focal points.

Eurobarometer does this for the Eurozone. In 2020, net trust in the Euro was 58%. Does that mean that 42% of citizens are resorting to barter? Obviously, this is not an option.[112] Either way, the parameter defining "trust" is not endogenously determined by the model. The best that search-theoretic models are able to demonstrate, therefore, is that first, it is individually rational to accept money once the social institution of money is given; and second, that the resulting allocation is pareto optimal compared to a setting without that institution.[113] What they certainly do not show is how that institution is established, let alone "self-enforced."

It is, nevertheless, possible in principle to conceive of some forms of monetary trust as a network externality, bootstrap effect or cooperative game. Again, network externalities simply describe a form of interdependence in which the practices of one economic agent strategically depend on the practices adopted by others in the same network of interactions.[114] An example of this type of externality occurs with the choice of whether or not to install a messenger or videoconference application: the greater the number of other users, the more useful the application would be, and hence the more inclined someone would be to use the application. The gradual joining of participants in the network is likened to a bootstrap effect, a self-reinforcing and self-sustaining process.[115] Applied to a monetary context, an economic agent's decision to use money then truly relies on strategic interdependencies that are significantly based on trust in others. In principle, there is nothing wrong with this idea, but it is problematic on two accounts: there is an infinite regress—

[112] As Davidson has observed, "most communities reveal a preference to use even a crippled monetary system rather than revert to barter" (Davidson 1972 [1978]: 148).
[113] In that sense they are more sophisticated versions of Walras's original model.
[114] The bootstrap effect comes in many variations. Economists also speak of "interdependent utility" and "self-fulfilling prophecies"; in institutional economics, it is called "credibility thesis"; in business economics, a "bandwagon effect"; sociologists (perhaps borrowing from economics) have called it "multiplier effect"; and philosophers, "collective intentionality". All these features display elements of "circular causation," which I do not intend to deny exists.
[115] Iwai (1988) called his theory the "bootstrap theory of money."

someone, somewhere must have started the network—and a dynamic problem—once the network is in place and becomes dynamic, it grows in directions that may be hard to predict. In marketing economics, the first problem is called a first-mover advantage; the second problem requires dynamics. Elements of both ideas can certainly be found in Menger's theory, as well as in the search-theoretic approach à la Kiyotaki and Wright, provided that they integrate an endogenous learning process, but the static nature of search-theoretic models rules out any possibility for a dynamic *process*.[116]

Search models are thus ill-suited to explain the existence of money as a social institution prone to change. Agents in these models cannot change their strategies, which rules out the possibility of switching between different equilibria. Since the choice of a transaction technique is not an individual but a collective one, the choice of one exchange technology over another must eventually be linked to a social disequilibrium process. Search-theoretic models, however, avoid this possibility by assuming that the exchange technology is determined when the economy is in a state of equilibrium. They thus mistake the rules of the game with the outcome of the game. As both Walras and Menger have understood, monetary exchanges are rules that should be established prior to the exchange game, not as its result. Furthermore, in Kiyotaki and Wright's model, agents holding money cannot produce commodities, and money is limited to an indivisible unity. Under these conditions, an increase in the amount of money would diminish the number of potential producers, a Malthusian result. If, on the other hand, agents holding money are allowed to produce money, the

[116] Nash equilibria cannot incorporate learning processes because agents are not supposed to change their strategies. Learning processes can, however, be modelled in different ways, e.g., with stochastic evolution or dynamic network analysis. Search-theoretic models, however, are ill-suited to explain the emergence of rival currencies let alone speculative assets, which are ignored in models whose sole concern is money as a medium of exchange. The odd-one out in this context is Kiyotaki and Wright's "speculative equilibrium," in which the commodity with the worst intrinsic properties, i.e., the highest storage cost (Kiyotaki and Wright 1989), is chosen as money. The idea of free-bankers to understand money as a "brand name" and trust in money like "consumer confidence" is particularly prone to the conclusion that competitive equilibria will lead agents to "naturally" choose the most stable money. See, e.g., Klein (1974: 433).

money quantities would affect agents' strategies and final allocations, resulting in disequilibrium. In short, while the structure of Kiyotaki and Wright's model prevents the establishing of money neutrality, neutrality appears to be a necessary consequence of the fact that money is a pure medium of exchange.

Now, there may be some forms of money, what anthropologists call "special-purpose money" (Polanyi 1957: 47ff) and economists "limited media of exchange" (Brunnermeier et al. 2019: 23), that work in a self-reinforcing way. Indeed, the value of decentralized digital currencies such as Bitcoin depend, at least in part, on the number of other users willing to transact with that currency (Luther 2016: 554).[117] However, the kinds of money economists are referring to and that are described in search-theoretic models do not work in such a way. Most importantly, they do not take into consideration that the choice of one exchange technology over another modifies individuals' relative wealth, which would imply genuinely decentralized actions that generate disequilibria. That is the reason why most economists, let alone central bankers, do not appear to consider money that depends on decentralized trust to be money at all (Mishkin 2019: 106–7).[118] And yet, the idea that monetary trust is somehow self-sustained by what are essentially large-scale peer-to-peer transactions remains pervasive.

Two conclusions drawn by search-theoretic models were particularly welcomed by economists. First, search-theoretic models confirmed the role of money as an exchange medium facilitating economic transactions, as a "lubricant" of exchange, that should not be seen in the same way as other commodities but as a special add-on. Second, it provided

[117] Luther's model is based on Dowd and Greenaway (1993).

[118] The insistence of central bankers that cryptocurrencies are speculative assets gives the impression that digital currencies can never evolve into real money because of some inherent properties the latter has and the former is lacking. At the same time, central bankers are actively working on creating their own digital currencies (CBDCs), where it assumed, but rarely acknowledged, that it is precisely the "credibility" of the central bank that will produce trustworthy money. See Eichengreen (2019) for a discussion of the history of private money and the introduction of fiat cryptocurrencies and stable coins.

a formalized expression to the idea that money is a social arrangement. By assuming that agents are only willing to accept money in environments where they believe others to accept it as well, search-theoretic models were considered to have finally provided an adequate social foundation of money. Both conclusions are problematic, if not self-contradictory. The first conclusion is problematic from an economic point of view because it disregards the potential that money is not neutral, i.e., that changes in the quantity of money has destabilizing effects on the economy. The second conclusion is problematic from a social perspective because it argues that a trustful society is more efficient than a distrustful society, but then demonstrates that, for that reason, money is more efficient than barter. In essence, the Menger-Kiyotaki-Wright tradition is claiming that non-monetary relationships are more efficient, while then arguing the opposite. In the end, it sounds like monetary and non-monetary relationships are alike. Both conclusions are particularly damaging in the way that they understand institutions and institutional change. In line with neoclassical thought, search-theoretic models thus conceive of monetary trust relations as an evolutionary process benefitting the community at large. Even if search-theoretic models are unable to formalize this process, the narrative accompanying these models resembles the Mengerian idea of the spontaneous development of social institutions. In this spontaneous process, economic agents come to realize that some forms of money are better than others and that monetary transactions improve the disorderly rules of non-monetary ones until one medium exchange is singled out and institutionally established. It is unknown how this process plays out in detail, but the important point is that the development of monetary institutions is not the outcome of deliberate design, but of conventions which are essentially arbitrary and could have developed in a variety of ways. Nevertheless, once society becomes more familiar with the institution of money and the conventions are established and settled in, people assume that the conventions will be followed in the future and that this

general acceptance is required for the collective benefit. In this way, the potential discriminatory benefits of institutions for some segments of the community are ruled out or, if allowed, the burden defaults to those members of the community who are unwilling to cooperate. In other words, "more trust," as opposed to institutional reform, remedies coordination failures.

2.1.3.2 Vaughn-Gale-Shubik: Money and Distrust in Game Theory

Long before the neoclassicals had determined that money transactions would collapse without trust, a different breed of *homo œconomicus* was prevalent, one whose distrust in the users of money gave rise to the thing itself. Money was seen as a substitute for a lack of trust. In his *A Discourse of Coin and Coinage*, Rice Vaughan observes,

> The first invention of money was for pledge and instead of a surety, for when men did live by Exchange of their Wants and Superfluities, both parties could not always fit one another at the present; in which case the Corruptions of Man's Nature did quickly grow to make it behooful, that the party receiving should have somewhat worthy to be esteemed for a Pledge, to supply the givers want upon the like occasion. (Vaughan 1675 [1933]: 1)

For Vaughan, the absence of trust between economic agents required a quid pro quo. The quid pro quo guaranteed that agents would not default on the redemption of their promises and traced the existence of money as an externally issued medium of exchange to the absence of trust.[119]

[119] The structure of this argument resembles the social contract theory in Hobbes' *Leviathan* (1651), where the existence of government is famously justified on the base nature of the citizenry, with the crucial difference that in Vaughan's account, there is no authority to justify the existence of money. Hobbes warns against too much interpersonal trust. See, in particular, *Leviathan Vol. 2* (i) 6, 94: 3–4, "And though by men's actions we do discover their design sometimes; yet…it be

The view that money derived from subjective confidence in the reliability of one's fellow men, was further developed by John Locke (1691), who found himself arguing at length for a monetary standard free from manipulation by individuals and discretionary political interference.[120] Locke wrote several essays on money during the Coinage Crisis, when the English Government under King William III intended to replace most of the coinage in circulation. The silver coins that were in use throughout much of the 17th century had been severely clipped, so that their nominal value no longer represented their metal value. Meanwhile, the government had a war to finance and silver coins that were harder to clip had been in circulation since the 1660s. Witnessing the ease with which a sovereign could create money out of nowhere, and corrupt businessmen could profit from the fluctuations in the value of metal, Locke feared that "all must break in Pieces, and run to Confusion" (Locke 1695: 213). To curtail money's fragility and corruptibility, Locke argued for a "depoliticized" (Eich 2020) fiat currency tied to an initially arbitrary but unalterable quantity of metal. Even though Locke's argument goes much further, it is essentially that of Vaughan. Locke embraced an unalterable metal money out of mistrust, both towards citizens and the government.

Henry Thornton did not dwell so much on the corrupted nature of man, but like his predecessors, he thought that money evolved out of a lack of trust in the personal honesty of trading partners and consequently in the stability of the legal system to enforce, if necessary, the fulfilment of contractual obligations. His *Enquiry into the Nature and Effects of the Paper Credit of Great Britain* opens with a reflection on "confidence" in which the concept is equated to money, or credit. He writes, "Commercial credit may be defined to be that

for the most part deceived, by too much trust, or by too much diffidence; as he that reads, is himself a good or evil man," and Odzuck (2017), for discussion.

[120] See Carey (2014) for a discussion on inter-subjective trust and money in the works of Locke, and Eich (2018) for a historical analysis of Locke's understanding of monetary trust during the Coinage Crisis as well as the references therein.

confidence which subsists among commercial men in respect to their mercantile affairs" (1802: 75). According to Thornton, credit precedes money. "Commercial credit," he observes, "is the foundation of paper credit; paper serving to express that confidence which might otherwise be merely verbal" (1802: 76). Money is seen as a necessary guarantor for commercial exchange to take place smoothly. Thornton continues, "In a society in which law and the sense of moral duty are weak, and property is consequently insecure, there will, of course, be little confidence or credit, and there will also be little commerce" (1802: 76). For Thornton, as for Vaughan and Locke, money thus evolved out of a lack of societal trust. In it was represented a need for a strict enforcement of oaths, public promises, and contracts.

That money could be understood as a result of distrust was in a sense eclipsed by neoclassical assumptions positing the contrary. The first economist to revive the idea that money may be seen as a substitute for a lack of trust in economic exchange was Douglas Gale.[121] Gale was skeptical about the underlying trust assumption in neoclassical theory. In particular, he observed that if money was supposed to act as a store of value and not only as a means of exchange between trades that are happening over time (sequentially), and if, furthermore, the economy is supposed to be decentralized (information and coordination are not frictionless), the neoclassical tradition (in its Walras-Hicks-Patinkin variant) placed too much responsibly into individuals' credible commitments.[122] In his article "The Core of

[121] As the opening of this section addressed, the problem is not new. See, e.g., Joan Robinson: "A world in which expectations are liable to be falsified cannot be described by the simple equations of the equilibrium path" (Robinson 1962: 25). Specifically with regards to sequential trading, it should be noted that Ostroy (1973) had addressed a similar problem with his remark on the "behavioral feasibility" of trading sequences, where he notes "the restriction that each individual have no incentive to depart from the sequence" (1973: 598) as one problem. Gale's paper, however, is usually cited as having shifted the trust problem towards analyses on mistrust or non-cooperation in the game-theoretic sense. See, e.g., Hahn (1986: 31).

[122] Gale's criticism also counts for general equilibrium models with complete markets such as in Debreu (1959), or Arrow-Debreu (1954) or McKenzie (1954), where the treatment of time (all transactions take place at a single instance) and uncertainty (there is no uncertainty) require that agents trust each other. See Gale (1982: 234–5). However, since the idea behind cooperative "core" equilibria is that agents can meet and reject a proposed economy-wide allocation when they can do better on their own, obviously some kind of kind of centralization is necessary.

a Monetary Economy without Trust" (1978), Gale first demonstrated that there is certain type of social instability in intertemporal models, which he thought must be due to the lack of trust in the fulfilment of trade contracts concerning goods to be delivered at different dates. Using an exchange model with a finite number of periods and a sequence of budget constraints, Gale justified a lack of trust on some allocations because of inherent incentives to break futures contracts at time of delivery. For instance, if one agent exchanges a unit of consumption today for another unit of consumption tomorrow, he or she is just receiving a promise of future delivery in return. However, in the absence of trust, there is no reason for that agent to expect that a utility maximizing trading partner will keep such a promise.[123] In a situation of mistrust, that is, if defaults are permitted as part of the game, all kinds of forward markets would be eliminated even if participation is costless. Like in Walras's initial model, trades would have to take place on the spot and any attempt to construct a sequential trading process would have to be abandoned. In order to circumvent this problem, Gale introduced "a social institution" (1978: 456), i.e., money, into the economy, which makes otherwise untrustworthy allocations trustworthy. By providing all traders with government-backed fiat money, they may trade without needing to trust one another.[124] As a result, sequential trading is possible and "the core" (equilibrium allocations) of the economy achieved. Gale concluded that "It is not the invention of paper money which restores trustworthiness. The Walras allocations are trustworthy in the monetary economy only because there is, in the background, a government which can enforce, evidently at no cost, the payment of money taxes. Thus, we have introduced not just a new commodity (money) but a

[123] In cooperative game theory, the "core" of an exchange economy is the set of feasible allocations which cannot be improved upon by any coalition of agents; core allocations are those satisfying individual rationality and Pareto efficiency.

[124] As in all monetary models with a finite horizon, there is a money tax at the end period to give money a positive price. See, e.g., Hahn (1973), Starr (1974). This should not be confused with any "real" tax. A referee collecting the exchange medium at the end of each period could do the job.

new social institution" (1978: 465). Knapp's theory—money as a creation of the State or of the law—appeared to be vindicated at last!

The institution in Gale's model was, of course, just the mathematical requirement of a rule enforced on the market whose basic constituents—endowments, preferences and technologies—were the same as in the Walrasian framework. In that sense Gale's theory recognized that the institutional assumptions are not "fictions" and thus needed to be defined as rules of the game before the game starts. This separated his approach from the Menger-Kiyotaki-Wright tradition of evolutionary models.[125] However, was the model well-suited to understand how "the new social institution" interacts with the economy? How does money alter the ways in which the game is being played out? Gale's model, like Kiyotaki and Wright's, proved that a monetary equilibrium is better than a non-monetary equilibrium. But what makes it better? The problem, again, lay in the way in which money was perceived as a "neutral veil" and "lubricant" making life easier for economic agents. In Gale's model, money has a positive price at equilibrium, but it is not treated as a component of wealth. Instead, it is only allowed to function as an intermediary of exchange. Gale specifically assumed that "There is no useful distinction to be made between its role as an asset and its role as a 'medium of exchange'" (1982: 231). Positing money as an institutional hypothesis, i.e., as a coordination mechanism of market economies, however, implies that money is not neutral.[126] It would have to account for skewed wealth distributions, policies managing the money supply, debt and taxation, etc. In the absence of such mechanisms, the "social institution" of money in Gale's model is as inessential as in Walras's model. To

[125] Even though it can be argued that there is an implicit evolutionary narrative in Gale's model. As markets become more and more anonymous, interpersonal trust between economic agents who know and trust each other is replaced by impersonal trust and state strategies. See Mirowski (1986: 248-9) for a similar observation regarding the role trust plays in Shubik's model.

[126] Otherwise the "sequence" is nothing more than a time-indexing of commodities. Walras, at least, was consistent with his timeless model, realizing that his *encaisses désirées*, i.e., the possibility for agents to keep money, would destabilize his equilibrium conditions. In response to Gale, Grimes (1990) has shown that introducing money into a two-period noncooperative bargaining framework has asymmetric consequences on final allocations.

explain the existence of institutions or institutional rules through the behavior (mistrust, in the case of cooperative game theory) of individuals is all the more problematic in this sense. At best it explains social institutions through individual psychology.[127] At worst, it distracts from the fact that the rules of the game are dependent on other variables than individual psychology, and we are confronted with yet another instance of "benign neglect."

Martin Shubik criticized Gale's approach for his reductionist institutional assumptions. In a review of Gale's *Money in Equilibrium* for the *Journal of Money, Credit and Banking* he remarked that "Attempts to merely extend general equilibrium theory without recognizing fundamentally different rules of the game concerning government, central banks, legal enforcement, power to collect taxes, etc. are doomed to failure" (Shubik 1985: 127). Regarding the postulate that money is a substitute of trust in Gale's model, Shubik objected, "The trust and the trust substitutes are generated in the context of the polity and society as a whole, not just the economy" (1985: 127). In Shubik's view, a more complete approach was needed to understand the "economic value of trust" (1985: 127).[128] Prior to Gale's results, Shubik himself had spent some time studying the role of trust in a monetary economy with core-equilibrium (Shubik 1970). There, his approach came to similar results as those obtained by Gale. Starting with a general equilibrium model with budget constraints, he demonstrated that "in an economy with perfect trust no money is needed" (1970: ii). He then considered different situations in which traders do not trust each other but they trust gold, a banker, debt contracts, fiat money, etc., where each of these "institutions" is regarded to provide a service of trust. He then solved each system to show under which conditions traders are in the core and allocations are "blocked," i.e., Pareto efficient, provided that traders cooperate. Like Gale, albeit less candidly, he concluded that "One way of

[127] Where legitimacy of authority, in Hobbesian fashion, is justified because of inherent vices, i.e., utility maximizing behavior.

[128] Shubik almost sounds like a heterodox economist when he writes, "The theory of money and financial institutions belongs to political economy not to economics alone" (1985: 127).

dealing with lack of trust is by having individuals enter into legally binding contracts. The use of money is one such contract" (Shubik 1970: 78). In this paper, Shubik thus also shared Gale's conception of money as a "measure of value (when one price is fixed), a means of exchange (by law, by custom and because it avoids added transaction costs caused by barter) and a symbol of trust (by law and custom)" (Shubik 1970: 83).

By the time Shubik was reviewing Gale's approach, however, he had begun to shift his focus.[129] In an article for the *Zeitschrift für Nationalökonomie*, he asked, "Should we assume that the laws and customs are to be modelled as rules of the game which are given and never broken?…Why should individuals accept fiat money or the laws and customs of trade in the first place?" (Shubik 1974: 383). One year later, in an article for *Kyklos*, he observed that decentralization and dynamic economies, e.g., economies where money is not neutral, are incompatible with the static approach of general equilibrium theory, even when the latter is sequential. His criticism against "the core" approach was devastating: "The core is a cooperative solution concept and is essentially as static and almost as nonstrategic and nonprocess oriented as are the mathematical models of the competitive equilibria" (Shubik 1975: 546). "*Money is not a veil*" (Shubik 1975: 563, emphasis original), he observed, reversing the conclusion drawn at the end of his 1970s paper. Struggling with the idea that mathematical institutional economics may be a contradiction in terms, he set out to describe an ambitious program that was to include specifications of disequilibrium states, decentralized competition, uncertainty, bankruptcy, etc.[130] This idea was echoed in Shubik's review of Gale's book: "The very essence of money and financial institutions lies in dynamics"

[129] This shift may be due to the fact that, in the early 1970s, Debreu (1974), Mantel (1974) and Sonnenschein (1972) demonstrated that general equilibrium will not lead to global stability. However, if at all, Shubik only acknowledges this development indirectly in the long but telling title of his article: "The General Equilibrium Model Is Incomplete And Not Adequate For The Reconciliation Of Micro And Macroeconomic Theory" (Shubik 1975). A brief history of Shubik's disillusionment with cooperative game theory can be found in Schotter and Schwödiauer (1980) as well as in Shubik (1992).

[130] "…mathematical institutional economics is deemed by many to be a contradiction in terms" (Shubik 1975: 545).

(Shubik 1985: 128). How did Shubik's new program differ from his earlier results? In the mid-1960s, Shubik had already used noncooperative Nash equilibria as a more "realistic" alternative to cooperative ones.[131] The difference between cooperative and noncooperative games is that in the former, players collaborate to create strategic plans; in the latter, collaboration is either forbidden or impossible from a rational point of view.[132] In a way, it is the most extreme form of methodological individualism because economic agents calculate their optimal strategies in complete isolation and without any actual interaction.[133] This, so Shubik believed, justified institutions; it was the natural progression of mass anonymous society (Shubik 2014: 52).

In a book entitled *Barley, Gold, or Fiat*: *Toward a Pure Theory of Money* (2014), Shubik, together with Thomas Quint, summarized much of his post-"core" equilibrium research. There, the "basic model" that includes fiat money presents two types of traders, each endowed with a different type of good and a fixed amount of money (Shubik and Quint 2014: 100ff). Trades take place in a single period, and agents solve their utility function by offering goods for sale and buying the goods of others at a given price. The utility of money, which Shubik also calls the salvage value of money, is either fixed or held constant via a parameter. If the parameter is fixed, the purchasing power of money is preserved over each period and the model is exactly the same as the model without fiat money (Shubik & Quint 2014: 20ff). If, on the other hand, the salvage value of money is uncertain, i.e., not fixed, money cannot be considered to preserve its purchasing power and those agents with more money holdings at the end of the period could be worse off; for example, they would not be able to buy the same amount of goods in the next period if the value of their money holdings

[131] The same equilibrium concept used by Kiyotaki and Wright (1993), see supra.

[132] The most famous noncooperative game is, of course, the Prisoner's Dilemma, where the optimal result cannot be reached because agents are not allowed to communicate with each other.

[133] As pointed out by Shubik in a historical overview, John von Neumann criticized Shubik for this methodological shift, telling him that he did not like the Nash solution and that the cooperative approach "makes more social sense" (Shubik 1992: 155).

decreases. While theoretically interesting, Shubik avoids modelling this possibility first by assuming that trades only take place in one period, which makes it superfluous for agents to keep fiat money. Far from presenting a dynamic economy, his post-"core" approach thus remained a static one-period economy, because "it offers precision at the cost of reality" (Shubik and Quint 2014: xi). Second, if traders are "allowed" to hoard money in the rare instances of several iterations of the game over more than one period, symmetry, rational expectations, "no bankruptcy laws" and "salvage conditions" will insure that expected prices are equal to actual prices, thus *de facto* ruling out the possibility of skewed distributions.[134] The only difference from his 1970s model, then, is the choice of the equilibrium solution, where the earlier model was a multi-step game with cooperation among traders and a "non-cooperative" (decentralized) market, and the latter model a single-step non-cooperative game. This can hardly be called a major change. Indeed, institutional assumptions and "enforcement mechanisms" (Shubik 1973: 37) such as "no bankruptcy laws" or "salvage conditions" in which money is neutral still require cooperation. In Shubik's non-cooperative model, the rules are thus obeyed in a way that markets do not fail and agents are led to "solve" their utility function so that everyone is better off. And so, the institutional set-up in the noncooperative game does not fundamentally change the economy; it can do nothing agents could not have done (cooperatively) on their own. Shubik had already acknowledged this when he first dealt with noncooperative equilibria. In his 1975 paper for *Kyklos*, he thus wrote, "it is likely that there is a large class of…noncooperative models which differ from each other in institutional details to handle disequilibrium yet have the same set of state equilibria which turn out to be the competitive equilibria of the system

[134] Shubik considers unequally distributed money in a model in which all agents are endowed with goods and only one agent is endowed with money (Shubik 2014: 40ff).

modeled without attention paid to its institutional and strategic details" (Shubik 1973: 562n). In the end, cooperation and noncooperation converge into the same equilibrium.

Unsurprisingly, the role of money as a substitute of trust did also not change from one approach to the other. In both models, money repeatedly gets described as a "symbol of trust" (Shubik 1970: 50; 82); *Barley, Gold, or Fiat* opens with the sweeping statement that "This book is about a fundamental phenomenon in economic life. This is the use of money and credit in transactions, and their roles as substitutes for trust" (Shubik and Quint 2014: 1).[135] In spite of such claims, however, Shubik's observations about monetary trust are not reflected in any of his models. In a typical passage, he observes, "fiat money is society's substitute for individual trust. These words almost belong to the popular press and common knowledge, but the appropriate mathematization of these words requires some work" (Shubik & Quint 2014: 52), but never creates a model that shows what would happen without that trust, or a model that provides meaningful insight into the question of how that trust is created, diffused and sustained, or a model in which different degrees of trust change the outcome of the game. The best analysis Shubik has to offer of a loss of trust in money is a variation on a quantity theory of money. That is, when there is not enough money in the economy, the purchasing power of money rises (and price levels fall) until it becomes too high for trade to take place. With reference to *Three Cities* (1929-30) by the early twentieth-century Polish writer Sholem Asch, Shubik concludes from this that "in reality," although not in the model, traders would then resort to different transactions techniques and trade would nevertheless take place.[136] Trust, however, does not influence the outcomes of

[135] In a footnote, Shubik and Quint claim intellectual indebtedness to Simmel, Walras, Menger and Jevons (among several other "historical figures…of the distant past"), observing that economists are too short-sighted in their referencing. Sadly, they do not discuss any of the works of these thinkers or compare their own work with the conceptual problems witnessed by them; see Shubik and Quint (2014: 63n).

[136] The astute reader may have observed the irony in the use of fiction to understand reality in this context. While perhaps a progress from the "conjectural history" of the classicals, one cannot but get the suspicion that the theory will stay valid so long as it does not have to confront reality.

"enough" or "not enough" money, since the quantity of money in the economy is exogenously given. Monetary trust, then, simply means that the agents in the economy accept the money tokens they are endowed with and that are used in trade, and no agent has an incentive to deviate given the rules and institutions of the game. The Nash equilibrium solution to the game, however, can neither explain the institution of money nor that of trust.[137] At best it shows that once money and trust are in place, it is rational for agents to accept money and to trust that others will do the same. Thus, monetary trust is not the result of individual actions, as Shubik appears to claim, but a predefined assumption. In the end, Shubik has to acknowledge, "the question…how expectations are formed in a society to provide a sufficient level of trust to preserve fiat's value in trade [are left open]" (Shubik & Quint 2014: 52). This is a discouraging, if not paradoxical, conclusion for a research program purporting to show how "trust and trust substitutes are generated in the context of the polity and society as a whole, not just the economy" (Shubik & Quint 2014: 323). In Shubik's model monetary trust is not economically, let alone socially or politically, "generated" in any steps of the model; it neither fosters institutional guarantees nor overconfidence, abuse or collapse. Instead, it is essentially risk-free and as stable, invariant and universal as money itself.

The game theoretic approach to monetary trust seemingly departed from the neoclassical tradition, which regarded money as a result of trust. By contrast, game theorists reintroduced the idea that money is a consequence of distrust, the necessary result of an atomist society in which self-interested individuals cannot be expected to know and hence to trust each other. Where microeconomic monetary theory in the Menger-Kiyotaki-Wright tradition sought to explain monetary trust in terms of coordinated beliefs, game theorists stressed that trust was necessary in the absence of coordination and cooperation. Money could

[137] A similar criticism has been made by Ganßmann: "invoking the Nash equilibrium concept looks much like a tautology when considered as an attempt to explain an institution as a result of actions. All it says is: Once the institution is in place, it is best for everybody to act according to the rules defined by the institution" (2012: 84).

substitute for a lack of trust. Unlike the microeconomic theories in the Menger-Kiyotaki-Wright tradition, where trust was misleadingly considered an outcome of the game, the Vaughn-Gale-Shubik approach thus made it clear that institutions such as money and trust are rules that have to be defined before the game starts. There is no mention of evolution or spontaneous order in Shubik's account of social institutions; the rules could be constraining, or even coercive. In spite of these differences, however, game theorists inherited many of the problems already witnessed by neoclassical monetary theory. The Vaughn-Gale-Shubik tradition thus also emphasized the importance of institutions in resolving "frictions" faced by economic actors, where the outcome produced by interactions without institutions are Pareto inferior to other alternatives. In that sense, the game theoretic context was as ill-equipped as the Menger-Kiyotaki-Wright tradition to make sense of the institutional framework of monetary economies. In both traditions, institutions are considered to ameliorate the economic situation of agents. As a social institution, monetary trust provides collective benefits for the whole of society. It renders economic transactions more efficient with regards to final allocations and reduces transactions costs. While Kiyotaki and Wright allow for barter to coexist with a monetary equilibrium and Shubik's more sophisticated models allow for the co-existence of several suboptimal equilibria, the underlying conception of both theories is that the efficiency gains provided by the institution of money are everyone's gain.[138]

It is certainly true, but also trivial, that in large, anonymous societies, monetary trust plays an increasingly important role. It is certainly not true that distrust follows from the absence of interpersonal trust. As the sociological literature on trust teaches us, impersonal

[138] Shubik's conclusion is revealing in this regard: "In conclusion: There tends to be a gain in efficiency (in the consumption of perishables) both when we switch from a gold to a fiat money, and when we introduce a central bank" (Quint & Shubik 2014: 105).

trust and personal distrust are not the same thing (e.g., Pixley 2004: 4). The fundamental problem of microfoundations is that they try to explain impersonal trust and distrust from theoretical observations that solely consider individual behavior. For that reason, it does not matter whether individuals *trust each other* or not, as in the Menger-Kiyotaki-Wright tradition, or whether they *distrust each other*, as in the Vaughn-Gale-Shubik tradition; i.e., whether the game is cooperative or noncooperative. In either case, individuals have to *trust in money*. Their feelings of trust or distrust for one another have no impact on what is essentially described as a "social convention" (Giannini 2011); institutions such as the state or central banks are not involved in the creation, maintenance or destruction of trust or distrust. In what ways institutionalized trust ensures trustworthy money, sustains certainty in the value of money or encourages uncertainty or failure remains unanswered. More than that, the underlying assumption that trust *in money*, even when that trust is regarded as an institutional responsibility, is a matter of optimizing interpersonal trust relations that could in theory work without it can be seen as a form of benign neglect, in which the institutional dimension of money is at once acknowledged and diffused. This benign neglect can be seen in both microeconomic traditions presented in this chapter. Monetary trust gets repeatedly defined in both traditions as a social institution on the basis of interpersonal relations alone. Thus, the role the "institution" is supposed to play not only remains diffuse but conveys the impression that it does nothing individuals could not have done on their own. In this apolitical conception of institutions, the institutional framework acts like the individuals in it: it is an imitation of the lower bonds of the economic sphere. This conclusion is in line with institutional theories that stress the collective benefits of social institutions exclusively from the vantage point of individual action, whereby the uneven benefits of such institutions—the unequal advantages for some parts of society—are obviated and coordination trumps conflict (Knight 1992, Hall & Taylor 1996).

The concept of trust in neoclassical monetary theory and its microfoundational succession never managed to break the "vicious cycle" first observed by Karl Helfferich in the context of understanding the marginal utility of money. To show that people trust money because it is being used and to explain the use of money in turn through trust is more tautology than proof, but nonetheless kept the idea that money acts like trust very much alive. More than that, it kept economists from seeking the determinants of trust outside models of exchange and the restrictive assumptions of general equilibrium theory. This conception of trust is not only incomplete but diverts attention from the fact that trust in money is not solely defined by trust in others but by what is usually described as "trust in the future purchasing power of money" (Giannini 2011: xxv; Issing 2002: 22). The neoclassicals, particularly Léon Walras, were astutely aware of the problem that the purchasing power of money could not be considered stable over time, but sacrificed time for stability. If the purchasing power of money does not change, the future purchasing power of money is guaranteed and the trust problem resolved. In other words, neutral money in the Walrasian framework theoretically obliviates the trust question. This may explain why economists in the neoclassical tradition focused on the Mengerian question of acceptability and belief in their understanding of monetary trust. Another explanation, favored by sociologists (Pixley 2012, Braun 2014, Beckert 2016) and institutional economics in the French tradition (Aglietta 1992, Aglietta & Cartelier 1998, Aglietta & Orléans 2002), is that the one-sided focus on interpersonal trust relations in the neoclassical framework deliberately ignores that trust in money implies trust in those institutions responsibly for maintaining the value of money, i.e., governments and central banks. Neoclassical economic theory, however, ignores the centrality of institutions as fundamental for economic organization.

2.1.3 Trust and Macroeconomic Theories of Money

In macroeconomic monetary theory, monetary trust usually gets mentioned as a variation of a Keynesian motivation to hold money, or liquidity preference. In his *General Theory*, Keynes observed, "our desire to hold money as a store of wealth is a barometer of our distrust of our own calculations and conventions concerning the future.…The possession of money lulls our disquietude" (Keynes 2015 [1937]: 218–9). On the other hand, Keynes also determined the demand for money by the "underlying factor" of expected inflation. In the French preface to his *Tract on Monetary Reform* he thus wrote, "the trust or distrust which the public feel in the prospect of the future value" determines the value of the currency (Keynes 2012 [1923]: xxi). In the first instance, mistrust, or the precautionary motive, determines the demand for money; in the second, mistrust reduces money holdings as people make to decrease the inflation tax on their cash balances. The two explanations may not be contradictory: mistrust may be as much of a motivation for stashing cash into mattresses as it is a cause of hyperinflation or even simple inflation expectations. But what, then, determines "the mood of the public" (Keynes 2012 [1923]: 68)? As Allen H. Meltzer noted in his study on Keynes's monetary theory, "Here and elsewhere, Keynes recognizes the importance of anticipations or confidence, but as was standard at the time, the determinants of confidence are left unstated, and the argument is incomplete" (Meltzer 1988: 55). Sadly, the "standard of the time" did not change much after Keynes. Post-Keynesians such as Paul Davidson (1979), Nicholas Kaldor (1970) and Basil J. Moore (1988) customarily reiterated Keynes's confidence claims without ever analyzing how they could be better understood within the Keynesian framework of monetary analysis. Davidson, for example, observed, "Any model of a monetary, market-oriented economy which attempts to provide insights about the real world should have the following characteristics.…There is

"confidence" in the monetary and financial system" (Davidson 1972 [1978]: 146–7), but never provided such a model. Recently, the French economist Edwin Le Héron (2020) has offered a useful analysis of the role monetary confidence plays in Keynes's economic thought, which can be seen as a bridge towards the credit and state theories of money introduced in the next section.

The only other macroeconomic theory, if it can even be counted as one, in which monetary trust was explicitly considered is the overlapping generations model.[139] The overlapping generations model (Allais 1947, Samuelson 1958, Diamond 1965) differed from the microeconomic models in the Walrasian or Mengerian tradition because it did not consider money exclusively as a transactions technology. In the Allais-Samuelson-Diamond model, money is seen as an asset which is used to transfer resources between generations. The general idea is that individuals who are young today want to consume goods in the future, but they cannot store future goods of consumption (goods have shorter best-before dates than their consumers' lifespans). In order to be able to consume, they trade with people who want resources today. However, if the young trade goods in their youth with the old, by the time they are old themselves, who will be around to pay them back? "Money," and what Philipp Weil has called "economic birth" (the characteristic of not being included in the economic calculus of pre-existing agents), can overcome this friction.[140] The young sell

[139] It may be debatable whether the overlapping generations model can be seen as a macroeconomic model, especially since it promised to provide yet another microfoundation to monetary theory. However, since it was based on Samuelson's growth model, and is still used in macroeconomic textbooks, I include it here. Blanchard and Fischer (1989: 156ff) may be outdated by now, but the model remains "fashionable" (Hahn 1981: 7), e.g., it is the basic model in Champ, Freeman and Haslag's *Modeling Monetary Economies* (2011: 15ff) and is still featured in Illing and Cao (2019). Although there was no explicit mention of trust in Blanchard and Fischer, see, e.g., Stefan Collignon: "…as Blanchard and Fischer…show, trust in the value of money is necessary for money to have value" (Collignon 2003: 2). See also Farmer (1999: 121), who speaks of "Samuelson's social institution of money." Interestingly, Shone (2003) dropped the model from the second edition of his *Economic Dynamics*, acknowledging that it does not display dynamics.

[140] See Philippe Weil's intellectual history of the overlapping generations model (Weil 2008: 117).

to the old, carry the money into their old age and buy from the next generation of young people, etc. *ad infinitum*. The role of monetary trust in this model was concentrated on the condition that individuals must ostensibly believe that money will maintain its value in the future (trust *in money*), but they also have to trust that the future generation will accept it (trust *in others*) (Illing & Cao 2019: 296ff). The model was thus considered to express a "grand consensus" (Samuelson 1958: 480–1) of intergenerational solidarity or interdependence that was interpreted as a form of social trust.[141] Because of the store-of-value function of money, the overlapping generations model also provides a useful bridge to Keynes, where "animal spirits" such as confidence in the future stability of the currency can have dramatic effects on current economic activity (Geanakoplos & Polemarchakis 1986: 755). However, as we shall see, what is called trust in overlapping generations models is a consequence of selecting among two different equilibrium prices, one in which there is a monetary equilibrium and one in which there is an autarkic one (barter). The choice between either equilibrium, and hence to trust or not to trust, is not up to the agents in the model but has to be set exogenously. The overlapping generations model thus exhibited the same problem that underpinned the microeconomic models discussed above. It defined the institutional assumptions in the model as a "social contrivance" and had to sacrifice the possibility for money to play an *essential* role. In the last analysis, money could not function as a real store of value in the model without violating the assumption that it is intrinsically useless and inconvertible into other assets.

[141] In a rare instance of philosophical musing, Samuelson even quoted Immanuel Kant's categorical imperative in this context. On the normative aspect of Samuelson's model, see, e.g., Hausmann (1994: 238ff).

2.1.3.1 Money and Trust in Overlapping Generations Models

The idea of overlapping generations was first put forward by Maurice Allais (1947) and successively by Paul Samuelson (1958) and Peter Diamond (1965). Overlapping generations models (OLG) differed from the models discussed above because they treated money as a store of value as opposed to a medium of exchange. There are many different variations of this model and disagreements about the meaning of its results have accompanied the model at least since the days of Samuelson.[142] The general structure of the model, however, is simple and comparable across different versions. In most OLG models there are two periods and two generations, the young and the old. The young generation is endowed with a single commodity that is not produced and not storable, and the old generation is endowed with nothing. In Samuelson's model the non-storable good was dubbed "chocolate" (Samuelson also considered "ice cream" and "radium"). The preferences of the young generation are such that they would like to consume as much as possible right now, without risking the possibility of ending up with nothing once they are old.[143] However, since "chocolate" is considered non-storable, it cannot be kept until old age, and it cannot be exchanged with the old because they will no longer be around in the next period to honor their commitments. In this situation, the equilibrium of the economy is autarkic, which means that agents can only consume their own endowments and allocation is achieved by the decentralized economy. Intragenerational trade, i.e., trade among the young, is impossible because preferences are considered to be symmetric.[144] This equilibrium is not Pareto-optimal since the

[142] See, e.g., Lerner (1959) and Meckling (1960) for early criticism and, e.g., Tobin (1980), Hahn (1981), McCallum (1983) and Hoover (1988, 1996) for criticism of more recent models and particularly those of Wallace (1978, 1980, 1983).

[143] Usually this implies that the young generation must be endowed with more than half of the total endowment and consume less than their endowment but more than half of what is available to them.

[144] So, a young person cannot lend to another member of his or her generation because then they would all be lenders and nobody would borrow.

old are left with nothing or, even worse, with nothing but the prospect of their imminent demise. Fiat money (or any kind of intrinsically useless but storable commodity) may come to the rescue, however, and produce more optimal equilibria. If the old are endowed with fiat money, they can offer to buy the fraction of chocolate the young wish to consume once they are old (and enjoy life before it is over). Why would the young accept this bargain? Because they expect that the same process will be repeated once they are old. The unusual result of introducing fiat money into this economy is that the autarkic equilibrium does not disappear. There are now two possible equilibria, one in which money is accepted, has a positive price at equilibrium and trade between generations takes place; and the autarkic one, where money exists but is not accepted, has no value and no intergenerational trade will take place.

Monetary trust in this model is commonly considered to explain the "choice" of the monetary equilibria over the autarkic one. If the young decide to use "money" for intergenerational trade, they are confronted with the nagging problem that there are no guarantees that the next generation will continue to agree to exchange goods for money; in the absence of trust, there is always the threat that the economy could resort to autarky in the next period. This may make trust necessary, but it also begs the familiar question of what determines that trust? Most models simply assume that agents trust money in order to focus on other problems exhibited by the OLG model, the most important one perhaps being the observation that it is not rational for agents to hold money over time in the presence of other interest-bearing assets. In other words, if the overlapping generations model is supposed to provide a use for money as a store of value that gets transferred in time, there may be other resources that could do this job much better than money (e.g., cacao trees as opposed to chocolate candy bars), not to mention existing social arrangements such as a social

security system.[145] Simple OLG models do not allow agents to transfer other resources through time except money. More complex models try to explain money holdings over assets that yield higher returns by weighing a risk threshold against stochastic real returns (Wallace 1981) or by introducing intermediation costs that make it costly to hold other assets (Bryant & Wallace 1979). While it is true that there is a risk in exchanging excess money holdings for other interest-bearing assets, the threshold is too narrow to explain the observed differences between the yields of money and the much higher yields of other assets. A similar argument can be made about intermediation costs like service and brokerage fees, which are too small to account for differential yields.[146] With unrealistically narrow restrictions, the store-of-value function of money thus provides a poor explanation for the existence of money. In the end, all that overlapping generations models were able to prove is that it is individually rational to hold money (under very restrictive assumptions) and that the monetary equilibrium Pareto dominates the non-monetary one. "Trust," as Jean Cartelier has rightly observed, "has nothing to do with that traditional method" (Cartelier 2018: 28). There are simply two equilibria, one monetary and one autarkic. The choice of either one of them is a result of the equilibrium conditions of the model and not of the sentiment one generation places in the trustworthiness of the other.

If trust is supposed to explain why agents choose the monetary over the autarkic equilibrium in the overlapping generations model, trust needs to be made explicit in the selection process. This familiar path, already seen in the search-theoretic models above, was applied to OLG models with the introduction of an acceptance probability parameter for

[145] Weil (2014) has put this succinctly: "Samuelsonian money has no place in high interest rate economies" (Weil 2014: 127).

[146] There may be other motivations for precautionary savings than aversion to risk. Recently, Corina Boar (2020) has empirically shown how wealth accumulation, intergenerational transfers and consumption insurance in the US can be explained with a model of altruistically-linked overlapping generations. Crucially, the dynastic character of wealth accumulation in Boar's study is shown to have distributional effects producing wealth inequalities.

money (e.g., Weil 1987, Esteban 1991, Bertocchi & Wang 1995). In these attempts to explicitly model trust in the selection process, welfare analysis reveals that higher probabilities of trust correspond to higher welfare gains. However, as we have already seen in the context of search-theoretic models, probability parameters of acceptability do not so much explain a selection process as they provide a theoretical rational for the assumption that trust is a value with similar characteristics to money itself, i.e., it reduces frictions and maximizes efficiency. Since in the real world, however, people do not resort to barter even when trust levels are manifestly low (acceptability of different monetary equilibria not being a question of choice), and the probabilistic trust parameters are exogenously set, this approach does not substantially differ from one that simply assumes economic agents to trust that the next generation will accept money.[147] Trust is again reduced to interpersonal beliefs, while the institutional dimension that could potentially explain these beliefs and the question of what establishes these beliefs in the first place is ignored or left open. In line with the conclusions drawn by the microfoundational literature, OLG models thus confirmed the interpersonal dimension of monetary trust, adding a moral dimension of solidarity to trust in the form of a Golden Rule of intergenerational transfers.

What may be considered new in OLG models is the interpretation that there is a political dimension to monetary trust. The Golden Rule interpretation considers intergenerational transfers as decisions based on an implicit agreement between societal groups, much in the spirit of social contract theory. While elements of this interpretation may have been observed in the cooperative game theory above, the idea that trust is a value whose gains exceed efficiency and utility adds a political dimension to monetary trust that has been

[147] An exception is Bertocchi and Wang (1995), where trust is endogenously defined as aggregate real money balances, although the quantity of money in their model is exogenously given.

absent from the microfoundational theories discussed above.[148] However, from an institutional perspective, we are again confronted with the problem of how that trust is determined. If, as for instance in Geanakoplos and Polemarchakis (1986), the positive price in equilibrium depends on the prices expected in the next period, which in turn depend on expectations then about the prices for the period after that, etc., the economy is fundamentally uncertain, resulting in a plethora of suboptimal equilibria, which could potentially undermine trust. This "Keynesian view…[of] animal spirits and the non-neutrality of public monetary and bond financed fiscal policy…is logically inconsistent with the premises of agent optimization and market clearing, considered together with rational expectations" (Geanakoplos & Polemarchakis 1986: 755).[149] In this analysis, expectations management becomes a responsibility of monetary policy. Trust, then, is not a factor of intergenerational altruism (horizontal trust) but of institutional design (vertical trust). If, on the other hand, trust is derived from the very fact that money is neutral, i.e., that money can be expected to keep its value over time, trust (and money) is a presupposed convention that exists independently of any political or institutional framework. Most authors (Wallace 1978, 1980, 1983) have chosen this latter path.

Regarding money, OLG models digressed from the usual path of interpreting money only as an intermediary of exchange by concentrating on its function as a store of value in order to demonstrate that this function may give money a positive price at equilibrium. This approach has caused considerable problems in monetary theory, since the store of value function of money is not unique to money. In order for OLG models to work, however,

[148] Esteban (2010) has applied a cooperative game theoretical framework to OLG models to show that the Pareto dominant strategy is the one that does not perform the intergenerational transfer.

[149] In spite of these insights, Geanakoplos & Polemarchakis try to reconciliate the monetary analysis of Keynes with the real analysis of Walras. That this type of "logical inconsistency" may not be reconcilable has been made clear by Bridel (1997) for Walras and more recently been shown by Bofinger & Ries (2017) for Keynes.

money has to be the only available capital (or unrealistic assumptions have to be added that make it thus). Regarding monetary trust, OLG models confirmed the now familiar conclusion that monetary trust is 1) interpersonal and 2) socially valuable when it is interpreted as a form of social contract. This conclusion hinges the institutional dimension necessary for such contracts to work on the behavioral assumptions of the agents in the model. It may make trust interpersonally necessary, but by the same token institutionally irrelevant. Once more, we are left with the idea that in case of coordination failures or welfare loss, a vaguely defined notion of "more trust" will remedy the problem, i.e., maximize efficiency and welfare gains.

2.1.3.2 Money and Trust in the Keynesian Setting

John Maynard Keynes writes about trust and confidence in different contexts, which makes it difficult to attribute a theory of monetary trust to his writings. In some passages Keynes talks about degrees of confidence as the weight of evidence regarding future expectations. For instance, in the *General Theory* he observes,

> The state of long-term expectations, upon which our decisions are based, does not solely depend, therefore, on the most probable forecast we can make. It also depends on the confidence with which we make this forecast—on how highly we rate the likelihood of our best forecast turning out quite wrong. If we expect large changes but are very uncertain as to what precise form these changes will take, then our confidence will be weak. (Keynes 1936 [2012]: 148)

In this passage, confidence stems from the condition of fundamental uncertainty and the degrees to which that uncertainty may be reasonably narrowed down. This meaning of confidence is closely related to the question of weights Keynes had already dealt with in the *Treatise on Probability*, where an argument, or proposition, is said to have a higher

weight if it is probabilistically closer to proof. In a monetary policy context, this concept of confidence has been associated with interest-rate setting and the difference between the short-term interest rate set by a monetary authority and the long-term interest rate, determined by portfolio choices of market actors (Shackle 1967: 247, Rogers 1989: 252, Moore 1995, Lavoie 2014: 180ff). As Edwin Le Héron (Le Héron 1986, Le Héron & Carré 2006, Le Héron 2020) has convincingly shown, there is a fundamental ambiguity in Keynes's interest-rate theory, which provides insight into his beliefs about monetary trust. Keynes's analysis of the short-term interest rate thus follows a "top-down" approach in which money is endogenously created by credit demand and the interest rate is exogenously set by a monetary authority. This framework calls for a vertical or hierarchical approach of monetary trust, since it depends on the political legitimacy of the central bank. Keynes's analysis of the long-term interest rate, on the other hand, follows a "bottom up" approach in which money is exogenously given by the output (money stock equals effective demand) and the interest-rate is endogenously determined by portfolio decisions. This approach interprets confidence as determined by the psychology of "liquidity preferences" and "animal spirits" (Le Héron 2020: 144). In this framework of analysis, monetary trust is interpersonal or horizontal, similar to the theories discussed in the context of microeconomic approach to trust above.[150]

The ambiguity between these two trust theories is closely related to Keynes's monetary theory and the fundamental differences between what Schumpeter called the "monetary analysis" and the "real analysis" (1954 [1983]: 264ff).[151] In the monetary analysis, money

[150] Since Keynes does not always specify if it is the short- or long-term interest when he talks about interest rates, the question of which theory is the "right" one has been the subject of much debate. The Keynesian synthesis has chosen the second approach with Hicks's development of the IS-LM model and Tobin's portfolio theory, while post-Keynesians and MMT have championed the first approach.

[151] The distinction is made in Chapter 6; e.g., "Monetary analysis introduces the element of money on the very ground floor of our analytical structure and abandons the idea that all essential

is not neutral and is introduced at the beginning of the theory, i.e., monetary and barter economies are fundamentally different.[152] In the monetary analysis, money is endogenous to the process of production; in the real analysis, money is exogenous—a convenient add-on or afterthought. In the monetary analysis, loans create deposits and banks are fundamentally different from other financial intermediaries in that they create new funds; in the real analysis, deposits create loans, i.e., banks are redistributing existing funds like financial intermediaries. In the monetary analysis, output is influenced by the flow of expenditure of monetary income; in the real analysis, output is constrained by savings, which create investment. Lastly, in the monetary analysis, uncertainty is the framework of economic activity; in the real analysis, certainty is provided by a Walrasian coordination process.[153] In a 1933 article entitled "A Monetary Theory of Production," Keynes made this Schumpeterian distinction himself:

> An economy which uses money but uses it merely as a neutral link between transactions in real things and real assets and does not allow it to enter motives or decisions might be called—for want of a better name—*a real exchange economy*. The theory which I desiderate would deal, in contradistinction to this, with an economy in which money plays a part of its own and affects motives and decisions and is, in short, one of the operative factors in the situation, so that the course of events cannot be predicted, either in the long period or in the short, without a knowledge of the behaviour of money between the first state and the

features of economic life are represented by a barter-economy model" (Schumpeter 1983 [1954]: 265).

[152] This insight is in stark contrast to the microfoundational theories discussed above, in particular the Menger-Kiyotaki-Wright tradition, where "the choice" of monetary equilibria is the result of the analysis.

[153] In his book on Keynes, Hyman Minsky put this last point succinctly: "The answer to Keynes's leading question is that the world we live in is not the world of 'the classical economy'; the world is an uncertain world because there are yesterdays, todays, and tomorrows" (Minsky 1975: 75).

last. And it is this which we ought to mean when we speak of a monetary economy. (Keynes 1933: 408-9)

From this passage, as well as from the first part of the *General Theory* (Chapters 1 though 11), it can be assumed that Keynes rejected the idea that money is neutral in either the short or the long run. The principle of effective demand developed in the first part of the *GC* makes this abundantly clear. Keynes thus develops a monetary economy in which effective demand determines the scale of output and employment. Money is an *ex-ante* concept in this economy, allowing the financing of investment and output and granting protection against uncertainty. The level of output and thus the need for financing is determined by firms' expectations of demand and investment profitability. In other words, the demand for money is endogenously determined by the output and the supply of money driven by demand. However, as Keynes asserts in Chapter 11, the demand for money is controlled by a monetary authority. This interest rate, which post-Keynesians call the short-term rate (Moore 1995; Lavoie 2014: 189), is not exclusively the result of demand. It depends on the central bank's policy choices about the way income will be distributed between borrowers and lenders. As Lavoie put it, "the central bank is a price-maker and a quantity-taker" (Lavoie 2014: 189).[154] It is interesting that Keynes does not apply the concepts of trust or confidence in this context, even though the implications of this theory not only make vertical trust in the monetary authority necessary, but also imply a "confidence strategy" (Le Héron & Carré 2005), as central bankers have the power to steer the economy in different directions depending on the chosen monetary policy.

[154] The passage most often quoted in this context is actually from Chapter 15: "The short-term rate of interest is easily controlled by the monetary authority, both because it is not difficult to produce a conviction that its policy will not greatly change in the very near future, and also because the possible loss is small compared with the running yield" (Keynes 2012 [1936]: 203).

Keynes explicitly introduces confidence in the second part of the *GC* (Chapters 12 to 18), however, where he seems to shift his views, both on the interest rate and the endogeneity of money. Keynes famously did not offer a theory for the long-rate of interest but believed, instead, that the long-rate depends on convention, which is itself determined by psychological factors. Confidence plays a role in this context, in the sense that market actors have confidence that the rate follows a particular norm or convention. If this confidence is given, then expectations are inelastic and the economy is stable. If on the other hand, confidence is withheld, expectations become elastic and the economy shows signs of instability. In chapter 12, Keynes goes into more detail about how such psychological factors are determined by future expectations. He thus writes about the "state of confidence" as the optimistic or pessimistic disposition of economic agents, their "animal spirits."[155] In chapter 17 of the *General Theory*, Keynes makes a similar point regarding the liquidity premium, i.e., why people would prefer to hold money when they could reach higher yields by investing in interest bearing assets (2012 [1936]: 240).[156] This idea gets expressed again in the passage already quoted in the beginning of this section: "our desire to hold money as a store of wealth is a barometer of our distrust of our own calculations and conventions concerning the future.…The possession of money lulls our disquietude" (Keynes 2015 [1937]: 218-9). Psychological factors, however, do not only pertain to a precautionary motive, i.e., the propensity to hoard money in times of heightened distrust, but also to the "finance motive," i.e., expectations on future investments, and to the "speculative motive," i.e., the inclination to bet on the past and future valuation of assets. In this part of the *GC*, then, the long-term interest rate is endogenously determined by a portfolio decision

[155] See also Dequech (1999) and Lavoie (2014: 80ff).

[156] Keynes relates the liquidity premium to the notion of weight made in the *Treatise*. "I am rather inclined to associate …liquidity premium with what in my *Treatise on Probability* I called 'weight'"

between money and bonds based on expectations of the future interest rate. The demand for money, on the other hand, is exogenously determined by the output. In Chapter 13, Keynes thus shifts his view, arguing for a control of the money supply by the central bank and for demand-driven interest rate determination. He observes, "As a rule, we can suppose that the schedule of liquidity-preference relating the quantity of money to the rate of interest is given by a smooth curve which shows the rate of interest falling as the quantity of money is increased" (Keynes 2012 [1936]: 171). In other words, and to rephrase Lavoie, in the second part of the *GC* the central bank is a price-taker and a quantity-maker.

In this analysis, confidence and trust are clearly horizontal, as market forces either directly determine the interest rate through market laws (as in the loanable funds theory) or indirectly through what individual market actors believe is a "safe" rate of interest. Here, Keynes's analysis resembles a network theory of interest-rate confidence that could almost be said to pertain to the Mengerian tradition. Keynes thus considers the interest rate to have microeconomic foundations: "the rate of interest is a highly psychological phenomenon" (Keynes 2012 [1936]: 202). This form of methodological individualism turns into a social convention when the belief, or confidence, about interest-rate expectations are shared by the masses. Keynes thus continues, "It might be more accurate, perhaps, to say that the rate of interest is a highly conventional, rather than a highly psychological, phenomenon. For its actual value is largely governed by the prevailing view as to what its value is expected to be. *Any* level of interest which is accepted with sufficient conviction as *likely* to be durable *will* be durable" (Keynes 2012 [1936]: 203, original emphasis). The circularity of this argument did not stay unnoticed. Indeed, John Hicks criticized Keynes for it, writing that the rate of interest is left hanging by its own bootstraps.[157] It may come as no surprise that

[157] The full quote goes as follows: "But to say that the rate of interest on perfectly safe securities is determined by nothing else but uncertainty of future interest rates seems to leave interest

this analysis opened the door for Keynes's theory "to look very like Wicksell's" (Hicks 1937: 158), i.e., a real analysis in which the short-term rate (market rate) gravitates towards the long-term rate (natural rate) and is determined by market forces of productivity and thrift, while savings and investments are independent of monetary analysis.[158] In that way, money could be neutral in the long run even though it may cause problems of inflation and deflation in the short run.

This analysis, which follows the New Consensus interpretation of Keynes, disregards the first part of the *GC*, however, where the rate of interest was not market-determined but the responsibility of a monetary authority. Keynes's writing thus leaves an ambiguity between this "top-down" process of confidence, in which an institutional dimension of trust is attributed to a monetary authority, and a "bottom-up" approach in which confidence is determined by "animal spirits" and the psychology of "liquidity preferences" (Le Héron 2020: 144). In the "top-down" approach, the central bank's control over the short-term rates will influence the entire structure of interest rates in the economy, including long rates, and the economy will adjust to the policies determined by the central bank. In this approach, "money matters!" (Davidson 1978: 48), affecting output and employment both in the short and in the long run.[159] In the "bottom-up" approach, the interest rate adjusts to the economy and is seen as a convention resulting from the interaction of independent economic agents. In this approach, money is neutral in the long run and monetary policy a question of managing inflation through a quantity-theoretic mechanism.

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hanging by its own bootstraps; one feels an obstinate conviction that there must be more in it than that" (Hicks 1978 [1939]: 164).

[158] In the IS-LM model this implies that real and monetary forces (IS and LM relationships) are conceptually independent.

[159] Keynes, like Walras, thus clearly also struggled with the temptation of sacrificing money for clarity; cf. "money enters into the economic scheme in an essential and peculiar manner, technical monetary detail falls into the background" (Keynes 2012 [1936]: vii).

One way to make sense of this ambiguity is to go back to Keynes's initial claim of fundamental uncertainty and his use of the concept of "confidence" in a context of unknowns. He thus observes, "Precisely because the convention is not rooted in secure knowledge, it will not always be unduly resistant to a modest measure of persistence and consistency of purpose by the monetary authority" (Keynes 2012 [1936]: 204). In other words, if the long-term interest rate is not determined by objective real forces, as in the tradition of real analysis, and if, furthermore, the short-term interest rate has real but unforeseeable consequences on the economy, then "confidence" in either the monetary authority responsible for setting the short-term rate or the market forces determining the long-rate is above all a political problem, which a simple policy rule is unable to solve. More concretely, if central banks attempt to align their policies to market expectations, they may end up following the market instead of shaping market expectations towards the intended policy.[160] If, on the other hand, central banks assume that market actors translate short-term into long-term rates, they disregard the liquidity preferences of banks and the possibility that the "state of confidence" may keep this convergence from taking place.[161] In Keynes's own words, "Thus a monetary policy which strikes public opinion as being experimental in character… may fail in its objective of greatly reducing the long-term rate of interest.…The same policy, on the other hand, may prove easily successful if it appeals to public opinion as being reasonable and practicable and in the public interest, rooted in strong conviction, and promoted by an authority unlikely to be superseded" (Keynes 2012 [1936]: 203). Seen from this perspective, steps must be taken beyond both the psychological and

[160] This point has also been made by Blinder (2004: 67ff).

[161] The "finance motive" is not equal to saving. Firms and households can accumulate wealth without there being more investment. Keynes clarified this position in an article entitled "The 'Ex Ante' Theory of the Rate of Interest" for the *Economic Journal*. There he observes, "This means that, in general, the banks hold the key position in the transition from a lower to a higher scale of activity.…The investment market can become congested through shortage of cash. It can never become congested through shortage of saving. This is the most fundamental of my conclusions within this field." (Keynes 2014 [1937]: 222).

the conventional paradigms in order to ensure the stability of the system. For Keynes, these steps consisted in taking into consideration the other variables in the economy, most crucially unemployment and finance. This conclusion is also drawn by Le Héron in his analysis of Keynes. He writes, "The danger that still lurks today is that the banks are serving the spirit of speculation and the development of financial markets, undermining the ethical confidence of the people. It is up to the monetary authorities to prevent this alternative in order to regain confidence, and it goes well beyond the simple search for financial stability" (Le Héron 2020: 149-50).[162]

While Keynes never developed a theory of monetary trust, his monetary theory is the first theory in which confidence is interpreted as a political problem instead of an interpersonal solution. Keynes's observations on the long rate of interest as based on a "state of confidence," which is itself determined by economic policy and conventions employed in financial markets, departs from the neoclassical framework discussed so far. This "state of confidence" is based on fragile grounds. Unlike the interpersonal trust relations of the neoclassical tradition, Keynes stresses the social and institutional dimensions of trust. Keynes thus emphasizes the importance of uncertainty, expectations and authority in his discussion about confidence and monetary policy. While the authority of a central bank is needed to maintain confidence, its monetary policy, and in particular the control over the short-term interest rate, may not always align with expectations and the long rate of interest, which Keynes considered to not "have anything useful or significant to contribute" (Keynes 2014 [1937]: 243). The hierarchical confidence in the central bank's monetary policy is thus

[162] In the *Treatise*, Keynes is more explicit about the potential risks attached to the production process of credit-money by banks. "[I]t is evident that there is no limit to the amount of bank-money which the banks can safely create *provided that they move forward in step*. The words italicised are the clue to the behaviour of the system.…Each Bank Chairman sitting in his parlour may regard himself as the passive instrument of 'outside forces' over which he has no control; yet the 'outside forces' may be nothing but himself and his fellow-chairmen, and certainly not his depositors" (Keynes 2012 [1930]: 26-7].

complemented by the horizontal confidence of the market and, in particular, the portfolio decisions of financial market actors, which may not always translate in accordance with the policy of the central bank. Indeed, they can display signs of overconfidence and speculation as well as of mistrust and "shortage of cash" (Keynes 2014 [1937]: 222). The control over the short-term interest by the central bank may, then, do little to reestablish a unique "state of confidence" in which a natural rate of interest exists. The "practical significance" (Rogers 1989: 269) of this is that the responsibility for the stability of the economy cannot lie in a rule, much less one whose "confidence strategy" (Le Héron & Carré 2005) leans solely on the familiar model of long-term stability, and the neutrality that goes with it.

2.4.1 Trust and State and Credit Theories of Money

With Keynes's observations on "the state of confidence," the idea that monetary trust is solely based on interactions between individuals and "convention" a question of interpersonal beliefs was set aside. While Keynes did not develop a full-fledged hierarchical theory of monetary trust, his theory showed that confidence in the monetary system could not be taken for granted as a result of natural economic laws, but was a question of political arbitration between monetary authorities, the financial sector and "public opinion." While Keynes was writing, a first generation of economists had already developed state and credit theories of money, which would go even further than Keynes in understanding the institutional dimensions of capitalist monetary economies.[163] In the United Kingdom, key thinkers were Henry Dunning Macleod (1889) and Alfred Mitchell-Innes (1913, 1914). Innes's credit theory of money was known to Keynes and may even have influenced the *General Theory*.[164] In Germany, Georg Friedrich Knapp had coined the term "chartalism" to argue that money is merely what government declares it to be. "Money is a creature of law," he wrote in the opening of his book, *Staatliche Theorie des Geldes* (1905). In France, advances in sociological theory, in particular the studies of Marcel Mauss (1914) and, a bit later,

[163] According to Schumpeter, credit theories of money can be traced back to ancient Greece. See, Schumpeter (1954: 50ff). Ingham, on the other hand, argues that credit theories of money coincide with the emergence of capitalist credit money and the development of commercial banks in the 17th century, which "could sustain this credit money economy …beyond the relatively closed networks of the metropolitan mercantile and political elite" (Ingham 2004: 207).

[164] Indeed, Keynes wrote a review on Mitchell-Innes's article "What is Money?" for the *Economic Journal.* Keynes concludes that "It is difficult to check his assertions or to be certain that they do not contain some element of exaggeration. But the main historical conclusions which he seeks to drive home have, I think, much foundation, and have often been unduly neglected by writers excessively influenced by the "sound currency" dogmas of the mid-nineteenth century" (Keynes 1914: 421). Keynes was also familiar with Knapp's state theory and helped to get the book translated into English. See Wray & Bell (2004: 2).

those of François Simiand (1934), are usually considered to present the first theories that systematically studied money in relation to debts and sovereignty.[165]

While credit and state theories of money were controversially discussed by mainstream economists in Germany and the United Kingdom in the early twentieth century, they only resurfaced again in sociological studies during the late twentieth century.[166] In France, on the other hand, where the theories had originated in sociology, they were picked up by economists, most famously in the works of Michel Aglietta and André Orléan, whose research in the context of the "théorie de la regulation" goes as far back as the 1980s. Indeed, the economists of the French monetary institutionalism school gave intensive attention to the role of trust from this point onwards, with reference to the French sociological tradition.[167] Alongside debt and sovereignty, Aglietta and Orléan saw trust as the third fundamental element in their theory, which distinguished it from the neo-chartalist school that was gaining popularity in Anglo-Saxon scholarship. In an article for *La Lettre de la régulation*, the authors thus proclaimed that their theory of money possessed "neither commodity, nor State, nor contract but trust" (Aglietta & Orléan 2002b: 1). The sometimes-ambiguous but nonetheless useful distinction between three modes of confidence in monetary

[165] See Gislan & Steiner (1995). It should, however, be mentioned that French economist Émile Mireaux (1930) put forth a credit theory of money for which he is seldom acknowledged by those defending such theories today, perhaps due to his controversial implication in the Vichy regime.

[166] See, e.g., Ehnts (2019) for a discussion on the reception of Knapp's state theory in Germany and Wray and Bell (2004) for a discussion of Mitchell-Innes's and Macleod's theories in a historical context. The economist L. Randall Wray (1998, 2000) seems to be the first to have rediscovered the works of Mitchell-Innes, republishing both of Mitchell-Innes's essays in 2004 (Wray & Bell). Randall's work influenced Geoffrey Ingham, whose research leading to his magnum opus *The Nature of Money* (2004) in turn influenced unorthodox economists such as John N. Smithin (see, e.g., Smithin 2002) and economic sociologists such as Jocelyn Pixley. An overview of some of the scholarship that has resulted from Ingham's work can be found in Pixley & Harcourt (2013). In Germany, contemporary research on credit and state theories has been undertaken by Dirk Ehnts (2014, 2017) and occasionally in papers commissioned by the Boeckler Stiftung—tellingly, however, not drafted by German scholars. See, e.g., Lavoie (2011).

[167] See the introduction in Alary et al. (2020) for a historical overview of the development of this school.

economies—*confiance éthique* (ethical confidence), *confiance hiérarchique* (hierarchical confidence) and *confiance méthodique* (methodical confidence)— will be discussed in this section.[168]

Contemporary research in this field outside of France has sparked its own controversies and debates, some more theoretical and academic—such as the disagreements between Fine, Ingham, Lapavitsas and Zelizer in the journal *Economy and Society*—and some more popular and politically charged—such as op-ed pieces arguing the political dangers or merits of MMT.[169] Despite these theoretical and political differences, two conclusions from this scholarship are particularly relevant regarding monetary trust: 1) in credit and state theories, monetary trust is not interpersonal (horizontal) but impersonal and hierarchical (vertical). Since money is seen as a form of debt, trust is fundamentally a question of social relations, which are institutionally and hierarchically structured according to levels of liquidity and enforceability of monetary obligations. In this view, the institution of money is not representative of individual coordination, where efficiency and rationality ensure collective benefits for the society at large, but the product of a power struggle and competing interests among social groups within a hierarchy. These groups can be schematically defined as citizens, markets and states. The distributive effects of this institutionalized conflict may outstrip the efficiency gains posited by the collective-benefits view of money (2.1.2). 2) Because of this hierarchy, "degrees" of trust in money are only representative of the "value" of trust in that they ensure that the hierarchy is accepted by all (or the majority of) members of the monetary community. Trust is therefore not intrinsically valuable in any moral sense, but is a social question of belief. Degrees of trust, provided that they can

[168] This ambiguity stems from the fact that the economic analysis by scholars of the French school sometimes reads like a normative reiteration of standard economic theory; cf., the discussion on "hierarchical confidence," below.

[169] See Fine and Lapavitsas (2000), Zelizer (2000), Ingham (2001, 2006) and Lapavistas (2005).

be measured, can, but do not have to, correspond to the normative justification of the trust relation. As discussed in the first parts of this chapter, trust can play an active role in "forgetting" (Douglas 1986) about that relation. Trust can thus obliviate the hierarchical and institutional dimension of the production process of money, and foster notions of "faith" (Simmel 2004 [1900]), "benign neglect" (De Vroey 2004) or "méconnaissance" (Aglietta & Cartelier 2016 [1998]), so that money can be believed to exist as a neutral veil. In this sense, trust and confidence are fundamental to the political legitimacy and stability of the monetary system. However, they may also have "performative" (Braun 2014, 2017) characteristics that are not always "justified" or "wise" (Bagehot 1999 [1873]).

In credit and state theories of money, trust in money thus stems from the premise that money is a socially-constructed relation (Wray 1993, 2010; Bell 2001; Smithin 2009; Ingham 2004). This social relation is a creditor-debtor relation. It requires three levels of trust, which define the conditions of money's value, acceptability and circulation. The first is concerned with the unique institutional arrangement of social interactions in monetary economies, where social groups enjoy varied degrees of credibility that underpin their claims to pay, resulting in unequal liquidity positions and acceptability of their monetary commitments. Trust and confidence are required on both sides of the creditor-debtor relation (Ingham 2004: 77). Norms of creditworthiness and the morality of indebtedness determine the supply and demand of credit-money creation. Where financial institutions, credit scores and credit-rating agencies assess debtors' ability to repay, credit may not be rationed according to the rules of supply and demand but according to socially constructed criteria. Creditworthiness and risk of bankruptcy thus operate both as a "functional requirement" and "normative imperative" to demarcate winners from losers in the competitive process of credit creation (Fourcade et al. 2013). Aglietta and Orléan call this type of confidence "methodological confidence" (Aglietta & Orléan 2002, Aglietta et al. 2020) in describing

the operational rationality that governs creditor-debtor relationships. This methodological confidence does not differ descriptively from a horizontal trust-relationship that might be found in the neoclassical tradition; however, it acknowledges its social foundation, which is neither functional, i.e., based on efficiency, nor collectively beneficial. On the contrary, it highlights the discriminatory benefits of institutions in favor of some segments of society. In an English-language volume, making available for the first time the scholarship of French monetary intuitionalism, the authors succinctly summarize this point: "Methodical confidence… plays the part of security-ensuring discipline under the watchful eye of peers with a club type of mindset that excludes outsiders" (Aglietta et al. 2020: 118). Methodical confidence thus determines degrees of acceptability not in terms of a Mengerian belief system, i.e., from the vantage point of methodological individualism, but in relation to relative creditworthiness, in a social process of credit creation.[170]

The second level of trust concerns the hierarchies of these relationships, which follows from the observation that the norms governing debtor-creditor relationships and monetary interactions are not uniformly distributed. The currency issued by the state thus has a privileged position within the hierarchy, which is defined by its power to impose debts in the form of taxes (Wray 1998). As Stephanie Bell writes, "the legal obligation to pay taxes and the state's proclamation that it will accept its own currency at state pay-offices elevate the state's liabilities to the top of the pyramid, rendering them the promises with the highest degree of acceptability" (Bell 2001: 160). In other words, not all money is created equal.

[170] It is important to highlight this difference, as the "mimetic" quality of methodical confidence appears to relapse towards the purely horizontal trust relationship at the heart of neoclassical theory. See, e.g., Bruno Théret (2020), who observes, "Methodical confidence is the most currently highlighted; it is due to mimetic behaviour by which an individual routinely accepts money because others do the same" (2020: 203). This proximity prompted Jean Cartelier to object that "Aglietta & Orléan's propositions are very close to those of the mainstream" (2018: 49). However, this criticism disregards the fact that in the institutional framework of analysis, the three levels of trust cannot be considered separately; interpersonal trust relations should always be understood within a broader social framework of both hierarchical and ethical trust.

While all social groups in a monetary economy, from banks and businesses to households and individuals, participate in creating money in the accepted unit of account, only the state has the authority to implement and impose fiscal rules. The acceptability of different kinds of credit-money thus depends on the readiness with which they can be converted into more liquid forms of money. State money is considered to have a monopoly position in the hierarchy because of the certainty attached to the liquidation of tax obligations. That is why state-sanctioned tax-money is the money that is sought after by the largest number of participants in economic exchange. Wray summarizes this chartalist concept of tax-drive money: "The public demands the government's money because that is the form in which taxes are paid" (Wray 1998b: 8). From this perspective, private debts such as corporate bonds and commercial papers, but also consumer loans and mortgages, enjoy lower liquidity positions, which makes it harder for these "moneys" to gain widespread acceptance by third parties and precludes them from serving as a universal payment method.

However, the hierarchical nature of different intermediate forms of money does not stem from functionalist observations about their inherent convertibility and acceptability, in the sense that real estate is less liquid than gold, which is less liquid than cash, etc.; nor from the "portfolio decision" of rational economic agents calibrating between rates of return and risk. In their analysis of hierarchical confidence in credit networks, credit and state theories sometimes appear to follow a standard analysis of liquidity and risk (see, e.g., Krugman et al. 2018: 391ff.). Ingham, for example, describes a system of debts and claims in which different "money stuffs" are transformed into each other in a way that reflects their ascending liquidity or transferability, so that lower-grade debts can be paid with higher-quality liabilities that are relatively more trusted or more easily enforced (Ingham 2000, 2001). The metaphor used to describe such hierarchies of debt liquidity and convertibility is that of a pyramid. A "pyramid of these promises evolves—each backed by (or made convertible

into) a promise higher in the pyramid" (Wray 1993, 28). Similarly, Aglietta and Orléan speak of a "pyramidal system of financial guarantees based on the circulation of private debts. For such a transformation to come about, it must accompany a mutation of the rules of central issuing" (Aglietta & Orléan 2002: 62). Because such descriptions of the banking system, in which the liquidity of instruments used to discharge debt obligations progressively rises, could be confused with liquidity management in standard banking theories (see, e.g., de Haan 2012: 304), it is important to keep in mind that "hierarchical confidence" is not functionalist but fundamentally social and political: pyramids are not illustrative of liquidity provisions, but of the infrastructural powers that grant different social groups unequal control in the process of debt creation. This type of hierarchical confidence, then, is determined by conflicts, compromises and regulation of access to money across different interest groups within the hierarchy (Théret 2020 [2008]: 220).[171]

There are different ways to schematize such a monetary hierarchy, in which the increasing ranks of promises to pay correspond to higher degrees of trust in the ability to fulfill previously given pledges. The government or the central bank are usually placed on top of the pyramid, since the they have the power to create state money and provide liquidity to the banking system. Individuals, small firms and households are at the bottom of the pyramid, as the trustworthiness ascribed to their promises is impaired by their lower levels of liquidity; i.e., their position in the hierarchy cannot easily be used to back the claims of others' promises to pay. At the intermediate level are large firms and banks, whose liquidity position and enforceability of claims is also limited, but higher and hence more trustworthy than those sitting below. Central banks play an exceptional role in this hierarchical process of converting private debts into public money. Once again using the pyramid analogy,

[171] It is pedagogically useful to compare the pyramid in Théret (2020 [2008]: 220) or Wray (2012: 78) with that of de Haan (2020: 304) to understand that confidence does not play a role in the latter's conception of portfolio provisioning.

Lapavitsas observes that “The central bank is the apex of the pyramid of the credit system” (Lapavitsas 2003: 84). Central bank liabilities thus arguably enjoy the highest degree of creditworthiness and hence “hierarchical trust” because central bank money functions as a means of settlement and exchange among banks. Furthermore, the central bank is usually the bank of the state, managing state accounts and debts. The quality of the assets a central bank agrees to hold thus emanates corresponding degrees of trust. The central bank’s role as a lender of last resort and custodian of monetary and supervisory policy endows it with the highest degree of authority and the power to instill trust and enforce credible norms among the groups in the monetary hierarchy (Giannini 1995; Ingham 1998).

The third level of confidence, ethical confidence, extends to the society at large. This type of confidence refers to the collective norms that are shared by the members of a monetary community, more closely resembling prior notions of trust, as opposed to the former types of confidence, which are in effect structurally imposed. In the tradition of French monetary institutionalism, this third form of confidence is perhaps the most ambiguous in that it is alternatively understood as a moral value, i.e., from an ethical or philosophy-of-justice point of view; and sometimes as a social more, i.e., from a sociological point of view. In the above-mentioned English-language anthology of the French school, the authors explain this concept: it is because “ethical confidence has the higher value, the integrity of the human person, as a reference, that it is placed above hierarchical confidence” (Aglietta et al. 2020: 114). Passages such as this give the impression that ethical confidence indeed implies ethics, where a more universal notion of trust refers not to how things are, but how they should be. This view derives from the observation that a political authority such as a central bank, in order to be legitimate, needs to be anchored in some form of collective consensus or social contract, which must itself be based on universal principles. However, in other passages, the concept is imbued with a more sociological meaning. In

La violence de la monnaie (Aglietta & Orléan 1982), the distinction between methodical, hierarchical and ethical confidence was not yet made. In this book, social trust in money is understood from a sociological point of view as "mimetic compliance" (*adhésion mimétique*), a type of social conformism which leads people to adhere to a given monetary system without understanding how the system works. With reference to the anthropological studies of Simiand and Mauss, this view understands trust as social faith, emphasizing the magical and irrational aspect of money. In this trust theory, the stability of the monetary system relies on collective beliefs about money that sustain the system even when they are based on violence, superstition or questionable economic theories.[172] This type of trust is neither hierarchical nor methodical, but norms-based, not in the sense of ethics but in the sense of social mores. It is very similar to Simmel's idea of quasi-religious faith, and to the sociological tradition that holds trust as a blending of knowledge and ignorance, a phenomenon Aglietta and Orléan have themselves associated with the concept of "méconaissance" (Aglietta & Orléan 1982: 131).

In *La Monnaie entre violence et confiance* (Aglietta & Orléan 1982), where the tripartite distinction between methodical, hierarchical and ethical confidence was introduced, ethical confidence is discussed in reference to Simmel's philosophy of money and Simiand's concept of "croyance social" (social faith), but oddly interpreted as a universal, ethical value. "Ethical confidence poses a limit on monetary authorities" the authors observe. "In order

[172] Regarding violence, the late David Graeber convincingly demonstrated how the origins of money and markets were not the result of spontaneous coordination but of state violence. Money precedes markets. He observes, "Say a king wishes to support a standing army of fifty thousand men. Under ancient or medieval conditions, feeding such a force was an enormous problem—unless they were on the march, one would need to employ almost as many men and animals just to locate, acquire, and transport the necessary provisions. On the other hand, if one simply hands out coins to the soldiers and then demands that every family in the kingdom was obliged to pay one of those coins back to you, one would, in one blow, turn one's entire national economy into a vast machine for the provisioning of soldiers, since now every family, in order to get their hands on the coins, must find some way to contribute to the general effort to provide soldiers with things they want. Markets are brought into existence as a side effect" (Graeber 2011: 49-50).

to be legitimate from an ethical point of view, monetary policies *should* conform to a monetary order" (Aglietta & Orléan 2002: 105, emphasis mine). Reflections on the ethical value of monetary systems are certainly valid. In the context of hierarchies of money, where those at the bottom of the pyramid—who have lower levels of liquidity ascribed to their obligations—do not have the same capabilities of establishing trustworthiness for their monetary promises as those on top, discussions on the "fairness" (Rawls 1958) of the monetary system and the moral principles underlying monetary authority may be particularly pressing.[173] However valid such observations may be, confidence may be a misleading, and even contradictory, concept for understanding the ethics of monetary systems for the very reasons Aglietta and Orléan outlined in their sociological analysis of social faith, i.e., confidence does not inform about the "ethics" of a monetary system. Ethical principles such as fairness are universal precisely because they are valid even in a context of absent or sustained confidence. A "confidence strategy" based on ethics will thus face the same challenges as one trying to disguise the "violence" of hierarchies; it will have to confront those interest groups in the monetary system who will be hurt by those principles.[174] It may, then, be more useful to understand ethical confidence not in this moral sense but in the earlier, sociological sense of social faith. This interpretation can also be found in the work of Mitchell-Innes:

> The main obstacle to the adoption of a truer view of the nature of money is the difficulty of persuading the public that 'things are not what they seem,' that what appears to be the simple and obvious explanation of everyday phenomena is incompatible with ascertainable, demonstrable

[173] The introduction of Central Bank Digital Currencies (CBDCs), which could grant citizens and non-financial firms direct access to central bank liabilities, have been acknowledged to alter the hierarchies of financial intermediation and improve financial inclusion (BIS 2018).

[174] One cannot help but note the characteristically French notion of universalism in this theory, and the paradoxes that come with it. The standard Marxian criticism of this position is to submit that universalist rhetoric will again end up serving the few. See Marx (2009 [1843]).

> facts—to make the public realise, as it were, that while they believe themselves to be watching the sun's progress round the earth, they are really watching the progress of the earth round the sun. (Mitchell-Innes 1914: 154)

In state and credit theories of money, trust is fundamentally constituent of the theory. Economists of the French monetary institutionalism school, in particular, have put trust and confidence at the center of their theories, where it is understood to have three distinct conceptual roles, defined as methodical, hierarchical and ethical confidence. This section has discussed these theories in relation to contemporary Anglo-Saxon credit and state theories of money, as well as to the sociological and anthropological traditions that have encouraged the formulation of trust theories in economics. While some theoretical ambiguities around the concept of trust remain, a common understanding of most scholars working in this field is, first, that monetary trust is not simply interpersonal (horizontal) but first and foremost impersonal and hierarchical (vertical). If money is seen as a form of debt legitimized by the state, trust is fundamentally a question of social relations that are institutionally and hierarchically structured according to varying levels of liquidity and enforceability of monetary obligations. This hierarchical organization of creditor-debtor relationships is not functional but implies competing interests among social groups within the hierarchy. Second, because of these competing interests, trust in money is a question of making these hierarchies socially acceptable. This type of trust-building can come in different forms. While mostly associated with religious faith in the past, in our times it may be seen as a soft power underpinned by technocratic credibility, merit, moral strength and other forms of "symbolic violence" (Bourdieu 1979), which help align moral with economic hierarchies. We have, indeed, come a long way from Menger, Walras and the neoclassical tradition.

2.2 Conclusion

In the opening of this chapter, I asked what central bankers mean when they speak about trust. If economic theories shape beliefs and beliefs shape politics, which of the theories discussed in this chapter get mentioned by central bankers? Since the creation of the Euro, all the theories discussed above, with the sole exception of the Vaughan-Gale-Shubik tradition, have been explicitly mentioned by European central bankers.[175] **Figure 1** shows an index of the two monetary trust theories that underpin economic thought and that have been discussed in this chapter.[176] The interpersonal trust line (yellow) counts all references to monetary theories that consider monetary trust from the vantage point of interpersonal trust relations alone, measured from the first issuance of the euro to 2019.[177] The institutional trust line (blue) counts all referrals of those monetary theories that consider trust from the vantage point of institutions.[178] It can be seen from this chart that institutional theories were virtually absent from central bank communications until 2012, when Benoît Cœuré, shortly after joining the ECB's Executive Board, first quoted Michel Aglietta's institutional trust theory of money in a speech, entitled "Restoring Trust in Economic and Monetary Union".[179] Before that date, interpersonal trust theories seemed to have been the only game in town.

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[175] This may be due to the Hobbesian assumption of this approach. The database includes all published documents of the ECB, the Bundesbank and the Banque de France. See the complete database on github and the next chapter for discussion. https://github.com/Moritz-Pfeifer/Money-Trust-and-Central-Bank-Communications

[176] I exclude Simmel's trust theory as well as Keynes's monetary theory because they have been interpreted in both the interpersonal (horizontal) and the institutional (vertical) way.

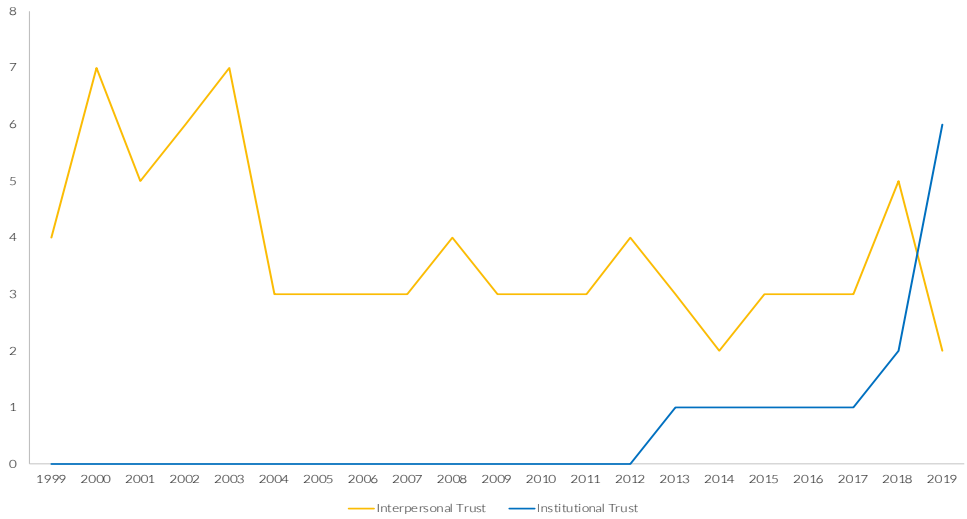
[177] These include: Jevons's barter theory, Menger's network theory, the Walrasian numéraire and the neutrality of money, Kiyotaki and Wright's search-theoretic models and their variations, and the monetary overlapping generation model of, e.g., Blanchard and Fisher.

[178] These include Georg Friedrich Knapp's state theory, Alfred Mitchell-Innes's and Henry Dunning Macleod's credit theories, Michel Aglietta and André Orléan's institutional trust theory, MMT and David Graeber's history of debt.

[179] The full quote is, "Money involves trust because it is a debt between society as a whole and each of its members." From Aglietta (2002).

This observation may appear strange in light of the fact that the ECB is an institution. It would therefore be reasonable to suppose that central bankers would address matters of institutional trust more frequently. However, as we have repeatedly observed in this chapter, interpersonal trust theories of money are often accompanied by a form of benign neglect.

Figure 1: Central bankers' mentioning of trust theories



This form of benign neglect is perhaps most prevalent in central bankers' insistence on the neutrality of money, where money remains essentially a unit of account and a mere intermediary of exchange, but does not affect the economic equilibrium, which is seen as an equilibrium of real exchange. In this view, the central bank does not participate in the economy at all, or participates only to the extent that it regulates the quantity of money. Hence the idea that money is a question of quantity and trust in money one of acceptability. Shortly before the news of the global financial crisis reached Europe, Jürgen Stark, then board member of the ECB, succinctly expressed this view in a speech: "in the long run economic growth and employment are determined by real, structural factors. This irrelevance of monetary policy measures with regard to the long-term development of real economic variables

is referred to as the neutrality of money." In the same speech, he lauds the ECB's success in "building citizens' confidence in the new currency".[180]

That this view was no longer tenable after the financial crisis can be seen from the sudden prevalence of institutional trust theories, which started to get mentioned in 2012 and surpassed the interpersonal trust theories in 2018. As we shall see in more detail in the next chapter, this expansion of the theoretical framework coincided with another expansion—that of the ECB's balance sheet—and a shift in the ECB's monetary policy from interest rate-setting to the unconventional policies of quantitative easing. Suddenly, the question of trust was no longer one of a relation between the users of money but one between users and issuer; i.e., the hierarchical position of the ECB in the credit-production process had been acknowledged. It is enlightening to compare **Figure 1** with **Figure 2**, which shows citizens' trust in the Euro (yellow line) and their trust in the ECB.

The Eurobarometer is a quarterly survey polling selected citizens whether they trust the European Central Bank and gauging their acceptance of the Euro as a currency.[181] From this survey, it may be reasonable to assume that trust levels are relatively low as compared, for example, to similar surveys conducted with regards to the Federal Reserve Bank of the US.[182] In "normal times"—that is, until the start of the Great Financial Crisis of 2007/08—

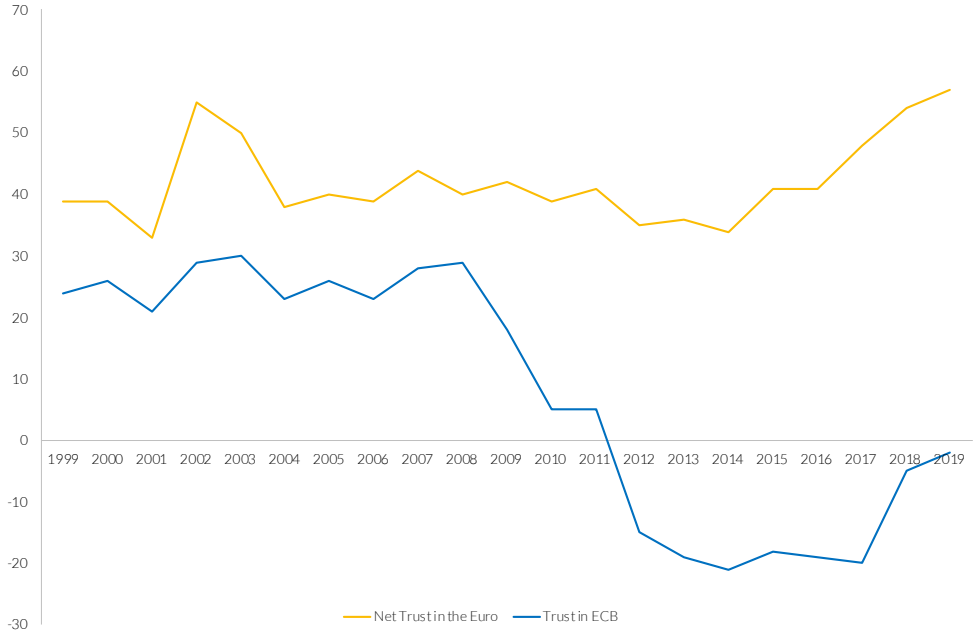
[180] In the original: "Die Geldpolitik kann zwar kurzfristig reale Effekte erzeugen, langfristig werden wirtschaftliches Wachstum und Beschäftigung jedoch durch reale, strukturelle Faktoren bestimmt. Diese Irrelevanz geldpolitischer Maßnahmen in Bezug auf die langfristige Entwicklung realwirtschaftlicher Größen wird als Neutralität des Geldes bezeichnet."

[181] The Eurobarometer survey, which asks citizens about their support for the Euro and the EMU, is often included in studies on trust in money. See, e.g., Bergbauer, at al. (2020).

[182] Compared with other institutions of the European Union—the European Commission and the European Parliament, for example—the ECB survey does not seem to stand out by its levels of confidence. Indeed, since the onset of the global financial crisis, there has been a decrease in trust in public institutions in Europe at both national and supranational levels. As for the FED, trust surveys are not conducted on a regular basis. The closest survey may be the one conducted by the analytics and advisory company Gallup, which regularly asks American citizens for their "confidence in Federal Reserve Chairs to Do or Recommend the Right Thing for the U.S. Economy." For the same period, results from this survey yield positive replies above the levels of the ECB. For most recent data, see Mccarthy (2019). However, a recent survey by Axios-Ipsos

net trust in the ECB floated between 20 and 30 percent on average. After 2008, trust levels starkly declined, with more citizens mistrusting the ECB than trusting it. More recently, as of 2019, trust levels have somewhat recovered, though with a majority still mistrusting the ECB. Standard interpretations of these surveys (including studies that do not come from the ECB itself) generally consider these lower trust levels as negative signs.

Figure 2: Eurobarometer trust survey



Sources: Eurobarometer, own calculations.
Notes: Net support for the euro is calculated as the sum of answers "for" minus the sum of answers "against" to the question "Please tell me whether you are for or against it: A European economic and monetary union with one single currency, the euro." Net trust is calculated as the share of respondents giving the answer "Tend to trust" minus the share giving the answer "Tend not to trust" to the question "Please tell me if you tend to trust it or tend not to trust it?: The European Central Bank." Respondents who answered "don't know" are excluded in both cases.

This corresponds to the findings of the trust literature I have mentioned in this chapter, where trust is perceived as a value judgment, albeit one based on emotions. Nevertheless, not one of the studies involving this survey tries to determine what a reasonable trust level should be, which renders the question asked by the Eurobarometer somewhat meaningless. Thus, Roth (2009: 203) speaks of a "sufficient level of trust" for the period before 2008

concluded that a majority of respondents across the board say they either had "not very much" or no "trust at all" in the central bank. (Jackson, Newall & Yi 2021).

without ever establishing criteria that qualify these levels as sufficient. Ehrmann et al. (2012: 4) observe that higher trust levels lead to better-functioning public institutions but do not explain how the "negative trust levels" have impeded the functioning of the ECB.

Instead of understanding trust as a relation between the users and the issuers of money, and examining under what conditions fluctuating trust levels may or may not be justified in that relation, most authors set out to find the "determinants" responsible for the changing trust levels on the side of the trustors. Thus, Roth et al. (2012) and Roth and Jonung (2019) cite unemployment as the determining factor in the declining trust values. Bergbauer et al. (2020) put the blame on education or occupation, while Kaltenthaler et al. (2010) and Berlemann (2012) attribute declining trust levels to the Great Financial Crisis.[183] These determinants may certainly be relevant, and even decisive, in influencing the replies of survey respondents. Nevertheless, the focus on determinants outside the trustor-trustee relationship makes it hard to understand the specific role that trust plays in that relationship. It also makes it considerably easier to explain away low trust levels as unfounded, i.e., not related to the activities of the institution (unemployment famously not being part of the ECB mandate). Keynes, as we have seen, would have a different view. Another typical rection to "low" levels of trust is to place the responsibility on a lack of information, awareness, and knowledge about what the activities of the ECB actually are. This echoes the "transparency paradox" in central bank policy; the fact that trust relationships are at least in part, if not always, also defined by a lack of information seems to escape the cries for more trust in these studies. As we have seen, however, in a world of fundamental uncertainty, competing

[183] Only one early study by Fischer and Hahn (2008) finds that higher inflation reduces trust, making it the only study in this group that looks at the functioning of the ECB to explain the survey data. The irony is, of course, that with the advent of unorthodox monetary policy following the recession of 2008, the ECB has been frantically trying to create inflation and been largely unsuccessful in this endeavor.

expectations and institutional hierarchies, more information does not imply more trust.[184] Yet, in a final oddity, the frequent policy recommendation is centered on providing more information, awareness and knowledge about the ECBs tasks and objectives. The opposite recommendation could, of course, be made. Only by becoming more interested in the activities of the ECB in the course of the Great Financial Crisis, thereby becoming more informed, did citizens start mistrusting its activities. It is reasonable to suppose that this last explanation is the most plausible.

Regardless of the "cardinal question" that opened this chapter, i.e., whether the degrees of trust reported in **Figure 2** are justified or wise, it is interesting to note that citizens appeared to have lost their trust in the monetary authority after the financial crisis of 2007/8. However, it also shows that trust in money and trust in the monetary authority had developed in tandem until that point, and that the financial crisis did not seem to have substantially affected citizens' trust in money. This may indicate that the institutional dimension of trust (vertical trust) was indeed conflated with the interpersonal dimension (horizontal trust) before the crisis and that, as we have seen in this chapter, the institutional dimension of monetary trust had been functionally acknowledged and diffused. In that sense, the benign neglect observed in central bank communications seemed to have trickled down into public opinion. **Figure 1** and **Figure 2** thus follow a very similar development.[185] Just as central

[184] As many authors writing on trust do not fail to point out, the paradox of informational transparency is precisely that trust entails lack of information, and lack of information entails vulnerability towards those on whose action one depends. If one were certain about these actions, one would no longer talk about trust. See Nooteboom (2013). A similar point with regards to central banks has been made by Mishkin (2004).

[185] Pace Bergbauer et al. (2020), there is thus no "paradox" between rising support for the euro and declining trust in the ECB. While the former simply expresses approval for the *functions* of money (traditionally understood as a means of payment, store of value and unit of account), the latter expresses concern for its *creation*, thus leaving room for the political aspects of money: the common view that central banks are allied with high finance, repeatedly bailing it out at the expense of taxpayers; the Euro(zone)-skeptical views that member states of the Eurozone lack monetary sovereignty; and so on.

bankers turned their discursive framework towards a monetary theory that acknowledges their position on top of the credit-system pyramid, the public appears to have taken note as well, perhaps realizing their own position in the monetary hierarchy. In light of the bolstered liquidity of targeted financial markets, and diminishing hopes about the effect of these policies on the real economy, this realization may have been particularly painful. If benign neglect—the pretense of ignoring the institutional dimension of hierarchical trust—is itself a strategy of trust, then that which had long been caged may, once released, come out roaring.

3 Empirical Evidence from the ECB, Bundesbank and Banque de France

τοὺς μὲν θεατὰς εἰδέναι μ᾽ ὃς εἴμ᾽ ἐγώ,
τοὺς δ᾽ αὖ χορευτὰς ἠλιθίους παρεστάναι,
ὅπως ἂν αὐτοὺς ῥηματίοις σκιμαλίσω.[186]
Aristophanes, *The Acharnians*

The last chapter has examined the role trust plays in monetary theory concluding that monetary trust is fundamentally a question of authority. In modern credit money systems, the monetary authority is assumed to be the central bank. The central bank establishes trust, or legitimacy, through transparency and credibility, both understood as the absence of asymmetric information between monetary policy makers and economic agents (e.g. Cukierman and Meltzer 1986: 1108; Geraats 2002: 533; Svensson, 2011: 1238). This, in turn, puts communication into the center of central banking and monetary policy. "The hallmark of credibility", Alain Blinder writes, "is matching deeds to words." (Blinder 1998: 64). The assumption that central banks are trustworthy when they achieve to communicate transparently and credibly with "the public" implies a homogenous (and economically literate) audience. That the central bank's audience is not homogenous, was painfully acknowledged by Jörg Asmussen, then executive board member of the ECB, in a speech entitled "Building trust in a world of unknown unknowns",

> During this crisis, central bankers and policy-makers are faced with a potentially explosive interplay between markets and politics. Messages that are necessary and legitimate in public debates can be completely unsuited for market communication and exacerbate tensions. (Asmussen 2012)

The bulk of research on central bank communications does not appear to agree with Asmussen. They understand the "public" as the development of European stock markets (Born, Ehrmann & Fratzscher 2011; Bandelli & Guo 2018; Hayo, Henseler & Rapp 2019;

[186] "The audience must know who I am, but the Chorus must stand there like fools, so that I can dupe them with my neat little speechlets."

Apergis & Pragidis 2019).[187] This one-sided focus reflects the observation that "the outside world" in economic research is limited to market actors (van der Cruijsen et al. 2010). However, some studies also demonstrate the extent to which central bank communication is related to government bond yields (Beaupain & Girard 2020; Gertler, Horváth & Jonášová 2020) and still other studies the extent to which central bank communication reflects the macroeconomic performance of individual countries in the euro area (Bennani & Neuenkirch 2017; Tillmann & Walter 2019). Apel and Grimaldi (2012), Bennani and Neuenkirch (2017) and Renault and Picault (2017) analyze the tone of central bankers and find empirical evidence for the observation that inflation and growth expectations have a positive impact on tone when expectations are positive and a negative impact when they are negative. These findings are in line with Taylor rule-based monetary policy and the hawkish or dovish leanings of central bank policy decisions (Taylor 1993). In other words, when macroeconomic indicators exceed expectations, such that there is, for example, a positive output gap, the average tone of the central bankers is observed to be "hawkish," implying a tighter monetary policy and a rise in the interest rate. Conversely, if the economic outlook underperforms and there is a negative output gap, the average tone of the central bankers is "dovish", suggesting a lowering of the interest rate and a more accommodating monetary policy. The aim of such studies is to investigate how central bankers react to "the economy" when deciding on the monetary policy and how the economy reacts to central bankers' communication.

Although there is not yet any standardized methodology and studies differ significantly in their choice of datasets, the linguistic methods used to classify sentiment indicators and

[187] At the time of this writing, I have counted 22 published empirical studies on ECB central bank communications. Of these, 14 are either fully or partially concerned with relating communication to financial markets, the most common dependent variables being the EUROSTOXX50 and volatility indices such as the VDAX, VCAC, or VSTOXX. See bibliography.

their econometric analyses, at least two problems can be identified that all studies have to face. The first problem concerns the choice of dictionary and the related decision of what exactly counts as "positive," "negative" and/or "neutral." The second problem concerns the framework of the political economy in which central bank communication is supposed to take place. The first problem concerns the speaker, the second the audience. The two problems are interrelated in that a positive, negative and/or neutral tone may also depend on who the central bank is communicating with, or what exactly is understood as the "economy." An example may illustrate this issue. The ECB's task is to ensure price stability, and its political independence is founded on the belief that inflationary pressure from governments distorts monetary policy decisions, which is known as the time-inconsistency problem (Kydland & Prescott 1977). The Kydland and Prescott paper was not explicitly concerned with central bank independence, but it offered an intellectual framework for the institutional decoupling of monetary policy from government. The paper was later developed by Barro and Gordon (1983) and Rogoff (1985) and became the standard reference for separating the institutional role of central banks in developing monetary policy from "the regular Government 'machine"' (Keynes 1913: 160). What is referred to as time-inconsistency in this context is the assumption that when governments have control over monetary policy, they will want to please the electorate by keeping unemployment below its natural level, thereby inflating wages and the natural rate of inflation.[188] In such a framework, the word "inflation" or, even better, the groups of words (bigrams) "high inflation" or "low inflation" can therefore express different moods depending on who the central bank is communicating with and in relation to which topics. For a government with high unemployment and a high government debt ratio, a rising inflation rate may be a welcoming

[188] See (Cukierman (2003) for a collection of evidence of time-inconsistency. For contrary evidence, see i.a. Scharpf (1987) and Goodman (1992) as well as Bernhard et al. (2002).

signal, while a government with low unemployment and a lower government debt ratio, as well as holders of government bonds, would view the signal negatively. In Apel and Grimaldi's (2012) dictionary, the bigram "high inflation" is consistently evaluated as "hawkish" and the textual analysis is compared with the evolution of the reference interest rate, i.e., the "audience" of the central bank in this study are commercial banks. Similarly, Bennani and Neuenkirch (2017) consistently rate the word "high" as "hawkish" but differentiate between national central bank governors and their communications at home and in Frankfurt, i.e., the audience in this study includes nation-states. However, the word "high" not only includes statements about inflation forecasts, so that "high" interest rates would be consistent with a "hawkish" monetary policy. It also includes "dovish" signals such as "high unemployment," "high debt-to-GDP ratio," etc., so the problem here is the ambivalent choice of words in the lexicon on the one hand, and the intention that is motivating the central banker's policy decision on the other. Picault and Renault (2017) assess "low inflationary pressure" from a monetary policy point of view as "dovish," but "high inflation expectations" ("expected annual inflation") as cyclically positive. This study differentiates between monetary policy and macroeconomic developments without, however, distinguishing between the various member states of the euro zone.

In the euro area, central bank communication is further complicated by the fact that, apart from the ECB, there are still 19 national central banks whose governors are appointed by their respective governments and who have voting rights in the Governing Council. Every six to eight weeks, the Governing Council—the six members of the Executive Board and the nineteen governors of the national central banks—meets to vote on the future course of monetary policy in the euro area. For a supranational central bank such as the ECB, members of the Governing Council may therefore disagree with each other, e.g., members may have differing opinions on the exact size of the interest rate adjustment if inflation

expectations do not correspond to the current price level, but also because of the different business cycles and macroeconomic developments in their respective home countries. Speeches by central bankers, which are used as data sets in most studies, provide only limited information for this type of differentiation, since it is difficult to determine which criterion is chosen when a central banker speaks "at home" or "abroad." A speech given by a German central bank governor during a meeting outside the ECB's headquarters in Frankfurt may thus only be "at home" if the audience the central banker addresses also consists of German political or economic actors. In other words, if the speech is given during a summit of central bankers in front of "Davos Men," it may not reveal much about conflicts of interests between member states. In a world of globalized metropolitan elites and institutions, the location of the speech is therefore not meaningful.

One way to resolve these two problems is to distinguish between the audiences to whom central bankers are speaking and to adjust the dictionary, or dictionaries, of the textual analysis with regard to the different target or interest groups with which central bankers are communicating. For such an analysis, it is necessary to look not only at English-language speeches, but also at texts spoken in the home language, assuming that there are conflicts of interest between the various members of the eurozone. This includes speeches given in the home language, but also interviews for the national press. An oft-repeated saying in research on central bank communication states that "not all words are created equal" (Renault & Picault 2017). This may also be true of the audiences with whom central bankers are communicating. Economic sociology and research focused on political economy in particular have argued that there are "communities of interest" (Braun 2014) or "power struggles" (de Haan & Eijffinger, 2016) whose competence in understanding and evaluating monetary policy signals may differ. In economic research on central bank communication, however, the question of "who is listening?" has so far played too minor a role. Based on

the findings of not only economic but also social science-oriented research (Posen 1995, Hall & Franzese 1998, Bernhard et al. 2003), this study uses four different dictionaries that not only pay attention to the specific linguistic differences between languages but also differ in the evaluation of what counts as "positive" or "negative" in front of different audiences.

I thus extend the habitual dataset of ECB speeches to speeches and interviews of German and French central bank governors, as well as to the board members of the German and French central banks, in order to more closely examine whether the national monetary policies of France and Germany differs from European monetary policy in terms of communication. I roughly separate the "audiences" according to economic interest groups—market, state and society—with "literacy" in terms of communication signals decreasing from the "inside" (money and financial markets) toward the "outside" (individual savers and borrowers). This distinction follows the pyramid hierarchies observed in the last chapter (2.4.1). The reason for choosing three different dictionaries is that each of these groups presents its own challenges for central bank communication. For example, the task of conducting monetary policy—controlling the short-term interest rate—is negotiated between the ECB and the interbank market (super insiders). The task of monetary policy transmission—controlling the future expectations of the private and public sectors—is primarily negotiated between the ECB, firms and the financial policies of individual governments in the euro area (insiders). Finally, the "confidence" challenge is primarily negotiated between the ECB and the general public, i.e., monetary policy "outsiders." As a prior, I thus assume that central bank communication is not happening in a vacuum, and that time-inconsistency does not only apply to governments and the electoral cycle but to financial policy and the financial cycle as well.

3.1 Database Overview and Empirical Methodology

For the purpose of this study, I have collected 21 years (1999M1-2019M4) of public documents from three central banks—the European Central Bank (ECB), the Banque de France (BdF), and the Bundesbank—through various web scraping tools, as well as from scanned documents from the Bundesbank and Banque de France archives.[189] The data for the European Central Bank is available online in HTML or PDF format. Since October 25, 2019, the ECB has made all speeches available in a comprehensive dataset (ECB 2019). Interviews have been published on the ECB homepage since 2004. Not all interviews appear to be kept on the homepage, however. Notably, interviews delivered by the national central bank presidents for the local press are seldom published on the ECB website, whether translated or in the original language. Additional interviews, in particular those interviews conducted prior to 2004, have been compiled via news databases.[190] Since January 2015, the ECB has followed other major central banks such as the FED and the Bank of England in making "minutes" of the General Council meetings publicly available.[191] This move towards greater transparency may be seen as a welcoming addition to widen the communicative channels of the ECB. Nevertheless, these so-called "monetary policy accounts" still remain opaque because individual votes are not documented and because the discussion section omits direct speech by the use of the passive voice, e.g., "it has been said" as opposed to "Draghi said." Some (Issing 1999, 2013) have also questioned the publication of minutes on the grounds that they would have the reverse effect of forcing central bankers

[189] The full database is available on github. https://github.com/Moritz-Pfeifer/Money-Trust-and-Central-Bank-Communications

[190] Factiva (for ECB) and Europresse (for France) and G+J Pressedatenbank (for Germany).

[191] The world's major central banks have long published the minutes of their monetary policy committees. The Fed started in 1993, the Bank of England and the Bank of Japan in 1998.

to voice dissenting opinions less openly and hence speak less transparently.[192] While it is not obvious why this criticism should not also apply to speeches, interviews and other communications, I have ignored the minutes in this study because they do not cover the entire period and only rarely include direct speech, which makes it difficult to process and attribute opinions to specific speakers.[193] In the absence of precise transcripts, the largely anonymous remarks in the discussion sections provided by the accounts of the monetary policy meetings remain a black box on the question of monetary policy divergence among the members of the General Council.

On their current homepage, the Banque de France has made available all *Interventions* (speeches and interviews) since 2015. Older *Interventions* have been compiled via older versions of the BdF homepage, news databases and the physical archives made available by Les Service du Patrimoine Historique et des Archives of the Banque de France, where press dossiers are being kept. The Internet Archive reveals that interviews have only been published online on the homepage of the Banque de France since 2008. A comparison between these interviews and those available in the Archives and on the live homepage has not yielded significantly more data, however. This may be due to the fact that older print versions of press articles are still not available in these databases. As to the data available in the physical archives, communications made during the mandate of Jean-Claude Trichet are being kept under the sections "Cabinet du gouverneur" and "Service de communication" under the numbers 1044 (boxes 5, 44, 35) and 1035 (boxes 25, 1, 1.2, 66),

[192] This debate dates back to an argument between Issing and Willem Buiter. See, Buiter (1999). That formality of speech is a general problem in central bank communications has been shown by Muchlinksi (2011). To my knowledge, the only available dataset of unfiltered central bank communication is the one made available by Diem25 under the title Euroleaks (https://euroleaks.diem25.org/ [last accessed 10.10.2021]), which cover the Eurogroup discussions during the Greek debt crisis. See also infra.

[193] For text and sentiment analysis, it is also difficult to attribute the indirect passages in the minutes to specific speakers. To do this would require machine learning, which could be interesting for a future study.

respectively.[194] These boxes comprise all *Interventions* and press reports and appear to be exhaustive until 2001. For the first three quarters of 1999, files under section 1035 have been published in three bound volumes. Unfortunately, after 2001, the state of affairs is much less complete. For the third quarter of 1999, the archives under the section 1044 have been kept in unordered printed and digitized files.[195] The Service du Patrimoine has compiled these files in 24 unnumbered boxes from 1999-2007 for this research. The boxes contain press releases and speeches as well as publications such as the Bulletin de la Banque de France. The remaining files for section 1035 that are not in these boxes, which for the most part include interviews and speeches by Jean-Claude Trichet, have been sent to me in digital format by the Service du Patrimoine. However, these files appear to be incomplete. A comparison of the data from these files with the data from the archived website shows that only a very limited selection of what can be found in the physical archives was put online, at least until 2008/9.[196]

The Bundesbank data is available online in HTML or PDF format on the homepage of the Bundesbank. Press reports are available for the last 12 months and speeches extending back to 2005. Earlier press reports and speeches have been made available in PDF format

[194] The complete numbers (numéro de boîte, numéro de bordereau, Pilon) are 25/1035201603/9999/ MA.AJ.11.A.1, 1/1035201603/9999/ MA.AJ.2.C.1, 1.2/1035201603/9999/ MA.AJ.2.C.1, 5/1044201201/9999/ MA.E.2.D.6, 35/1044201201/9999/ MA.E.3.A.3, 44/1044201201/9999/ MA.E.3.A.4. For some central bankers, such as Christian Noyer, independent archives are being kept. For Christian Noyer, these are: 1035201603 AR 1, 1035201603 AR 2, 1035201603 AR 3, 1035201603 AR 4, 1035201603 AR 5, 1035201603 AR 6, 1035201603 AR 7, 1035201603 AR 8, 1035201603 AR 9, 1035201603 AR 10, 1035201603 AR 11, 1035201603 AR 12, 1035201603 AR 13, 1035201603 AR 14, 1035201603 AR 15, 1035201603 AR 16.

[195] This may be due to the fact that the press service had been outsourced to a company called "la voix des medias" before, which documented all press material from and about the Banque de France until the end of that year. It is unknown to me or the staff currently working at the Service des Archives if another service replaced this one and if so which one.

[196] The Service du Patrimoine does not allow the documents to be taken out of the archive. All the Banque de France data from the archives used in this study is based on photographed snapshots that have been OCRed. This process yielded some unreadable files and makes the French database the most compromised one.

by the Pressearchiv of the Deutsche Bundesbank. The online access to or digital availability of interviews is limited on the Bundesbank homepage, however, and the Bundesbank does not allow snapshots of older website versions via the Internet Archive. However, since 1957, all interviews have been published in print in the form of a newsletter, *Auszüge aus Presseartikeln* (Bundesbank 1999-2019).[197] Complete archives of all the *Auszüge* are being kept at the Universitätsbibliothek Trier. Parsed scans of all interviews from the *Auszüge* (1999-2019) from the Universitätsbibliothek Trier, which were generously OCRed by the Direction des ressources et de l'information scientifique (DRIS) at SciencesPo Paris, are included in the database.

Unlike the ECB, the Banque de France and the Bundesbank do not publish "minutes" of their board meetings. As mentioned above, the fact that recordings of private conversations are inaccessible to the public makes the use of public documents the most common sources to assess decision makers' views (van Esch 2007, Marsh 2009, van Esch 2014), even though occasional field studies that include private conversations (Pixley 2012 [2004], Braun 2014, Wansleben 2018), as well as first-hand accounts (Varoufakis 2017, Carney 2021), may provide additional sources. Discussions about whether speeches written by speechwriters, possibility of censorship or self-censorship (Cook & Heilmann 2010), cognitive internalization of institutionalized beliefs (Keller 2009), strategic performativity (Schmidt 2008), coded language (Muchlinski 2011) and other factors of linguistic bias truly reflect central bankers' personal views are certainly valid. However, several studies have shown that policymakers' public speeches provide an adequate approximation of the trends in more privately held beliefs (Axelrod 1976, Marfleet 2000, Renshon 2009; but see Hay & Smith 2010). Unlike press releases and press reports, speeches have the additional advantage of reflecting the speaker's opinion in his or her official role, regardless of the

[197] The *Auszüge* were discontinued on March 19, 2020.

question of whether there is such a thing as a central banker's true voice.[198] It is interesting to note that since Born, Ehrmann and Fratzscher's (2013) pioneering study on central bank communication, very few studies have included interviews in their databases.[199] Compared with speeches, interviews may be less scripted and provide a more ad-hoc indication of a central banker's beliefs. As noted by, e.g., Hermann (2005), interviews are a more spontaneous material than speeches, as policymakers need to respond quickly and without aid. Nevertheless, in the likely presence of pre-scheduling, speech coaching and post-interview revisions, the potential bias faced by published interviews may be similar to those observed in speeches.[200] Indeed, this study shows that the average tone between speeches and interviews differs to an alarmingly little degree (see **Table 2b**).

The entire dataset contains 3071 documents (1086 interviews and 1985 speeches). Of these, 1468 speeches and 778 interviews are from the ECB; 305 interviews and 479 speeches from the Bundesbank; and four interviews and 37 speeches from the Banque de France.[201] The ECB dataset focuses on German and French Executive Board and General Council members only, so communications of non-German and non-French ECB members have been excluded from the ECB dataset. The reasons why the German dataset for national board members is so much larger than the French one may be threefold: first, the Bundesbank data exists in the form of a complete archive; second, the Bundesbank has six executive board members (*Vorstandsmitglieder*), while the French has three (*members du*

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198 Indeed, the fear that a central banker might reveal his or her personal opinions and thus shatter "the myth of neutrality" (Adolph 2013) has accompanied each move towards "greater transparency." See also Issing (2019).

199 This study also differentiates between the different audiences, where optimistic Financial Stability Reports are reported to have a higher effect on stock market returns than speeches and interviews. Other studies on central bank communication that have taken into account interviews are Ranaldo & Rossi (2010) and Gertler & Horvarth (2018).

200 See, e.g., Hermann (1977), Winter et al. (1991) and Schafer (2000) for research considering the differences between speeches and interviews in assessing policymakers' beliefs.

201 Note that these numbers do not reflect the sources, e.g., as Jean-Claude Trichet's interviews are from the archives of the Banque de France but counted as ECB communiqués since, as a national central bank president, he is part of the General Council.

Conseil Générale); and third, the Bundesbank may communicate more frequently.[202] An overview of the dataset sorted by speakers, position and country can be seen from **Table 1** in the appendix this chapter.

3.1.1 Measuring the Sentiment of Speeches

As a first step, I followed the standard textual analysis methodology by a) converting all words in the 3076 speeches and interviews to lower case, b) removing numbers and punctuation, c) using a Porter (1980) stemming algorithm to reduce inflected words to their word roots (e.g, "inflation" to "inflat," "decreasing" to "decreas,"), d) running an n-gram based language detection algorithm (Hornik et al. 2020) to differentiate between German, French and English communications, and f) removing a set of stop words (e.g, "and," "the," "of," "to"…) for each language. In a second step, I created four different dictionaries for each language, each dictionary representing a different audience group. Text analytic studies of central bank communication use different methods to quantify the tone of communications. Most studies use standardized dictionaries such as the "financial dictionary" by Loughran and McDonald (2011), the central bank dictionaries by Apel and Grimaldi (2012) or Bennani and Neuenkirch (2017), the Harvard IV psychological dictionary, or the central bank communication index dictionary by Picault and Renault (2017). These dictionaries classify certain words or groups of words as negative, positive and sometimes neutral expressions. Based on these or similar dictionaries, publicly available central bank communications such as speeches or press releases are then analyzed textually, i.e., the expressions

[202] The Executive Board of the Bundesbank currently consists of the president, the vice-president and four members with different responsibilities. The Executive Board of the Banque de France currently consists of the governor and two vice-governors.

classified in the dictionaries are counted in the texts and it is determined whether a text is predominantly positive, negative and neutral in relation to the total word count of the texts.

As mentioned in the introduction, a major drawback of these dictionaries is that they quickly run into ambiguities. To avoid ambiguity (as much as possible), I only include singular words when it can be known with relative certainty that the word is either negative or positive across all contexts (e.g., "crisis," "recession," "boom," "welfare") so that preceding adjectives are unlikely to change their meaning. Otherwise, I have followed Picault and Renault (2017) by only taking into account n-grams (e.g., "high employment" is positive whereas "low employment" is negative, but "high" and "employment" by themselves are ruled out). The choice of words in the dictionaries include all adjectives and noun combinations provided by Apel and Grimaldi (2012) and Bennani and Neuenkirch (2017) as well as an additional combination of manually selected n-grams which are relevant to each audience category.[203] To keep the dictionaries homogenous, I have used the same or semantically identical words across languages with an equal number of positive and negative word combinations. The removal of stop words and stemming make it possible to count grammatical patterns, so that n-grams can be formed both when the adjective is placed before the noun (e.g., "growth is declining" turns into "growth declin") or after a linking verb (e.g., "declin growth"). Overall, the English dictionary includes 957 possible word combinations across the four dictionaries, the French dictionary 395, and the German

[203] I have used various topic modeling algorithms, among them latent Dirichlet allocation (LDA), non-negative matrix factorization (NMF), CorEx, and t-distributed stochastic neighbor embedding (t-SNE) in an effort to automate the process of creating the dictionaries. However, at the time of this writing, this process has not yielded satisfying results. The preliminary codes and results of these attempts can be found on github. One promising result of this process is that the LDA and NMF algorithms have found legal topics to be prominent among the German dataset (e.g., "bgb," "Gesetzbuch") but not for the ECB and the Banque de France. This country-specific approach to text analysis may be further explored in future research.

dictionary 981.[204] Word combinations that did not yield any results (e.g. nonsensical bi-grams) have been removed from the dictionaries.

Another important methodological problem in the standard literature comes from the ambiguous use of single dictionaries and the attribution of overall positive (negative) words to hawks (doves). However, the hawkish (dovish) policy leaning may be voiced in a negative or positive depending on what monetary policy issue the central banker is addressing. In light of the fact that "doves" are usually considered to favor "faster growth" and "greater employment" pursuing "expansionary" monetary policy, it appears problematic if not counterintuitive to attribute all negative word combinations to so-called doves. Conversely, hawks are considered to vote for "tighter" monetary policy—higher interest rates—with the aim of keeping inflation in check, even when "fighting inflation" means "slower growth." As higher interest rates discourage borrowing and encourage saving, it cannot be readily assumed that the tone of hawkish central bankers should be more positive.[205] The matching-deeds-to-words problem (Blinder 1999, Issing 2019)—positive outlook, positive tone, higher interest rates but restrictive monetary policy; negative outlook, negative tone, lower interest rates, but accommodating monetary policy—may therefore not hold when the tone is supposed to reflect an intended monetary policy.

Equally important is the assumption that the central banker in the hawkish-dovish paradigm is simply reiterating observations on whatever macroeconomic variables are considered important, where a perfect alignment of communication and variables implies perfect "transparency". Such a view, however, makes the trust element superfluous, as there seems to be little use for trust in a world in which policy makers and economic agents know the

[204] As mentioned above, the lower French word counts are most likely due to the smaller set of French data.

[205] This ambiguity is most obvious in Picault and Renault (2017), where the usual hawkish-dovish dichotomy is replaced by "accommodating" and "restrictive" monetary policy, yet the accommodating tone is paradoxically attributed to hawks.

economic policy rules and the instruments used to achieve them.[206] The tension between managing market expectations and learning from market outcomes, for example, would disappear with full transparency and even make the role of the central bank unnecessary. This "transparency paradox" (Morris and Shin 2005: 19)—the higher the ability of the central bank to accurately read the economy, the lower the incentive for economic agents to act on their own information—has generated a literature which tries to assess "optimal degrees of transparency" (Van der Cruijsen et al 2010; Horváth and Vaško 2016.). Such quests demonstrate what has been defined as the trust puzzle in the last chapter, namely that those who depend on central bank policies have good reasons to verify what central banks do.[207] In most studies on central bank communication, communication is thus considered to take place in a vacuum and the question of whom central bankers may or may not be addressing is omitted.[208] In short, how can we talk about communication when we do not even mention audiences?

This omission is troubling, given the institutional reality of the European Central Bank, which is embedded within a broader system of economic and political institutions, both domestically and internationally. I follow a recent development in the economic and sociological literature (Braun 2014, de Haan & Eijffinger 2016, Hartwell 2019) by assuming

[206] The transparency paradox is not oblivious to the ECB. Perhaps nobody has put it better than Otmar Issing (2000): "In an ideal 'full information' world, transparency and clarity would coincide; the public could observe economic data and central bank objectives, it could then perfectly deduce and predict its optimal policy. In such a world there would be no need for communication or for a monetary policy strategy, let alone one with distinct pillars or features like a 'reference value' or a 'prominent role for money'."

[207] Most often, however, the problem does not get stated as such. Instead it is interpreted as a matching-deeds-to-words problem, i.e. "too much transparency" increases the risk of contradiction and hence leads "paradoxically" to less transparency. And so the quest for optimal transparency ends where it began. Tellingly, these studies assess trust on how well the central bank meets its own demands instead of asking what kind of institutional setting establishes and upholds certain kinds of trust relations.

[208] The original study by Born, Ehrmann and Fratzscher (2013) is an exception in this regard, since it differentiates between sources that are or are not relevant for market participants. Subsequent studies, however, have not followed this path. The other path assumes that the "vacuum" is an intended consequences of central bank independence.

that the institutional nature of the ECB means that it is not insulated from political pressure or "power struggles," and that these pressures influence the central bank despite any intended vacuum.[209] This institutional distinction is common practice in the political economy and economic sociology literature (Iversen 1999; Hall and Franzese 1998; Bernhard et al. 2003; Epstein 2019) as well as in post-Keynesian and New Institutional Economics (Forder 2005, Bibow 2013), where it is usually applied to question the role of central bankers as impartial, i.e. independent, adjudicators in policy bargaining among the three competing interest groups (Maxfield 1997; McNamara 2002). In this literature, central bank independence does not resolve but absorbs competing political pressures and interests. The threat of opaqueness and a lack of credibility, here, are not provided by "transparent" or "credible" value signaling with regards to the central bank's own established set of discretion or rules, but by how efficient the central bank is in pandering to its constituents. Thus the disincentive to expend effort in reaching an independent judgment in a transparency regime of central bank communication counts for insiders, i.e. market participants, as well as for outsiders, i.e. the general public. In this understanding, more room is given to the political struggles that underpin monetary trust relations. For instance, if the role of the independent central bank is to achieve price stability, then subsequent political debate about how much attention to pay to inflationary pressures as opposed to other goals such as full employment appears much less relevant because the decision in favor of price stability has

[209] This distinction not only follows the chartalist and MMT literature quoted in Chapter 2, which questions CBI on the grounds that modern central bank appear to be very sensitive to one interest in particular, namely that of the financial sector (Wray 2007); it is a view that can also be found in the opposite Mengerian camp, which regards CBI as an elongation of the government (Selgin 2017: 268). It is interesting to note that the original formulations of the time-consistency problem to justify central bank independence, while incessantly *acknowledging* theses three institutional actors—partisan cycles, financial markets, corporatism—as constituents of a power struggle over monetary policy (whose checks and balances CBI was intended to bring about), refrained from *analyzing* independence within this institutional framework. As Forder (1998: 310) has aptly noted, CBI is an institutional solution to an incentives issue, and "whenever an institutional proposal—such as central bank independence—is proposed as a solution to a time-consistency problem, there is the danger that the "problem is simply relocated, or displaced."

already been preempted (Vibert 2007: 57).[210] In ignoring the institutional embeddedness of central bank communications, the mainstream literature has been skewed towards a one-sided obsession with transparency and accountability issues, neglecting agency responsiveness to external pressures from interest groups (Arras & Braun 2018).

Table 2a: Audience dictionaries

Dictionary	Audience	+	-
Super Insiders	Financial institutions	accommodating	restrictive
Insiders	Large firms, government	expansionary	contractionary
Outsiders	Households, small firms	inclusive	exclusive
Trust	Everyone	trust building	trust busting

In order to study central bank communications by taking interest groups into account, I have created three different dictionaries (**Table 2a**) corresponding to distinct economic audiences, where each audience is assumed to have a different and perhaps conflicting role in the transmission mechanism of monetary policy. The dictionary-specific audiences are financial market participants (super insiders), monetary insiders in the non-financial sectors of the economy (government and industry), and monetary outsiders (households, small firms). The task of conducting monetary policy—controlling the short-term interest rate—is negotiated between the ECB and the interbank market (super insiders). The "super insider" dictionary thus primarily includes financial terms (e.g., adjective like "regulatory," "resilient"; and nouns like "portfolio," "liquidity"). To remedy the potential ambiguity of hawkish/dovish tones mentioned above, I have only included n-grams in the dictionary for the super insiders, which are unambiguously either accommodating or restrictive (e.g., "invigorat market" is accommodating and "scrutin portfolio" is restrictive). The task of monetary policy transmission—controlling the future expectations of the private and public

[210] The same problem exists in signaling processes that do not rely on the use of words, such as the biographies of central bankers, and specifically their education and previous employment. If, thus, the appointment of a central banker with a Ph.D. in economics from an ivy league university and formative years at a major investment bank is considered the ticket to price stability, the bias towards market communication (i.e. central bankers are best at calming the markets when they come from powerful market players), is at best assumed and at worst redundant (Adolph 2013).

sectors—is primarily negotiated between the ECB and firms and the financial policies of individual governments in the euro area (insiders). This dictionary focuses on governments and industry (e.g., adjectives like "support," "unsustainable"; and nouns like "public deficit," "labor"). Lastly, the task of governing monetary outsiders (i.e., households) is defined by the trust in the money they use, in the banking system that issues that money, and in the central bank that backs it. This dictionary is the broadest as it is directed towards the wider public (e.g., adjectives like "united," "angry"; and nouns like "citizens," "savers").[211] Lastly, I include a trust dictionary which I assume to address all audiences, as a kind of dictionary to bind them all. I therefore expand the standard practice in the literature of assigning "hawkishness" or "dovishness" to a single tone score, by understanding the tone scores as "accommodating" or "restrictive" for the super insiders; as "expansionary" or "contractive" for the insiders; as "inclusive" or "exclusive" for the outsiders and as "trust building" and "trust busting" for the trust dictionary. In line with research on financial literacy and financial sophistication (van der Cruijsen et al. 2010, Mellina & Schmidt 2018), the complexity of words diminishes from super insider to outsiders dictionaries. However, it is interesting to note that in spite of the diminishing complexity, the number of generated n-grams decreases from super insiders to insiders, and is the lowest for the outsiders dictionary.[212]

[211] Recently, central bankers have tepidly come to admit that their transmission mechanisms may have unequal distributional consequences (see, e.g., BIS 2021 and Rogoff 2021 for discussion), a trend which can be interpreted as a rection to institutionalize the "democratic" motivation behind digital currencies. In this context, "financial inclusion," "inclusive growth," etc. have entered the list of buzzwords in central bank communications. While the polarity of inclusive/exclusive may thus appear anachronistic, the idea of social and political unity was certainly present during the creation of the Euro, which explains the choice of these terms.

[212] The number of n-grams for each dictionary is as follows: English dictionary: super insiders: 495, insiders: 304, outsiders: 67; trust: 81; French dictionary: super insiders: 234, insiders: 94, outsiders: 30; trust 37; German dictionary: super insiders: 453, insiders: 262, outsiders: 134, trust: 132. Performing a Flesch-Kincaid (Flesch 1948, Kincaid et al. 1975) test on the ECB data yields a mean-readability score of 36 for speeches and 50 for interviews. In other words, interviews are slightly "easier" to read than speeches, but both are "difficult to read." The dictionaries and Flesch-Kincaid test scores are available on github.

To quantify the tone of each communication, I follow the standard practice and use an automated linguistic text approach (e.g., Bligh & Hess 2007; Apel & Blix Grimaldi 2012; Born, Ehrmann, & Fratzscher 2013; Hansen, McMahon & Prat 2014; Bennani & Neuenkirch 2017; Renault & Picault 2017). This process searches each of the 3071 speeches and interviews for words and counts number of positive or negative words in each speech. The value measuring the tone of each speech and interview is calculated with the following formula for each dictionary:

$$tone\ {}^{j}_{i,t} = \frac{\sum_{i=1}^{n} positive\ tone_{i,t}^{j} - \sum_{i=1}^{n} negative\ tone_{i,t}^{j}}{\sum_{i=1}^{n} positive\ tone_{i,t}^{j} + \sum_{i=1}^{n} negative\ tone_{i,t}^{j}} \quad (2.1)$$

This automated search and word-counting approach creates a continuous variable $tone_{i,t}^{j}$ for each dictionary j and for the speech or interview of central banker i on day t that is bound between -1 and $+1$. I do not correct observations for a minimum of occurrences because I believe that the word combinations that are detected are meaningful even if the dictionaries are most certainly incomplete. However, because tone scores are not always recognized for each dictionary in every speech or interview, and in order not to impute missing values, I record quarterly average tones across the dictionaries and communications.[213] This process leaves a total of 871 observations. **Table 3a** sets out descriptive statistics for the different tone indicators.

It is worth highlighting that communications contain, on average, slightly more positive tone scores than negative ones when the dictionaries are combined across all areas. This result is in line with the findings of the literature (e.g., Born, Ehrmann, & Fratzscher 2013; Bennani & Neuenkirch 2017), which also discovers that central bankers' tone is positive (interpreted as "hawkish" in the standard literature) on average.

[213] This approach is also more consistent with the quarterly data for the independent variables in my regression model.

Table 3a: Average communications by dictionary

	N	Mean	Median	Min	Max	Standard Deviation
Euro Area						
Super insiders	335	0.2127	0.2103	-1	1	0.2954
Insiders	335	-0.1023	-0.1184	-1	0.7926	0.3644
Outsiders	335	0.4283	1	-1	1	0.7697
Trust	335	0.03543	0	-1	1	0.6416
France						
Super insiders	89	0.3602	0.3179	-0.2103	1	0.3913
Insiders	89	-0.4287	-0.4511	-1	0.2533	0.3537
Outsiders	89	0.6517	1	-1	1	0.5429
Trust	89	0.2353	1	-1	1	0.9065
Germany						
Super insiders	447	0.2571	0.2741	-1	1	0.3653
Insiders	447	-0.1678	-0.1449	-1	0.7926	0.3472
Outsiders	447	0.6114	1	-1	1	0.5684
Trust	447	-0.1468	-0.1667	-1	1	0.6266
Overall	871	0.1472	0.1654	-0.6218	0.7184	0.2531

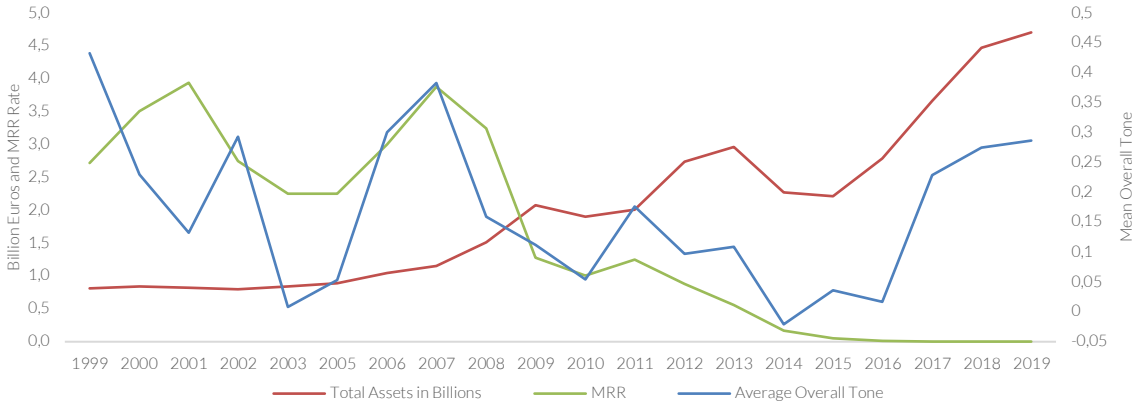
However, when looking at the different audiences, it is striking to note that tones are not the same across the different groups. In particular, the tone of speeches and interviews directed at insiders is negative ("contractive") on average, whereas the tone for super insiders and outsiders is positive ("accommodating" and "inclusive," respectively). This finding is consistent across all areas (Eurozone, Germany and France) and supports the hypothesis that central bankers face a communicative challenge in managing different interest groups. Lastly, the trust dictionary is the only dictionary that registers significant country-specific differences, with German central bankers using a more negative trust tone ("trust busting") and French central bankers a more positive one ("trust building").

Figure 3 shows the average tone of communications and the average main refinancing rate within a year over the sample period. Most studies trying to relate central bank communications with the interest rate collapse after 2014, when the ECB cut the interest rate to zero.[214] In the central bank communications paradigm, where the tone scores follow the interest rate setting, the zero lower bound would imply that central bankers either stop speaking or that communications are consistently neutral after that date. In times of a persistent zero lower bound and Quantitative Easing (QE), the hawkish/dovish paradigm is

[214] On July 11, 2012, the interest rate fell below the 1% mark for the first time. It then decreased continuously until March 16, 2016, when it dropped to 0%.

thus no longer a useful indicator for understanding central bankers' policy intentions from their tone. However, a glance at the balance sheet of the ECB may remedy this problem. As monetary policy shifted from interest rate management to using the balance sheet as a tool of monetary policy, the communications appear to have followed suit.

Figure 3: Average tone of speeches per year and average main refinancing rate.



From **Figure 3**, it can be seen that balance sheet policy was used in conjunction with interest rate policy for the years following the global financial crisis of 2008. The overall tone, however, still followed the interest rate until 2014, when the ECB's "new monetary policy" was announced in the context of its Asset Purchasing Program (APP).[215] This change coincides with "forward guidance" as the primary tool of expectations management, which started in July 2013 when the ECB's Governing Council announced that it expected interest rates to remain low for an extended period of time.[216] The notion of "forward guidance" describes the communication of long-term policy intentions and concerns both interest rates and central bank balance sheets. The main challenge is persuading banks and markets that interest rate normalization will take place in a slow and gradual manner. Unlike inflation

[215] The ECB introduced its Asset Purchase Program (APP) as part of measures including targeted long-term refinancing operations. The APP consists of the corporate sector purchase program (CSPP), the public sector purchase program (PSPP), the asset-backed securities purchase program (ABSPP) and the third covered bond purchase program (CBPP3).

[216] Nevertheless, a standard Chow test (1960) did not reveal a structural break in my data, which could be indicative that the paradigm shift towards balance sheet-based monetary policy was a gradual shift.

and growth, the two cornerstones of Taylor-rule based monetary policy, there has not been much of agreement about the optimal size and composition of a central bank's balance sheet, which makes communications about the use and pursuit of such policies a delicate issue.[217] In particular, using the balance sheet as a monetary policy instrument more frequently results in holding more, and potentially riskier, assets. On the one hand, policies of low interest rates have thus paved the way for a disconnection between the real and the financial sectors, shifting inflation away from goods in the CPI basket into asset prices, with the potential for fueling financial instability. This has granted the central bank regulatory power over financial stability. On the other hand, government bond-purchases have extended the ECB's monetary dominance to fiscal dominance, as the conditions of maintaining the bond-buying programs have effectively pushed domestic authorities to adhere to fiscal discipline.

The combination of interest rate-setting with liquidity management, systemic stabilization and fiscal dominance has raised questions about whether the ECB's role and functions are reaching the acceptable limit for a non-elected body within a democratic society (e.g., Tucker 2018). In the case of "new monetary policy," attempts to manage financial market expectations by talking up the market effects of quantitative easing may undermine public monetary trust and inspire fears of inflation and concern about "socialism" for the financial sector. Similarly, handing out warnings to governments to "get their house in order" and bear financial responsibility for their supposed failings may undermine the trust of those suffering from austerity, structural reform and competitiveness. In this context, communications about future policy decisions may be expected to look not only at macroeconomic and financial variables in addition to inflation, but also at the "soft constraints" (Judge

[217] The classic paper in favor of a large balance sheet is by Greenwood, Hanson and Stein (2016), delivered at that year's August Jackson Hole meeting. For a more critical view, see, e.g., Goodhart (2017).

2014) of trust management. In short, the "new monetary policy" has fundamentally altered the politics of monetary trust and central bank legitimacy, the cornerstone of central bank independence, making it no longer possible for the central bank to speak consistently either in "one voice" or to "one audience."

Figure 4: Alluvial diagram of dictionaries and tone scores

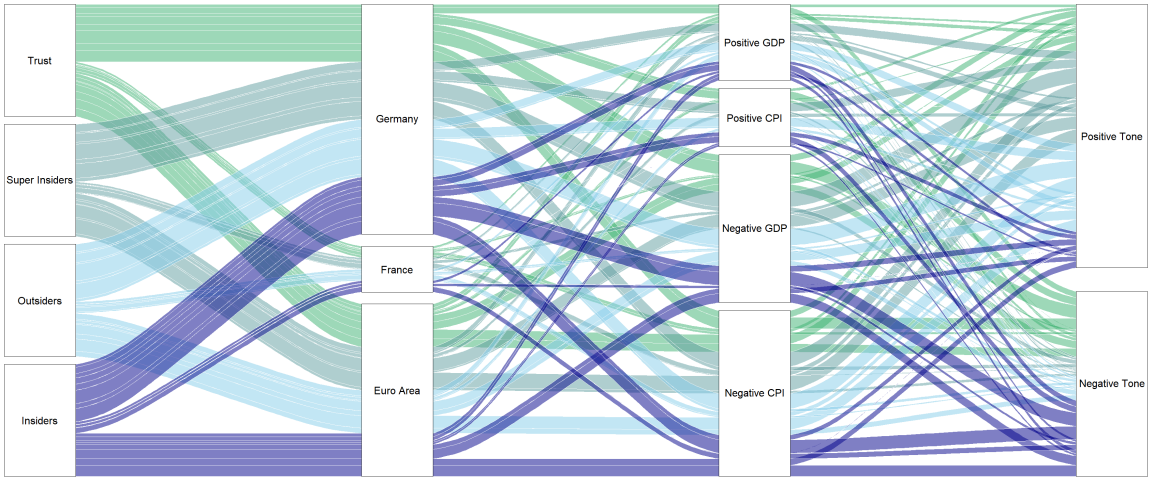


Figure 4 illustrates how the 871 observations in each of the dictionaries flow between the central banks (Banque de France, Bundesbank, and ECB) and the macroeconomic indicators (inflation and output gaps) into positive and negative tone scores. It shows that 1) there are more negative inflation and output gaps, i.e., instances when the realized inflation and growth underperformed the forecasts and that 2) the tone scores are more positive than negative. While this finding would be in line with a countercyclical Taylor-rule type monetary policy (i.e., underperforming inflation and output gaps leads to a more accommodative/expansionary tone and hence monetary policy), it may not always hold. This can be seen in the chart by following, e.g., the flow of the observations for the insiders. Going into the ECB (Euro Area), the stream is thicker for both negative inflation and output gaps, but remains thicker when flowing into the negative tone. The inverse appears to hold for the super insiders, where the stream going, e.g., out of the inflation gap into the positive tone is thicker than the negative one.

3.1.2 Econometric Methodology

I deploy a quantitative analysis of central bank communications. Such an approach means a quantification of textual empirical evidence aimed at extracting word frequencies that reveal and correlate with monetary policy preferences and decisions. As explained in equation (2.1), this quantified textual evidence is measured by $tone\,{}^{j}_{i,t}$. The tone of the central banker's communication reveals the extent to which the monetary policy stance can be labeled as either accommodating or restrictive; expansionary or contractionary; inclusive or exclusive; and trust building or trust busting. As each of the four dictionaries pertains to monetary policy, the core variation of the tone is assumed to stem from a set of macroeconomic indicators. As an extension to the Taylor rule-like framework, I include one financial market indicator, an audience dummy, and two soft restraints to get:

$$tone\,{}^{j}_{i,t} = f(\phi, D, (\pi_{i,t} - \pi_{i,t+12}), (Y_{i,t} - Y_{i,t+12}), P_{i,t}, tone_t^{NBM}, EB_t) \quad (2.2)$$

where j is the dictionary employed for the word count, i is the central banker (Executive Board Members and National Central Bank Presidents) and t is the time at which the communication occurred. Parameter ϕ is a set of estimated regression coefficients. D is a dummy regressor that indicates whether a central banker is speaking in his or her native language ("at home," i.e., in French or German; or "abroad," i.e., in English).[218] The macroeconomic variables $\pi_{i,t} - \pi_{i,t+12}$ represent the inflation gaps, as the quarterly difference between realized inflation and the inflation forecast. $Y_{i,t} - Y_{i,t+12}$ stands for the output gaps as the quarterly difference between the realized output (real GDP) and the output forecast. The financial market variables $P_{i,t}$ stand for price indices and are calculated from the prices

[218] A note on the language assumption: while some studies have studied differences between communications that are considered to take place at home and abroad, this study does not rely on geography as a differential indicator. The reason for taking the language as the home/abroad indicator relies on the assumption that the central banker is more likely to be speaking to his or her home audience when he or she is communicating in his or her native language.

of common shares of companies traded on the national stock exchanges. The soft restraints $tone_t^{NBM}$ and EB_t indicate the average j tone of the National Board Members (NBM) and the yearly net trust signals calculated by the Eurobarometer Trust Survey, respectively.[219]

As a regressand, the *i*th banker's *j*th tone at time *t* depends on the set of macroeconomic indicators, the financial market indicator, and the soft constraints. I rely on Pillai's Trace (Pillai 1955) to ascertain robustness of the estimates in the presence of heteroskedasticity, non-normality, and zero mean of the model residuals. The mode specification is the following (2.3):

$$f\left(tone_{j,i,t}^{GC}\right) = \beta(D(\pi_{i,t} - \pi_{i,t+12})) + \Theta(D(Y_{i,t} - Y_{i,t+12})) + \gamma(D(P_{i,t})) + \delta(D(tone_t^{NBM})) + \rho(D(EB_t)) + \varepsilon$$

which with algebra manipulation becomes,

$$f\left(tone_{j,i,t}^{GC}\right) = D(\beta\,\pi_{i,t} + \Theta\,y_{i,t} + \gamma\,P_{i,t} + \delta tone_t^{NBM} + \rho EB_t) + \varepsilon \qquad (2.4)$$

The common factor D interacts with the Beta, Theta, Gamma, Delta and Rho parameters to show differential coefficients with respect to the three categories Germany, France, and the Eurozone. Finally, breaking communications down into four independently-sampled tones leads to testing the hypothesis of simultaneous effect over a set of four outcomes. Such a data arrangement requires a Multivariate Analysis of Covariance (MANCOVA) design for the regression model. Therefore, the point estimate for the coefficients is calculated via Ordinary Least Squares (OLS), while the Multiple Analysis of Variance for the tests of significance among group means is estimated via Pillai's test statistic, which is an approximation of the traditional F Test for regression models with one dependent variable. Pillai's test seems to have the necessary robustness to avoid Type I error in statistical inference (Olson 1976). The multivariate design produces a set of four model residuals that are assumed to factor simultaneously as white noise in the model. Given that the assumption

[219] The source for the macroeconomic data is from the OECD database. The trust index is from the Eurobarometer survey and the tone of the national board members are calculated from my dataset using equation (2.1).

about the distribution of error enables the inference on the parameters as best linear unbiased estimators (BLUE), the assumptions of normality and heteroskedasticity are difficult to hold for fourfold model residuals. To the best of my knowledge, the robustness of Pillai's test enables hypothesis testing in the presence of model violations, which requires a departure from the location of the mean as a standard for the analysis of variance. Following Olson, "The Pillai-Bartlett V test is recommended for general use. It is the most robust of the invariant tests and is sufficiently powerful to detect population differences in any noncentrality structure" (Olson 1976: 583).

3.2 Empirical Findings

Table 4a represents the results of equation (2.4), which is estimated for all German and French members of the General Council. The results for the Pillai-Bartlett test of equation (2.4) are reported in **Table 4b**, which provides the significance for each predictor. Because the significance is very high ($p < 0.001$), it can be assumed that all coefficients reported in **Table 4a** are significant.[220] A first general observation is that differences in tone between the European level ("abroad") and France and Germany ("at home") can be observed across all dictionaries, although the differences change with regard to the independent variables. Furthermore, the communications "at home" are similar in France and Germany, except for the outsiders and trust dictionaries. Also of note is the observation that the communications of the Bundesbank presidents are in line with those of the board members at home, whereas the communications of the French board members are negatively correlated to the interviews and speeches of the *Gouverneur*. Finally, significant differences can be observed between the tone scores of each dictionary. Both observations—1) the difference between

[220] Recall that in a multivariate regression, we cannot rely on the p value reports when each model is tested separately. I do not report the asterisks of Pillai's test in **Table 4a**. See the appendix for a detailed overview.

the national and the European levels and 2) differences across dictionaries—support the hypothesis that central bankers face difficulties not only in aligning national interests with European ones but also in consolidating the interests of their different audiences.

3.2.1 Speaking at Home and Abroad

Starting with the English language communications for super insiders (i.e., when GC members are speaking to financial market participants "abroad"), GC members adopt a slightly more accommodating tone when the realized inflation exceeds the expected inflation in the Eurozone. For the German- and French-language communications (i.e., when GC members are speaking to financial market participants at home), the tone is also more accommodating with regards to the inflation gaps observed in their respective home countries. The French central bankers display the highest magnitude of accommodating tone in their communications.[221] The coefficients for the output gaps follow a similar pattern. The only exception is the output gap of the Eurozone, where a more restrictive tone is adopted when the output gap exceeds expectations. This coefficient is also the only one that has a higher magnitude; for all the other output and inflation gap coefficients, the magnitude is higher when the central banker speaks at home. Nevertheless, the magnitudes of the coefficients for the output gap are lower in comparison to the inflation gaps, which may be indicative of the priority of maintaining price stability and inflation expectations over responding to the general economic situation. With regards to the financial market variable, communications addressed to financial market participants abroad and with respect to the development

[221] This may be due to the smaller sample size of the French data.

Table 4a: Explaining communications in France and Germany

	Super insiders	Insiders	Outsiders	Trust
Constant	-0.117	-0.623***	-1.329***	0.133
	(0.143)	(0.154)	(0.283)	(0.293)
$\pi_{i,t}^{EA} - \pi_{i,t+12}^{EA}$	0.020	0.242**	-0.290	-0.335
	(0.106)	(0.114)	(0.209)	(0.217)
$Y_{i,t}^{EA} - Y_{i,t+12}^{EA}$	-0.029***	0.013	0.063***	-0.008
	(0.008)	(0.009)	(0.016)	(0.016)
$P_{i,t}^{EA}$	0.004***	0.005***	0.008***	-0.0003
	(0.001)	(0.001)	(0.002)	(0.002)
$EB_{i,t}^{EA}$	0.0004	0.005**	0.028***	-0.003
	(0.002)	(0.002)	(0.004)	(0.004)
$tone_t^{NBM}$	-0.142***	0.006	-0.212***	-0.309***
	(0.035)	(0.038)	(0.069)	(0.072)
$D^{FR}(\pi_{i,t}^{FR} - \pi_{i,t+12}^{FR})$	0.653	1.153*	3.832***	-5.959***
	(0.596)	(0.644)	(1.181)	(1.224)
$D^{FR}(Y_{i,t}^{FR} - Y_{i,t+12}^{FR})$	0.009	-0.244***	-0.070	0.338***
	(0.032)	(0.035)	(0.064)	(0.066)
$D^{FR}(P_{i,t}^{FR})$	-0.010***	-0.006**	0.004	0.004
	(0.002)	(0.002)	(0.005)	(0.005)
$D^{FR}(EB_{i,t}^{FR})$	-0.060***	0.053***	0.061**	-0.074***
	(0.013)	(0.014)	(0.026)	(0.027)
$D^{FR}(tone_i^{FR})$	-0.157*	-0.059	0.058	0.740***
	(0.080)	(0.087)	(0.159)	(0.165)
$D^{DEU}(\pi_{i,t}^{DEU} - \pi_{i,t+12}^{DEU})$	0.152	0.097	-0.100	0.108
	(0.130)	(0.141)	(0.259)	(0.268)
$D^{DEU}(Y_{i,t}^{DEU} - Y_{i,t+12}^{DEU})$	0.012	-0.023**	-0.054***	-0.015
	(0.010)	(0.011)	(0.019)	(0.020)
$D^{DEU}(P_{i,t}^{DEU})$	0.001	-0.002	-0.010***	0.005*
	(0.001)	(0.002)	(0.003)	(0.003)
$D^{DEU}(EB_{i,t}^{DEU})$	-0.001	-0.001	-0.020***	0.010*
	(0.003)	(0.003)	(0.005)	(0.006)
$D^{DEU}(tone_t^{NBM})$	0.134**	0.017	0.372***	0.255**
	(0.059)	(0.063)	(0.116)	(0.120)
Observations	871	871	871	871
R^2	0.207	0.177	0.139	0.130
Adjusted R^2	0.192	0.160	0.122	0.112
Residual Std. Error (df = 853)	0.310	0.336	0.615	0.638

of the European share price index also show a positive correlation; i.e., with rising share prices central bankers adopt a more accommodating tone. German central bankers follow this pattern with regard to the German share price index, whereas French central bankers adopt a more restrictive tone, as observed in the quarterly development of French share prices. Lastly, regarding the "soft constraint," communications abroad are positively correlated to trust levels, whereas communications at home are negatively correlated to the

country-specific trust survey. This means that as general trust levels decline, central bankers adopt a more accommodating tone.Interpreting these results is by no means simple. It would certainly be tempting to understand these findings following the standard logic of the Taylor rule and attribute a hawkish stance to the overall positive correlations (i.e., positive gaps, positive tone, higher interest rates; negative gaps, negative tone, lower interest rates). However, for the reasons outlined above, this conclusion cannot be made with certainty. All that can be said is that for each positive (negative) unit change in inflation and output gaps, communications containing word combinations primarily relevant for financial market actors are accommodating (restrictive).[222] It is also interesting to note that the financial market indicator, which may be considered to be of relative importance to the target audience under scrutiny, is not "leaning against the wind" since the tone is positively correlated to the changes in the market capitalization of the basket of shares, with France being the exception. However, this does not necessarily imply that the monetary policy is procyclical regarding macroeconomic and financial market indicators and that "When it Rains, it Pours" (Kaminksy, Reinhart & Végh 2004), at least not everywhere. With below-target inflation across the sample period (1.72 for the Eurozone, 1.37 for France and 1.42 for Germany) and modest economic growth (1.43 for the Eurozone, 1.46 for France and 1.4 for Germany), the accommodative tone would appear consistent even in the presence of rising inflation and accelerating growth. In theory, the communications may thus match the intermediate target levels provided by forecast targeting so long as the target on the horizon has not been hit (cf. Rogoff 1985, Svensson 1997, Walsh 1997). In practice, this

[222] A note on reading this table: the positive/negative coefficients do not mean that the overall tone for the corresponding independent variable is positive/negative. Thus, a positive/negative coefficient in this table should only be read in the following way: as one variable increases/decreases in its values, the other variable also increases/decreases in its values. For instance, the first coefficient 0.020 for the inflation gap of the super insiders reports that as the realized inflation exceeds the forecast, the tone in the super insiders dictionary increases by 0.020. It is important to keep this rule of linear relationships in mind and useful to understand both the descriptive tone scores and the independent variables for the interpretation of these results.

reflects the ECB's monetary stance of maintaining accommodation until a sustained upward shift in inflation is achieved.

Nonetheless, the impression that central bankers are neutral and vigilant observers (Bibow 2012: 6) can certainly not be read from these results. If the hypothesis of an overall accommodative tone is accepted in light of below-target levels of inflation and weak growth, the positive coefficients are indicative of the view that the transmission of monetary policy to aggregate demand (via expectations) can be achieved through bank lending. Furthermore, when the direct policy of lowering the interest rate does not have the desired effect, i.e., when the inflation target stays "on the horizon," the accommodative tone appears to reflect the ECB's attempt to exert influence on the financial sector through signaling. However, in an environment where mark-ups on the official rate remain high and banks have been slow to increase lending, relying on the investment activity of financial intermediates to achieve monetary policy targets may not yield the intended results. Instead of driving up prices (and wages) by creating new funds for consumption, investment, and as a means of finance, financial intermediaries may simply end up redistributing existing funds. This is especially true for Germany, where household and corporate demand for loans has sunk below the European level after the financial crisis.[223] Whereas weak inflation prospects may be a problem for the economy at large (in particular the labor market), banks do not face this problem because they can mitigate compressing effects on borrowing activity through portfolio rebalancing, in particular valuation gains on equity prices. This is, of course, precisely the "grand bargain" (Hartwell 2019: 70) between financial institutions and society. As long as the general price level does not hollow out wages, both savers

[223] France and Germany have reversed positions from before to after the financial crisis. For France, domestic credit to private sector as percentage of GDP was around 10 percentage point below European average until 2008 and has exceeded the European average since 2014. Germany, by contrast, had a higher domestic credit to private sector ratio in the early 2000s and one of the lowest after 2008.

and financiers are happy, even though the former appear to be in decline (see, e.g., Bofinger & Ries 2017 for evidence).

Regarding communications in English ("abroad"), and French or German ("at home"), the difference in tone is only in magnitude. Central bankers thus do not appear to have a home bias, with the exception of a positive difference in the coefficient of the output gap, the latter being talked up "at home" and "talked down" on the European level. Differences between France and Germany, aside from the more restrictive tone of French central bankers regarding rising share prices, can be observed in the tone between the members of the General Council and the national board members of the Bundesbank and the Banque de France. While the tone of German board members is positively correlated to the tone of German members of the general council when they speak at home, the German board members appear to adopt a more negative (restrictive) tone when they speak abroad. If there is a home bias, then it is between the board members of the Bundesbank and the German members of the general council but not between the council members themselves. This may be indicative of the Bundesbank's reputation for favoring a more restrictive monetary policy, a stance that Bundesbank board members have not always been able to maintain at the European level, to put it mildly.[224] In Germany, fears about the accommodative policies of the ECB were notoriously voiced in the aftermath of the financial crises by the complaints of the Constitutional Court against the ECB's Outright Monetary Transactions. The tone of the French central bankers is more consistent. The board members of the Banque de France follow the negative coefficients of French members of the General Council. Lastly, the R^2 for the super insiders indicates a modest goodness of fit, with an explanatory

[224] In this regard, it is telling that two out of the three German Executive Board members who have resigned from their positions at the ECB (Sabine Lautenschläger and Jürgen Stark) had been recruited from among the Bundesbank's board members (the other one being Jörg Asmussen).

power that matches similar studies of central bank communications.[225] The originally hypothesized model thus fits well enough to be used in further modeling, even though there is clearly room for improvement of model fit.

Looking at the results for communications directed at insiders (i.e., when GC members speak to governments and large firms "abroad"), GC members adopt an expansionary tone when the realized inflation exceeds the expected inflation in the Eurozone, and a moderately expansionary tone with positive output gaps. This positive correlation can be observed for the financial markets and for the soft indicator as well. However, the positive correlation holds for the communications at home only for the inflation gap, with both French and German output gaps, financial market and soft indicators displaying a negative correlation; e.g., when the realized national output exceeds the forecast, central bankers adopt a more contractionary tone. This result appears to be more in line with standard countercyclical monetary policy, i.e., when the inflation and output gaps are higher than the expected forecasts, the tone is more contractionary and vice versa. This result also appears to display a more significant home bias, since the coefficients for the communications at home are negatively correlated (except for inflation gaps) while the ones on the European level are positively correlated.

If the above explanation of below-target output and inflation gaps is accepted, the contractionary tone at home would be at odds with the findings for the super insiders. A possible explanation for this difference may be provided by looking at the target audience and the ECB's trilemma of wanting to achieve the inflation at target, endorsing structural reforms and imposing fiscal discipline all at the same time. While the expansionary tone for the inflation target is thus consistent with the ECB's accommodative stance towards inflation for super insiders, it breaks down for the national output gaps and the financial market

[225] See, e.g., Bennani & Neuenkrich (2017).

indicator when central banks communicate with insiders. The magnitudes of these contractionary tones are particularly noteworthy in the French coefficients, where political pressures to converge toward the German path of "virtue" (Bibow 2013: 19) and increase competitiveness through structural reform may be particularly high. But fiscal discipline and structural reform pave the way for deflation, even under an expansionary monetary policy, especially when nominal wages do not increase (which is the case for Germany, but not for France).[226] Note, however, that the magnitudes of the tone scores for the French inflation gaps are significantly higher, which may be an indication of French central bankers' willingness to condone and even encourage inflation expectations. In France, where growth is mainly driven by domestic demand, "disinflationary competition" after the crisis did not increase price levels as the commitment to the stability mandate further decreased domestic demand. Whether the contractionary tone in France for the other independent variables is a result of post-crisis adjustment pressures will have to be analyzed separately, however. If so, "vigilance" would appear to be a more adequate description of the tone scores for the insiders than for their intended audience (super insiders). It does unambiguously fit the German tone, however. For the German central bankers speaking at home, the contractionary tone may thus be indicative of "the German view" (Brunnermeier, James & Landau 2016: 98ff). Regardless of the output gap, Germany's "stability culture" encourages a contractionary monetary and fiscal policy, even during the so-called "Exportwunder", the motor of German economic growth for the post-crisis decade, itself driven by the expansionary policies of China and the US, as well as exchange rate and labor unit cost imbalances (the latter particularly damaging for Germany's "friend" across the Rhine). In sum, central bankers' communications in Germany and France follow a similar contractionary trend,

[226] Indeed, nominal unit labor costs in Germany stayed significantly below the 2-percent level (and the European average) for the sample period, whereas France stuck to the 2-percent norm.

which may be indicative of the countries' commitment to the Stability and Growth Pact (SGP). The deflationary impact of these policies may explain the positive correlation with the inflation gap, a paradox economic theory has termed "expansionary fiscal contraction" (Alesina & Ardagna: 1998), commonly known as austerity.

The tone for the "outsiders" (i.e., central bankers speaking to the wider public) when central bankers speak "at home" follows that of the "insiders". The magnitudes are substantially higher, however, which could be an indication for less moderation when talking to the wider public (the higher magnitudes in the trust dictionary would support this hypothesis). Adopting the below-target inflation assumption made above, the "exclusive" tone for the European and German coefficients suggests that central bankers speak more about social unrest, fears and tensions as the realized inflation exceeds the forecast, except in Germany. While it would be tempting to assume that this reflects the "German view" of inflationary fears and its corresponding dominance on the European level (the ECB being just a bigger version of the Bundesbank), it does not make sense in an inflationary environment that is overall below-target, at least not for France and the tone "abroad". Again, it is thus telling to look at the other indicators, in particular in France and on the European level, where the tone is negatively correlated; e.g., if the tone for the inflation gap is "exclusive", it is "inclusive" for the output gaps, the financial market variable and the soft constraint and vice versa. This may not be contradictory, however, especially because the tone follows the "outsider" dictionary in this respect. A more fitting explanation could thus be provided by the above-mentioned trilemma, namely that achieving inflation at target and endorsing anti-growth structural reforms and fiscal discipline at the same time is not possible. With regards to the audience at hand, it may thus be no surprise that in a deflationary environment, central bankers are confronted with the challenge of maintaining social cohesion with a more "inclusive" tone at the same time that they will have to take note of the unpopular

and potentially destructive austerity policies with an "exclusive" tone. In France, where the magnitude for the inflation gap is more than twice as high for outsiders as it was for the insiders, this contradiction is particularly apparent.[227]

So far, the results have shown that navigating between these different audiences does not prove to be a simple task, neither between the European and national levels, nor across the different constituencies that make up nations. The rational for including the trust dictionary is provided by the reality of this observation. If we were to follow the definition of trust provided by the literature on central bank communications, i.e., that the "honesty of central bankers…forms the basis of trust" (Issing 2019: 62), then it appears that central bankers are in trouble. For, the results presented here indicate that central bankers speak with a forked tongue. A concept of trust that looks at the trust problem (Chapter 1) not from a matching-deeds-to-words perspective but from an institutional one may be better equipped to understand the results of the trust dictionary. From this perspective, the very fact that central bankers are unable to communicate uniformly and to one audience makes trust-talk necessary. In other words, "trust trolls" (Keen 2015) and "confidence fairies" (Krugman 2010) may remedy the "discursive double game" (Crespy & Schmidt, 2014) observed over the previous dictionaries. With this in mind, it interesting to note that the coefficients for the trust tone on the European level are negatively correlated for all variables. This means that even when the realized inflation and output exceeds the forecast, share prices rise and the trust survey is positive, the "trust talk" records a lack of confidence and breeches of trust. With the overall below-target paradigm adopted above, this may be indicative of the conflicting views attached to the ECB's policies. It would also be consistent with "confidence boosting" and "trust rebuilding" when the realized indicators underperform the forecast. This explanation is especially telling for France, where the

[227] This could also be explained by the smaller French dataset, however.

magnitude of the trust coefficient for the inflation gap is even higher than that recorded for the outsiders. For the German data, on the other hand, the trust coefficient for the inflation gap is positively correlated, again confirming the conclusion that Germany's aversion to inflation is what governs trust, whereas a diversion from its "stability culture" is registered as a "breach of trust."[228] In other words, while the type of fiscal and monetary policy described above may be popular in Germany, it records a lot more "trust busting" rhetoric in France.

In conclusion, the empirical findings support the hypothesis that French and German central bankers have difficulties coordinating their tone at home and abroad and when talking to different audiences. In some respects, the differences in tone are representative of the varieties in German and French economic traditions. This is especially noticeable in the different tones regarding the inflation gaps, with French central bankers adopting a more accommodative/expansionary/inclusive tone than the German central bankers across all audiences. This finding could be indicative of the Franco-German "battleground" (Bibow 2013) over European monetary policy, with Germany being more at ease with underperforming inflationary and output targets than its neighbor. There are also remarkable differences between the audiences. In spite of Germany's reputation as a monetary disciplinarian, the corresponding tone does not appear to extend across all audiences. Thus, German central bankers adopt a more accommodative tone towards market participants (super insiders) than towards insiders and outsiders, which could be indicative for a bias towards market forces, a pattern that is also observable on the European level.

[228] It is worth quoting Wolfgang Schäuble (2010) in this respect: "[We] take the longer view and are, therefore, more preoccupied with the implications of excessive deficits and the dangers of high inflation. So are German consumers.…[T]hese fears are among the most potent factors of consumption and saving rates in our country. Seeking to engineer more domestic demand by raising government borrowing even further would, here at least, be counterproductive. On the contrary, restoring confidence in our ability to cut the deficit is a prerequisite for balanced and sustainable growth."

3.2.2 Speeches and Interviews Before and After the Crisis of 2008

To study whether there has been a change in tone before and after the financial crisis, I replace the dummy regressor D in equation (2.4) with a dummy $D^{B,A}$ where *B* and *A* separate the communications for before (*B*) and for after (*A*) the crisis.[229] In order not to overfit the model, I do not regress for home and abroad differences in this model. The model thus takes the tone scores of all German and French speeches and interviews combined (with the exception of the national board members) and the European data for the independent variables. Nevertheless, the coefficients of the national board members may provide some insight into the differences in tone observed "at home", albeit without distinguishing between France and Germany.

Table 5a: Explaining communications in before and after the Crisis of 2008

	Super insiders	Insiders	Outsiders	Trust
Constant	-0.072	-1.671***	-2.271***	-4.046***
$D^B(\pi^B_{i,t}-\pi^B_{i,t+12})$	(0.264)	(0.284)	(0.497)	(0.513)
	-0.312*	-0.551***	-0.015	-0.557*
$D^B\,(Y^B_{i,t}-Y^B_{i,t+12})$	(0.169)	(0.182)	(0.319)	(0.329)
	0.001	0.072***	0.027	-0.030
$D^B\,(P^B_{i,t})$	(0.020)	(0.021)	(0.037)	(0.038)
	-0.003	-0.009***	-0.031***	-0.034***
$D^B\,(EB^B_{i,t})$	(0.003)	(0.003)	(0.005)	(0.005)
	0.010**	-0.005	0.028***	-0.021***
$D^B\,(tone^B_i)$	(0.004)	(0.004)	(0.008)	(0.008)
	0.113	0.045	0.539***	-0.255
$D^A(\pi^A_{i,t}-\pi^A_{i,t+12})$	(0.088)	(0.095)	(0.166)	(0.172)
	0.402***	0.802***	-0.083	0.555*
$D^A\,(Y^A_{i,t}-Y^A_{i,t+12})$	(0.148)	(0.159)	(0.279)	(0.288)
	-0.023	-0.079***	0.005	0.012
$D^A\,(P^A_{i,t})$	(0.019)	(0.021)	(0.036)	(0.037)
	0.008***	0.012***	0.033***	0.036***
$D^A\,(EB^A_{i,t})$	(0.002)	(0.003)	(0.005)	(0.005)
	-0.011***	0.009**	-0.014*	0.010
$D^A\,(tone^A_i)$	(0.004)	(0.004)	(0.007)	(0.007)
	-0.192**	0.012	-0.526***	0.052
	(0.082)	(0.088)	(0.154)	(0.159)
Observations	0.123	0.099	0.140	0.138
R^2	0.112	0.087	0.129	0.127
Adjusted R^2	0.325	0.350	0.613	0.633
Residual Std. Error (df = 853)	10.941***	8.558***	12.745***	12.475***
F Statistic (df = 18; 853)	43.940***	22.472***	45.645***	7.223***
Note:				*p < 0.1; **p < 0.05; ***p < 0.01

[229] The exact start date for the period "after" is September 15, 2008, the bankruptcy of Lehmann Brothers.

Table 5a reports the findings for this model and **Table 5b** gives an overview of Pillai's test statistic for the hypothesis testing. Since all coefficients are significant (albeit less so than for model 2.4), I do not include the asterisks of Pillai's trace to indicate this significancy in **Table 5a.**

What is immediately striking in the results is the observation that there is a change in tone for speeches and interviews given before and after the crisis for all coefficients of the super insiders, insiders and trust tones. Only the tone for the outsiders does not record a difference for the two periods. It is also remarkable to note that the coefficients across the dictionaries are not different, with the outsiders dictionary again being the exception (however, only for the period after the crisis). Starting with the dictionary for the super insiders before the crisis, central bankers were adopting a more restrictive tone when the realized inflation exceeded the forecast, and a more accommodating tone when the inflation underperformed the forecast. This negative correlation matches the result for the insiders, where the tone is significantly expansionary with below forecast inflation and contractive when the inflation is above the forecast. These results are clearly consistent with a Taylor-rule type policy, especially because the realized inflation was slightly above target for this period (2,2 on average). The results are also consistent with the tone scores for the trust dictionary, which includes more instances of "confidence breeching" when the inflation gaps outperform the forecast and more "confidence boosting" with disinflation. The tone scores for the output gap are positively correlated however, but significantly lower for both super insiders and outsiders. Again, the positive correlation, accommodating/expansionary tone in light of "overperforming" output gaps (when the realized growth exceeds the forecast), could be the result of overall weaker growth. Note, however, that the magnitudes for the output gaps are significantly lower, which is consistent with the results for the home/abroad model and the ECB's priority of inflation targeting. Also of interest is the negative

correlation for the tones of the financial markets indicator (across all dictionaries), which could be indicative of the fact that a more "vigilant" tone towards market participants was adopted before the crisis.[230] However, the magnitudes for these coefficients are also quite low. The coefficients for the outsiders dictionary follow the negative correlations of the super insiders and insiders dictionaries, but are significantly lower. Lastly, the tone scores of the national board members are positively correlated with the members of the GC, which may suggest that the national central banks were adopting a tone in harmony with the European stance.

After the financial crisis, the correlations for the coefficients change for all dictionaries except that for outsiders. Central bankers thus adopt a more accommodative/expansionary/trust building tone even when the inflation gap exceeds the forecast. This should come as no surprise, however, since the inflation was substantially below the 2-percent target for this period (1.3 on average), almost one percentage point lower than for the period before the crisis. In other words, the Taylor-rule collapses after this period, an observation that confirms the hypothesis that central bankers shifted their policy framework from Taylor-rule type inflation targeting to forward guidance and toward a strategy that uses the balance sheet as a monetary policy tool. In this monetary policy framework, central bankers appear to talk up to financial markets and monetary insiders even when the inflation outperforms the forecast. The trust tones follow this trend with a more "trust boosting" tone. This result appears to suggest that the ECB moved away from a fiscal discipline and risk control perspective towards a commitment to its bond purchasing programs, i.e. from a regime of the expansionary fiscal contraction towards stimulus. However, there seems to be a more countercyclical attitude towards growth, which was significantly lower for the period after 2008

[230] It is also an indication of the limited political power of central bank communication. Clearly, talking down expanding market capitalization did not tame the "animal spirits."

(1.7 and 0.6 respectively). Only the tone for the outsiders dictionary remains unchanged for the two macroeconomic variables. Thus, while central bankers did not change their tone towards the wider public before and after the crisis, the coefficients of the outsiders contradicts with the coefficients for the other dictionaries, an observation that is consistent with the literature on central bank communication that differentiates between audiences (Schmidt 2014, Braun 2014). Lastly, the tone scores for the national board members also change, indicating potential home biases and disagreements in national and European monetary policy priorities. Of particular interest in this respect is are the very high negatively correlated coefficients for the tone of the national central bankers after the crisis, perhaps indicating Germany's commitment to expansionary fiscal contraction towards the wider public.

3.3 Conclusion

This chapter has built on the growing field of central bank communication by analyzing the tone of French and German central bankers' speeches and interviews in relation to different audiences. For this purpose, I have made available a new database that includes all speeches and interviews from the Banque de France, the Bundesbank and the ECB from 1999 to 2019. The theoretical justification for my analysis is based on the insights of institutional economics and economic sociology, where central bank independence is questioned on the grounds that monetary authorities are always embedded in a broader system of social and political institutions. Central bankers thus do not communicate in a vacuum, in spite of well-intentioned aspirations, but face different economic interest groups that are competing over monetary policy decisions. In such a framework of analysis, the central bank faces a communicative challenge in governing the different economic constituents of

its jurisdiction. For the ECB, this problem is exasperated by the fact that on top of the interests of different economic groups may tower diverging interests of members states. In order to empirically test the political and financial implications of this communicative challenge, I have expanded the standard use of a single dictionary for the use of text-analytical studies to four different dictionaries—one for each economic interest group and an additional trust dictionary, which I assume to count for all audiences. The three interest groups are separated according to their position in the transmission mechanism of monetary policy, and are defined as super insiders (financial markets), insiders (governments and firms) and outsiders (households).

The empirical findings of this study show that French and German central bankers face a communicative challenge in coordinating communications at home and abroad and when talking to different audiences. In some respects, the differences in tone are representative of the varieties in German and French economic traditions, with the "German view" favoring responsibility and accountability and the "French view" favoring flexibility, in particular in times of crises. The divergence between these views can be seen from the communications of the French and German central bankers regarding the inflation gaps, the most important indicator for conducting monetary policy. French central bankers thus appear to be less inflation averse than their German neighbors, adopting a more accommodative/expansionary/inclusive tone than the German central bankers across all audiences. This finding could be indicative of the Franco-German "battleground" over European monetary policy, with Germany being more at ease with underperforming inflationary and output targets than its neighbor, where monetary policy is considered less a question of rule than a political process comprising more general goals, including economic growth.[231] There are also remarkable divergences in the messages carried by central bank speeches toward their

[231] See also the chapter on French monetary institutionalism above (2.4.1.)

different audiences. First, this can be seen from the descriptive analysis, which reports an overall positive tone (accommodating) for the super insiders dictionary and the overall negative tone (contractionary) for the insiders. Second, the regression analysis also reveals that central bankers communicate differently with regards to financial and macroeconomic indicators, where a bias towards market forces can be observed. If it is true that "not all words are created equal," this analysis has shown that not all audiences enjoy the same seat at the symphony of central bank communication.

4 Conclusion

This dissertation has examined the role of monetary trust in monetary theory and policy and its implications for an empirical study on central bank communications. The first chapter critically examined the role monetary trust has played in economic theory in order to distinguish between two schools of thought. In the first school, monetary trust is defined as a horizontal relation between individuals, an approach to monetary trust that was developed by the neoclassical economic tradition and that continues to influence monetary theory and policy to this day. In the second approach, monetary trust is viewed from a vertical perspective, focusing on the institutional context and social embeddedness of trust relationships. This theory has its roots in sociology and political economy, as well as in state and credit theories of money.

The first chapter has shown the problems underlying the first approach, which understands trust in money as an interpersonal relationship limited to *personal trust* between economic agents. This chapter demonstrated how a theory of monetary trust solely based on individuals is unable to explain the complexities of monetary trust relations. For example, the horizontal theory fails to provide a meaningful explanation to the observation that people continue to use money in the presence of widespread mistrust. In this tradition, trust in money is unequivocally seen as a positive value, a lubricant to facilitate economic exchange. More trust resolves coordination failures, resulting in more efficient, profitable and predictable collective living. As this theory gained popularity, it was criticized early on for being unable to explain the reasons individuals may have to trust in money, i.e., under which conditions trust in money may or may not be justified. Thus, to show that people trust money because it is being used, and to explain the use of money in turn through trust, is at best a tautology. At worst, it distracts attention from the observation that trust in money

implies trust in those institutions responsible for maintaining the value of money, in the functioning of the monetary policy tools that exert control over inflation and in financial markets that create the bulk of the money supply. In short, it deliberately ignores the centrality of institutions as fundamental for understanding trust in money.

In institutional economics and economic sociology, this institutional dimension is at the center of economic analysis. Economists of the French monetary institutionalism school, in particular, have put trust and confidence at the center of their theories, where it is understood to have three distinct conceptual roles, defined as methodical, hierarchical and ethical confidence. A comparison of the insights of these theories in relation to contemporary Anglo-Saxon credit and state theories of money, as well as to the sociological and anthropological traditions the theories as their point of departure, has shown that a hierarchical (vertical) understanding of monetary trust provides a more adequate foundation to the subject. While some theoretical ambiguities around the concept of trust remain, a common understanding of most scholars working in this field is developed around the assumption that creditor-debtor relationships, which underpin monetary relations, are not functional but imply competing interests among social groups within monetary hierarchies. Because of these competing interests, trust in money is a question of making these hierarchies socially acceptable. This conclusion starkly contradicts a horizontal vision of monetary trust. It demonstrates that trust is not necessarily a positive value but a socially constructed norm that can be misplaced, excessive or abusive. While in the past mostly associated with religious faith, in our times trust may be seen as a soft power buttressed by technocratic credibility, merit, moral strength and other forms of soft constraints, which help align moral with economic hierarchies.

The conclusion that monetary trust is fundamentally hierarchical, drawn from the analysis in the first chapter, motivated the empirical study in the second chapter. This chapter

thus analyzed whether German and French central bankers are able to efficiently manage the communicative challenge of pandering to the different demands of their three distinct target audiences—the markets, the state, and the public at large. The empirical methodology for this analysis built on the growing literature analyzing central bank communications to better understand the political and financial implications of monetary policy. I hope to have contributed to this field of research by 1) creating a new database of 21 years of speeches and interviews of the Banque de France, the Bundesbank and the ECB (1999-2019), 2) devising a new method for analyzing communications that takes into account different audiences and 3) providing empirical evidence for the observation that monetary policy is not neutral, i.e., that communications are biased in favor of some economic groups over others. The results of this analysis provide interesting findings, in particular with regard to the different monetary policy cultures between France and Germany, as well as a preliminary confirmation of the hypothesis that central bank communications distinguish between audience groups according to the hypothesized hierarchical taxonomy.

Future research in this field could work on the development of a more culturally-specific text-analytical framework, which seems to be the most problematic aspect of similar studies in this field. Thus, while the results of this study clearly show country-specific differences, these have not been taken into consideration in the methodology for measuring the tone of the different communications. Going back to the question of trust that has guided this study, a trustworthy monetary policy and hence communications paradigm, may ultimately mean something different for a French and a German audience, regardless of their standing in the above-mentioned monetary hierarchy. The question of to what extent a "standard" dictionary should take into consideration factors of historical change—the coded language of central banking being particularly prone to adapt to the ebb and flow of the economic tides—as well as of cultural particularities—German stability vs. French

flexibility—would thus be an interesting path to follow. For scholars of European central bank communications, this task may be particularly challenging because enlarging the findings of this study means to taking into considerations interviews and speeches conducted in the native language of each member country. This does not, however, make the task less interesting.

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Appendices

A. Appendices Chapter 1

a. Search-theoretic model (Kiyotaki & Wright 1993)

One of the arguments that has been used to measure trust in money is Kiyotaki and Wright's search-theoretic model. Search theories have been used to understand the origin of the value and acceptability of money. These theories argue that the value of money has a social and institutional function which is based on the acceptance of money as a medium of exchange. Search models attempt to show that the transaction technique should be determined by an equilibrium condition. As the market is decentralized, significant search costs are imposed on agents. These search costs are the difference between the probability of a double coincidence of wants and transaction and production costs. A mutual acceptance of a medium of exchange, such as money, can reduce the search costs by making the double coincidence of wants unnecessary.

Kiyotaki and Wright's model measures, under certain assumptions and frictions, an agent's probability of accepting money in exchange for a consumption good and the other agent's probability of holding a good over accepting money. This, in turn, forms an equilibrium. Money becomes universally accepted when there is a pure monetary equilibrium, i.e. when the expected utility of becoming a money trader is greater than remaining a goods trader. In this way, the model is able to measure people's confidence in money. With this model, Kiyotaki and Wright attempt to demonstrate that, on a microeconomic level, it is rational to accept money given the institution of money. Furthermore, they prove that given the institution of money, the monetary equilibrium Pareto dominates the non-monetary equilibrium.

Assumptions of a typical search model of money

The Economy

- A very large number of agents all of whom live indefinitely and maximize discounted utility U.
- Agents discount expected future consumption at a constant rate $0 < \beta < 1$ or $1/(1 + r)$ where r is the real rate of interest.
- There is a large number of goods that are indivisible and storable at no cost.
- Furthermore, the agents do not know the economy's full history of transactions (see Kocherlakota 1998a, b) nor can they commit to future actions (see Wallace 1997).

Consumption

- All goods are consumed by a fraction x of all agents.
- Each agent consumes the fraction x of all goods.
- No agent consumes the good he produces.
- Utility derived from the consumption of one unit of a consumption good is U.

Production

- All goods are produced by an equal number of agents, the fraction x of all agents.
- Before an agent can produce a unit of a good he has to consume. Production takes place immediately after consumption.
- The costs per unit produced are c (in terms of disutility).
- The quantity produced is one unit.

Endowment

- The fraction M of all agents is endowed with one unit of an intrinsically worthless object called money.
- Money is indivisible.
- The fraction $1 - M$ is endowed with one unit of a good.

Trading technology

- In each period two agents are randomly matched.
- They trade iff it is beneficial for both of them.
- One makes a take-it-or-leave-it offer. Trade leads to an equal distribution of the gains of trade.

- Accepting one unit of a good other than money in exchange involves a transaction cost ε (in terms of disutility)

Solution

No agent accepts in equilibrium a consumption good the agent does not consume him- or herself. Therefore, two agents holding goods trade if and only if both of them receive their desired consumption goods. The equilibrium strategy in meetings with agents who hold goods, therefore, is: accept a good in exchange for another good if and only if it is your desired consumption good. The value of holding a good at the end of the period is defined by:

$$V_c = \beta\{(1 - M)x^2U + Mx\pi V_m + (1 - Mx\pi)V_c\} \quad (1.1.)$$

Where $\beta = \frac{1}{1+r}$ is the arrival rate (which is constant). An agent derives utility from $U = u - c - \varepsilon$ with probability $(1 - M)x^2$, ε is the transaction cost in terms of disutility, where $0 < \varepsilon < U$, and π the probability of accepting money. A fraction M of the agents are each endowed with money while $1 - M$ are each endowed with one real commodity, where $0 < M < 1$. x is equal to the proportion of commodities that can be consumed by any given agent, and also the proportion of agents that can consume any given commodity. Consuming one of the consumption goods yields utility $U > 0$, while consuming other commodities (or money) yields zero utility. Π is the expectations concerning the acceptability of money of others (trust parameter). An agent accepts money in exchange for goods if and only if $V_m \geq V_c$, i.e. when the relative value of holding money (V_m) at the end of a period is higher than that of holding a good (V_c).

The value of holding money at the end of the period is given by:

$$V_m = \beta\{(1 - M)x\Pi(V_c + U) + [1 - (1 - M)x\Pi]V_m\} \quad (1.2)$$

The flow return to a money trader equals the rate at which he or she meets commodity traders, $\beta\ (1-M)$, times the probability that both want to trade, $x\Pi$, times the gain from trading, consuming, and switching to production. For the monetary equilibrium, V_m should always be higher than V_c.

$$V_c = \frac{(1-M)x^2U}{(r+Mx\pi)} + \frac{Mx\pi}{(r+Mx\pi)}V_m \tag{1.3}$$

$$V_c = -U + \left[1 + \frac{r}{(1-M)x\Pi}\right]V_m \tag{1.4}$$

$$[r + Mx\pi + (1-M)x\Pi](V_c - V_m) = (1-M)xU(x-\Pi) \tag{1.5}$$

Individuals employ different strategies in order to decide whether to accept a good or money in exchange. They do this in order to maximize their discounted utility by taking into account the strategies of others. In the words of the original paper, "We look for Nash equilibria. We restrict attention for the most part to symmetric equilibria, where all agents and all real commodities are treated the same, and to steady-state equilibria, where strategies and all aggregate variables are constant over time" (Kiyotaki & Wright 1993: 66).

In order to determine the optimal strategy with respect to the acceptance of money π, Kiyotaki and Wright express V_c in terms of V_m in equations (1.1) and (1.2) and substitute $1/(1\ +\ r)$ for β. At the end, everything depends on the trust parameter Π. If Π is higher than x, then the medium of exchange is money, because money will be more likely to be accepted in exchange than goods.

Furthermore, the only possibility that the agent accepts money in exchange for goods is that $V_m \geq V_c$. In fact, if $\Pi < x$ then $V_m \geq V_c$, which implies that the best response is $\pi = 0$. Intuitively, if money is being accepted with a lower probability than a barter offer, then it is harder to trade using money than barter, and so the best response is never to exchange a real commodity for money. On the other hand, if $\Pi > x$, then $V_m > V_c$, which implies $\pi = 1$. If money is being accepted with a greater probability than a barter offer, then it is easier to

trade using money, and so the best response is to exchange a real commodity for money whenever possible. Finally, if $\Pi = x$, then $V_m = V_c$, which implies that π can be anything in $[0, 1]$. If monetary exchange and barter are equally easy then traders are indifferent between having money and real commodities, and they could accept money with any probability. Based on these results there are exactly three equilibria: $\Pi = 0$ (non-monetary equilibrium), $\Pi = 0$ (pure monetary equilibrium), and $\Pi = x$ (mixed-monetary equilibrium). Kiyotaki and Wright thus demonstrate that it is rational to accept money given the institution of money. Furthermore, they prove that the given institution of money, the monetary equilibrium Pareto dominates the non-monetary equilibrium. Trust, however, has nothing to do with either equilibrium, since the trust parameter is an exogenous variable that has little explanatory power.

b. Game-Theoretic model (Shubik & Quint 2014)

Unlike Kiyotaki and Wright's search-theoretic model (1993), Shubik and Quint (2014) have taken a game-theoretical approach to money and trust. Where Kiyotaki and Wright understand monetary exchange as a mechanism that fosters trust, Shubik adopts the view that money acts as a substitute for a lack of trust in economic exchange. Shubik wanted to go even further and demonstrate how trust and its substitutes are fostered by the entire society rather than only by economic exchange. His research on this topic is thorough and dates over several decades, in which he used different models such as cooperative Nash equilibrium. This allowed him to play out different scenarios with different actors (such as a dummy central bank) and other variables (such as trading gold). Later he substituted co-operative equilibria for noncooperative ones. Shubik believed non-cooperative equilibria to provide a more "realistic" representation of society. He tried to prove that economic agents who choose their optimal strategies under complete isolation would still use money. The model discussed below comes from *Barley, Gold, Or Fiat: Toward a Pure Theory of Money*. It is introduced in Chapter 3, of which the fiat model, presented in Chapter 7, is an extension. It proves that, when economic agents are given intrinsically useless objects functioning as money, final allocations are more efficient than barter. It is difficult to grasp what trust has to do in this model even when the "salvage value of money" is introduced in the model as an exogenous stand-in for inflation. Trust, however, is neither an exogenous nor endogenous variable of the model.

Assumptions of a (perfect) noncooperative game with fiat money

The Economy

- Two types of traders, each trader is endowed with a certain type of good ($good_1$, $good_2$).
- A very large number of utility-maximizing agents (φ).
- Trade takes place in a single period.

- *periods are repeated (and changes are taken over into nth periods)
- *Optional players: money buyer, monopoly banker, altruist banker, central bank with different strategies

Consumption

- Utility is derived from the consumption is variable and dependent on the type of one good and quantity of both goods.
- Goods are consumed immediately (there is no hoarding of goods).
- The utility of money is fixed.
  - *Utility of money is multiplied by a constant Π (salvage value of fiat)

Endowment

- Money is intrinsically useless.
- Each trader gets a units of goods of one type or the other.
- Each trader gets m amount of money.
  - *Optional e.g. central bank gets no goods, and all the money.

Trading technology

- Agents are price-takers.
- Agents of type 1 offer $good_1$ for sale; and agents of type 2 offer $good_2$ for sale.
- Agents of type 1 offer b amount of money for goods of type 2.
- They trade iff it is beneficial for both of them.
- Agents cannot spend more or sell more goods than they have (there is no borrowing or lending).
  - *Optional e.g. agents can borrow from central bank with interest rate $1 + \rho$

Simple model with two traders trading fiat

In the simple model with two traders trading fiat, there are two traders, two types of goods and fiat money. The initial endowment is $(a, 0, m)$ and $(0, a, m)$ for the two players respectively, which means each player has one type of good and money $(good_1, good_2, fiat)$. The utility function is $\varphi(x, y) + \Pi z$, where z is the terminal amount of fiat, and $\Pi > 0$ is the end of game salvage value for fiat. Shubik calls salvage value the amount each player can redeem at the end of each period. There is a continuum of traders of each type. The strategies

of each trader are denoted (b, q) with b the amount offered for $good_2$ and q the amount of $good_1$ offered.

Solution

$$\begin{array}{ll} max\varphi\left(a-q, \frac{b}{\bar{p}}\right)+\Pi(m+pq-b) & (2) \\ s.t. \quad m-b \geq 0 & (\lambda) \\ b \geq 0, 0 \leq q \leq a & \end{array}$$

Restriction λ is the cash-flow constraint, $a-q$ is the amount left after selling q units of $good_1$, $\frac{b}{\bar{p}}$ the amount of money spent on $good_2$ divided by its price, i.e. the quantity of $good_2$, m the initial money supply, pq the amount earned from selling $good_1$ and b money spent on $good_2$. The market balance conditions are $p = \frac{\bar{b}}{q}$ and $\bar{p} = \frac{b}{\bar{q}}$. The market balance condition states that the price is the ratio of the amount spent on $good_1$ and the amount traded. The solution for the fiat model is calculated in the same way as in the basic model presented in Chapter 3 (Shubik & Quint 2014: 16), i.e. through Lagrangian multipliers. Notice that in fact, it is the same as the basic model (Chapter 3), taking $\Pi = 1$ and applying a Cobb-Douglas function $\varphi(x, y) = \sqrt[2]{x, y}$ to equation (1.6.).

$$\mathcal{L} = m\sqrt[2]{(a-q)\frac{b}{p}} + qp - b + \lambda(m-b) \qquad (2.1)$$

Applying partial derivatives to equation (2.1) for b, q and m, $\frac{\partial \mathcal{L}}{\partial b} \rightarrow \frac{1}{\sqrt{p}}\sqrt{\frac{a-q}{b}} = 1 + \lambda$ and $\frac{1}{\sqrt{p}}\sqrt{\frac{b}{a-q}} = p$ give $m - b = 0$ and $\lambda = 0$. If m is large $\lambda = \bar{\lambda} = 0$, then equation (2) gives $\Pi\frac{1}{\sqrt{\bar{p}}}\sqrt{\frac{a-q}{b}}$ from which $\sqrt{\frac{b}{a-q}} = \frac{1}{\Pi\sqrt{p}}$. $\Pi p = \frac{1}{\sqrt{p}}\frac{1}{\Pi\sqrt{p}}$ which is $p\bar{p} = 1$. From symmetry, $p = \bar{p} = \frac{1}{\Pi}$, we have $p = \frac{b}{q}$ and also $\frac{b}{a-q} = \left(\frac{1}{\Pi\sqrt{p}}\right)^2 = \frac{1}{\Pi}$. Hence $\frac{b}{q} = \frac{b}{a-q}$ which implies $q = \frac{a}{2}$ Also $b = \bar{b} = pq = \frac{a}{2\Pi}$.

The implication is that fiat is hoarded and carried forward and the allocations from trade are efficient. The above analysis is valid if the cash-flow constraint $m - b \geq 0$ holds, that is, $m - b \geq 0$, that is, $m \geq \frac{a}{2\Pi}$. By that Shubik means that there is enough money in the economy. If there is not enough money in the economy, i.e. m is small, then $b = m = \bar{b}$. Then (2) implies $\frac{1}{\sqrt{\bar{p}}}\sqrt{\frac{a-q}{b}} = \Pi + \lambda$, which is $\sqrt{\frac{b}{a-q}} = \frac{1}{\sqrt{\bar{p}}(\Pi+\lambda)}$. $\Pi p = \frac{1}{\sqrt{p}}\frac{1}{\sqrt{\bar{p}}(\Pi+\lambda)}$, which is $p\bar{p} = \frac{1}{\Pi(\Pi+\lambda)}$. Hence by symmetry we have $p = \bar{p} = \frac{1}{\sqrt{\Pi(\Pi+\lambda)}}$. From the application of partial derivatives above, we get $\frac{1}{\bar{p}}\frac{a-q}{b} = (\Pi + \lambda) = a - m\frac{(\Pi+\lambda)}{\sqrt{\Pi}}$.

But also $b = \bar{b} = pq$, hence $m = \frac{1}{\sqrt{\Pi(\Pi+\lambda)}}\left(a - m\frac{(\Pi+\lambda)^{3/2}}{\sqrt{\Pi}}\right)$. The value of λ can be found computationally to find p and q.

With this model, Shubik is able to prove that when some agents are endowed with money and some with goods, trade is more efficient than without money. Trust, unless what is defined as money in this model *is* trust, has nothing to do with the model.

c. Overlapping generations model (Blanchard & Fischer 1989)[232]

The overlapping generations model (OLG) was conceptualized by Maurice Allais in 1947 and popularized by Paul Samuelson in 1958. It is a type of economic model in which agents live for an infinite length of time and live long enough to support at least two life spans of the next generations. We therefore consider two types of agents, the young and the old. Agents are considered to live in two periods. During the first period, they are young and live on the income from their work. During the second period, they are old and live on the income from their savings. The OLG differs from the microeconomic models in the Walrasian or Mengerian tradition because it did not consider money exclusively as a transaction technology, but also as an asset which is used to transfer resources between generations. We then ask ourselves if there is a stationary equilibrium and whether the equilibrium obtained is efficient or not. Thus, two important aspects of the overlapping generations model is that the steady state level of capital is not necessarily unique or efficient. In this model, the role of trust in money focuses on the fact that agents must believe that money will maintain its value in the future, but they also have to trust that money will be accepted by others in the future.

Assumptions of a typical overlapping generations model of money

The Economy

- Agents live for two consecutive periods and maximize lifetime utility $u(c_{1t}, c_{2t+1})$ which is a twice differentiable, continuous, strictly concave, and either separable or homothetic function increasing in its arguments.
- There is only one homogenous good that is not storable.
- Population grows at the rate n such that $N_t = N_0(1+n)^t$.
- There is no intrinsic uncertainty in the model. Individuals are assumed to have perfect foresight.

[232] As in Schmitz (2001).

Consumption

- Agents born in period t consume c_{1t} when young and c_{2t+1} when old.

Endowment

- Each agent is endowed with one unit of the good when young and zero units when old.
- At $t = 0$ the old are endowed with M_s units of money which is divisible and can be stored and exchanged at no cost.

Trading technology

- Agents can exchange money and the consumption good or engage in barter at competitive terms. Agents are price takers. There are no frictions in the money or good market (no information, transaction, or search costs).

Equilibrium

- Market clearing in the money market implies market clearing in the goods market (Walras' Law). In all markets all agents are price takers. The analysis is constrained to steady-state equilibria. All generations of young agents are treated identically as are all generations of old agents.
- Multiple equilibria, and even continuity of equilibria, are possible, since there are an infinite number of agents in the economy (over time) and there is no prior constraint on the differential equation relating the capital stock to investment.
- Two different equilibrium prices: money equilibrium and barter. The choice between either equilibrium and hence to trust or not to trust, is not up to the agents in the model but has to be set exogenously.

Solution

Agents face the following maximization problem:

$$\max_{c_{1t}, c_{2t+1}} u(c_{1t}, c_{2t+1}) \tag{3}$$

subject to

$$P_t(1 - c_{1t}) = M_t^d$$
$$P_{t+1}c_{2t+1} = M_t^d$$

Where c_{1t} designates consumption of the generation born in t in the first period, c_{2t+1}designates the second period consumption of the first generation, and M_t^d is the money demand in period t. The first order condition is:

$$\frac{\frac{\partial u(C_{2t+1})}{\delta c C_{2t+1}}}{\frac{\delta u(c_{1t})}{\delta c_{1t}}} = \frac{P_{t+1}}{P} \tag{3.1}$$

The savings function of the young is given by $(1 - c_t) = M_t^d/P_t$: their savings are equal to their real money demand. From the first order condition we know that optimal savings imply that the marginal rate of intertemporal substitution is equal to the real gross return on money holdings P_{t+1}/P_t. Since money is intrinsically worthless, the old offer their entire holdings M_s at the going price. The young demand money according to their savings function. Therefore, equilibrium in period t is given by:

$$(1 + n)^t M_t^d = M_s \tag{3.2}$$

In the previous period the old have determined their real money holdings according to their own savings function $L(P_{t-1}/P_t)$. Therefore, we can rewrite (3.2) in terms of supply and demand in the market for intertemporal exchange between two consecutive generations by:

$$(1 + n)L\left(\frac{P_t}{P_{t+1}}\right)P_t = L\left(\frac{P_{t-1}}{P_t}\right)P_{t-1} \tag{3.3}$$

$$(1 + n)\frac{P_t}{P_{t+1}} = \frac{L\left(\frac{P_{t-1}}{P_t}\right)}{L\left(\frac{P_t}{P_{t+1}}\right)} \tag{3.4}$$

As the savings of the old and the young must be mutually consistent in steady state (e.g. $c_{1,t} = c_{2,t+1}$) and n and (P_t/P_{t-1}) are constant over time, it follows that the price level must decrease at the rate of population growth. As the nominal supply of money is fixed at $M_s$but the real demand for money increases with the growth of the population, the price level must fall in order for the real supply of money M_s/P_to increase as well. The crucial

point is that equation (3.4) involves the price levels of three consecutive periods. Since the equation must hold in steady state, the expected value of money must be positive in all periods. “Suppose that the old and every generation thereafter believe that they will be able to exchange money for goods, at price P_t in period t.” (Blanchard, Fischer 1989, p. 158.) The expectations concerning the future acceptability of money are not determined endogenously. Given the social institution of money, the additional endowment of $M_s$units of an intrinsically worthless good can have the positive effects cited above: 1) It is individually rational to accept money in exchange for goods. 2) The allocation in the monetary economy Pareto dominates the allocation in an economy without money.

There are simply two equilibria, one monetary and an autarkic one. The choice of either one of them is a result of the equilibrium conditions of the model and not of the sentiment one generation places in the trustworthiness of the other. If trust is supposed to explain why agents choose the monetary over the autarkic equilibrium in the overlapping generations model, trust needs to be made explicit in the selection process. This familiar path, already seen in the search-theoretic models above, was applied to OLG models with the introduction of an acceptance probability parameter for money

Table 1: Database overview

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Executive Board	36	32	24	17	25	70	64	52	63	74	63	91	101	54	71	61	57	61	61	55	55	1187
NCB Presidents	40	47	59	28	23	20	29	43	49	53	57	55	64	58	57	52	59	94	68	55	49	1059
National Board Members	16	24	34	26	40	26	14	13	22	29	25	25	57	44	47	49	48	60	89	74	63	825
French Central Bankers	20	19	27	6	5	7	11	12	18	21	21	30	33	33	24	29	27	56	33	31	42	
German Central Bankers	36	52	66	48	58	39	32	44	53	61	61	50	88	69	80	72	80	98	124	98	70	
Christine Lagarde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
Jean-Claude Trichtet	0	0	0	0	9	51	44	32	48	56	49	65	67	0	0	1	3	3	4	2	1	
Christian Noyer	21	13	14	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Jörg Asmussen	0	0	0	0	0	0	0	0	0	0	0	0	0	30	36	1	0	0	0	0	0	
Benoît Cœré	0	0	0	0	0	0	0	0	0	0	0	0	0	24	34	43	38	39	31	36	35	
Otmar Issing	15	19	10	13	16	19	20	11	0	0	0	0	0	0	0	2	0	0	0	0	0	
Sabine Lautenschläger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	16	19	26	17	13	
Jürgen Stark	0	0	0	0	0	0	0	9	15	18	14	26	34	0	1	0	0	0	0	0	0	
Christian Noyer	0	0	0	0	0	7	11	12	15	18	19	29	31	30	22	24	25	4	0	0	0	
Jean-Claude Trichet	20	19	27	6	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
François Villeroy de Galhau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	51	32	23	32	
Hans Tietmeyer	16	0	1	3	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	
Axel A. Weber	0	0	0	0	0	10	17	28	34	35	38	26	12	0	0	1	1	0	0	0	0	
Ernst Welteke	4	28	31	19	18	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Jens Weidmann	0	0	0	0	0	0	0	0	0	0	0	0	21	28	35	27	31	39	36	32	17	
Denis Beau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6	9	
Sylvie Goulard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	
Anne Le Lorier	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
Robert Ophèle	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	4	0	1	0	0	0	
Jean-Paul Redouin	0	0	0	0	0	0	0	0	1	2	1	1	2	0	0	0	0	0	0	0	0	
Jean-Pierre Landau	0	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	
Burkhard Balz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	21	
Claudia Buch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	6	6	8	10	10	
Johannes Beermann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	6	6	
Rudolf Böhmler	0	0	0	0	0	0	0	0	0	1	2	2	1	4	1	0	1	0	0	0	0	
Andreas Dombret	0	0	0	0	0	0	0	0	0	0	0	4	22	15	22	27	25	37	50	25	0	
Hans Georg Fabritius	0	0	0	0	1	0	0	4	2	4	4	2	0	0	0	0	0	0	0	0	0	
Sabine Lautenschläger	0	0	0	0	0	0	0	0	0	0	0	0	3	12	10	0	0	0	0	0	0	
Hans-Helmut Kotz	0	0	0	1	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	
Edgar Meister	8	9	16	11	7	5	5	4	2	0	0	0	0	0	0	0	0	0	0	0	0	
Sabine Mauderer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	
Joachim Nagel	0	0	0	0	0	0	0	0	0	0	0	0	10	5	7	4	8	1	0	0	0	
Hans Reckers	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
Hermann Remsperger	3	8	9	7	14	10	0	1	2	9	0	0	0	0	0	0	0	0	0	0	0	
Jürgen Stark	5	7	9	6	14	8	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Carl-Ludwig Thiele	0	0	0	0	0	0	0	0	0	0	0	5	11	4	5	6	8	14	16	8	0	
Joachim Wuermeling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	11	11	
Franz-Christoph Zeitler	0	0	0	0	4	3	1	3	11	12	13	10	8	1	0	0	0	0	0	0	0	

Table 2b: Communications indicator by source

	N	Mean	Median	Min	Max	Standard Deviation
Interviews						
Super insiders	302	0.2413	0.2323	-1	1	0.3326
Insiders	302	-0.1798	-0.1478	-1	0.7926	0.3801
Outsiders	302	0.5497	1	-1	1	0.6533
Trust	302	-0.07813	-0.1316	-1	1	0.6656
Speeches						
Super insiders	569	0.2555	0.2605	-1	1	0.352
Insiders	569	-0.1636	-0.1449	-1	0.7926	0.3587
Outsiders	569	0.5427	1	-1	1	0.6594
Trust	569	-0.01618	0	-1	1	0.6824

Table 4b: Type II MANOVA Tests: Pillai test statistic

	Df	test stat	approx F	num Df	den Df	Pr(>F)
D	3	0.180171	13.6095	12	2556	< 2.2e-16***
$\pi_{i,t}^{EA} - \pi_{i,t+12}^{EA}$	1	0.045556	10.1426	4	850	5.045e-08***
$Y_{i,t}^{EA} - Y_{i,t+12}^{EA}$	1	0.035247	7.7637	4	850	3.805e-06***
$P_{i,t}^{EA}$	1	0.065761	14.9579	4	850	8.058e-12***
$EB_{i,t}^{EA}$	1	0.059786	13.5125	4	850	1.104e-10***
$tone_t^{NBM}$	1	0.039068	8.6395	4	850	7.761e-07***
$D^{FR,DEU}(\pi_{i,t}^{FR,DEU} - \pi_{i,t+12}^{FR,DEU})$	2	0.046743	5.913	8	1702	2.791e-06***
$D^{FR,DEU}(Y_{i,t}^{FR,DEU} - Y_{i,t+12}^{FR,DEU})$	2	0.096717	10.8111	8	1702	6.016e-15***
$D^{FR,DEU}(P_{i,t}^{FR,DEU})$	2	0.056719	6.2096	8	1702	6.215e-08***
$D^{FR,DEU}(EB_{i,t}^{FR,DEU})$	2	0.076272	8.4351	8	1702	2.676e-11***
$D^{FR,DEU}(tone_t^{NBM})$	2	0.053374	5.8334	8	1702	2.256e-07***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 5b: Type II MANOVA Tests: Pillai test statistic

	Df	test stat	approx F	num Df	den Df	Pr(>F)
D	2	0.122942	14.0327	8	1714	< 2.2e-16***
$D^B(\pi_{i,t}^B - \pi_{i,t+12}^B)$	1	0.020070	4.3829	4	856	1.946e-06***
$D^B(Y_{i,t}^B - Y_{i,t+12}^B)$	1	0.014460	3.1399	4	856	5.955e-07***
$D^B(P_{i,t}^B)$	1	0.111092	26.7449	4	856	< 2.2e-16***
$D^B(EB_{i,t}^B)$	1	0.029760	6.5640	4	856	3.544e-06***
$D^B(tone_t^B)$	1	0.017155	3.7352	4	856	0.0001185***
$D^A(\pi_{i,t}^A - \pi_{i,t+12}^A)$	2	0.036611	8.1324	4	856	0.0016342**
$D^A(Y_{i,t}^A - Y_{i,t+12}^A)$	2	0.039429	8.7841	4	856	0.0140984*
$D^A(P_{i,t}^A)$	2	0.097667	23.1631	4	856	< 2.2e-16***
$D^A(EB_{i,t}^A)$	2	0.035176	7.8020	4	856	3.328e-05***
$D^A(tone_t^A)$	2	0.026644	5.8578	4	856	0.0050688**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Sample Scripts for Web Scraping

The following is an explanatory sample of a python script used to scrape the Bundesbank homepage. The python tools used for scraping are the **requests** library for retrieving content from a webpage, and **BeautifulSoup(bs4)** for extracting the relevant information.

These two libraries are used together in the following manner: first, by making a GET request to a website, second by creating a Beautiful Soup object from the content that is returned and save it in the database file.

There are many different python scripts for different types of data on the Bundesbank site. Here, I just give an overview of the following file:

- extract_interviews.py

Code for understanding extract_interviews.py

We will discuss python script **extract_interviews.py** here in detail.

1. **Main Function**

   Input variable: section name

   Functionality: Verify section name and call extract function.

   Functions called: extract()

   The first step is to pass the section name to the script as an argument like 'interviews' for extracting interviews.
   Example Code:
   python extract_interviews.py interviews

```
if __name__ == '__main__':
    allowed_sections = ['reden', 'pressenotizen', 'interviews']
    args = sys.argv
    if len(args) != 2:
        print(
            'Incorrect format. The correct format is: python extract.py <section>
where section could be one of them: pressenotizen,reden and interviews')
        exit()

    section_name = args[1].lower()
    if section_name not in allowed_sections:
        print('Invalid section name. Valid sections are {}'.format(','.join(al-
lowed_sections)))
```

```
        exit()

    headers = {
        'Accept': 'text/html,application/xhtml+xml,application/xml;q=0.9,im-
age/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3',
        'Accept-Encoding': 'gzip, deflate, br',
        'Accept-Language': 'en-US,en;q=0.9,ur;q=0.8',
        'Cache-Control': 'no-cache',
        'Pragma': 'no-cache',
        'Referer': 'https://google.com',
        'Upgrade-Insecure-Requests': '1',
        'User-Agent': 'Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWeb-
Kit/537.36 (KHTML, like Gecko) Chrome/75.0.3770.142 Safari/537.36'
    }

    extract('https://www.bundesbank.de/de/presse/{}'.format(section_name.strip()),
section_name.strip())
```

Headers are passed for web scraping. From the main function, extract function is called and the url passed is 'https://www.bundesbank.de/de/presse/interviews' and section name 'interviews' is passed.

2. **store(_author, _publish_date, _title, _post_link, _link_type, _section) function**

   Input variable: _author, _publish_date, _title, _post_link, _link_type, _section
   Functionality: Insert values of records in 'links' table of 'bundesbank_interviews.db' database file.
   Output Variable: None
   Called from: extract() function

```
def store(_author, _publish_date, _title, _post_link, _link_type, _section):
    TABLE_NAME = 'links'
    DB_PATH = 'bundesbank_interviews.db'

    try:
        conn = sqlite3.connect(DB_PATH)
        if conn is not None:
            cursor = conn.cursor()
            sql = 'INSERT INTO {} (author,published_date,ti-
tle,post_link,link_type,section,status) VALUES (?,?,?,?,?,?,0)'.format(
                TABLE_NAME)

            cursor.execute(sql, (_author, _publish_date, _title, _post_link,
_link_type, _section))
            conn.commit()
            # print('Stored')
    except Exception as ex:
        print('Error while storing')
        print(ex)
```

Records value: author,published_date,title,post_link,link_type,section,status=0 is inserted in to database file 'bundesbank_interviews.db' using sqlite3 library.

3. **extract(url, section) function**

Input variable: url, section
Functionality: Extract relevant information from URL using requests and the BeautifulSoap library and pass values to store() function
Output Variable: records
Called from: Main function()

```
def extract(url, section):
    records = []
    total_pages = 0
    search_url = None
    state = None
    author = None
    title = None
    publish_date = None
    post_link = None
    link_type = 'html'

    section_code = {'reden': '729950', 'pressenotizen': '724000', 'interviews':
'729904'}

    try:
        print('Processing...' + url + '\n\n')

        session = requests.session()
        r = session.get(url, headers=headers, timeout=30)

        if r.status_code == 200:
            html = r.text.strip()
            soup = BeautifulSoup(html, 'lxml')
            page_count_section = soup.select('#searchres')
            state_section = soup.select('#state')

            if state_section:
                state = state_section[0]['value'].strip()

            if page_count_section:
                total_records = page_count_section[0].text.replace('Beiträge', '')
                total_pages = round(int(total_records) / 10)

            print('Total Pages Found {}'.format(total_pages))

            # Iterating Records
            entries = soup.select('.resultlist .resultlist__item')

            for entry in entries:
                title_section = entry.select('.h2')
                date_section = entry.select('.teasable__date')
                author_section = entry.select('.teasable__authors')
                post_link_section = entry.select('.teasable__link')
                post_heading = entry.select('.teasable__link > .link__label')

                if author_section:
                    author = author_section[0].text.strip().replace('|', '').re-
place('\n', '')

                if date_section:
                    publish_date = date_section[0].text.strip()

                if title_section:
                    title = title_section[0].text.strip()
```

```
                if post_link_section:
                    post_link = post_link_section[0]['href']
                    if 'https://www.bundesbank.de/' not in post_link:
                        post_link = 'https://www.bundesbank.de' + post_link

                    if '.pdf' in post_link:
                        link_type = 'pdf'
                    else:
                        link_type = 'html'

                print('Title = {}\n Publish Date = {}\n Post Link= {}\n Author= {}\n
Section = {}\n'.format(
                    title_section[0].text.strip().replace('\n', ''),
                    publish_date,
                    title,
                    post_link,
                    author,
                    section
                ))

                # print(title_section[0].text.strip().replace('\n', ''), author, pub-
lish_date, post_link,
                #       link_type)

                store(author, publish_date, title, post_link, link_type, section)
```

Requests and BeautifulSoap are used to scrape HTML content from the interview web page.

Sample HTML of https://www.bundesbank.de/de/presse/interviews:

Sample HTML after web scraping:

```
<li class="resultlist__item">
<div class="resultlist__content">
<div class="teasable teasable--linked teasable--flex">
<div class="teasable__main-info">
<div class="h2">
<i class="fa fa-angle-right"></i>
Weidmann: EU hat sich in der Krise als handlungsfähig erwiesen
<small class="d-block teasable__subtitle">Interview mit der Funke-Me-
diengruppe</small>
```

```
</div> <div class="teasable__download mt-2">
<p>
<span class="teasable__date">27.07.2020</span>
<span class="teasable__authors">
<span class="teasable__authors">
|
Jens
Weidmann
</span> </span>
<a class="teasable__lang" href="https://www.bundesbank.de/en/press/inter-
views/weidmann-eu-has-proven-itself-capable-of-taking-action-in-these-times-of-cri-
sis--837944" target="_self">
<span>EN</span>
</a>
<a class="teasable__lang" href="https://www.bundesbank.de/fr/presse/inter-
views/weidmann-l-ue-s-est-montr%C3%A9e-capable-d-agir-face-%C3%A0-la-crise-837942"
target="_self">
<span>FR</span>
</a>
<a class="teasable__lang" href="https://www.bundesbank.de/en/press/inter-
views/weidmann-l-ue-si-%C3%A8-dimostrata-capace-di-agire-nella-crisi-837946" tar-
get="_self">
<span>IT</span>
</a> </p>
</div>
<div class="teasable__text">
<div class="richtext"><p>Bundesbankpräsident Jens Weidmann hat der EU angesichts der
Corona-Krise Handlungsfähigkeit bescheinigt. "<q>Solidarität in Europa - auch finan-
zielle - halte ich in dieser Situation für richtig. Über Art und Umfang muss die
Politik bestimmen</q>", sagte er im Interview mit der Funke-Mediengruppe zu dem
jüngst beschlossenen EU-Wiederaufbaupaket. Dennoch müsse dieses eine außergewöhnliche
Maßnahme bleiben.</p></div></div> <div class="teasable__data">
<a class="teasable__link" href="/de/presse/interviews/weidmann-eu-hat-sich-in-der-
krise-als-handlungsfaehig-erwiesen-837910"><span class="link__label sr-
only">Weidmann: EU hat sich in der Krise als handlungsfähig erwiesen</span></a>
</div>
</div>
</div> </div>
</li>
```

Values of Title, Published Date, Post Link, Author and section is extracted from HTML data.

```
Title = Weidmann: EU hat sich in der Krise als handlungsfähig erwie-
sen
Interview mit der Funke-Mediengruppe
Publish Date = 27.07.2020
Post Link= https://www.bundesbank.de/de/presse/interviews/weidmann-
eu-hat-sich-in-der-krise-als-handlungsfaehig-erwiesen-837910
Author= JensWeidmann
Section = interviews
```

If post_link contains string ‘pdf’ then link_type is set to ‘pdf’ else set to ‘html’.

store() function is called to store data in ‘bundesbank_interviews.df’ file.

Sample of 'bundesbank_interviews.df' is:

id	author	title	post_link	link_type	published_d...	status	section
1	JensWeidmann	„Ich sehe kein...	https://www.b...	html	25.08.2019	3	interviews
2	BurkhardBalz	„Die Aufsicht ...	https://www.b...	html	12.07.2019	3	interviews
3	BurkhardBalz	„Banken müs...	https://www.b...	html	09.07.2019	3	interviews
4	JoachimWuer...	„Facebook wi...	https://www.b...	html	23.06.2019	3	interviews
5	ClaudiaBuch	„Selbstzufried...	https://www.b...	html	17.05.2019	3	interviews
6	SabineMaude...	„Minuszinsen ...	https://www.b...	html	13.05.2019	3	interviews

'State value is also extracted and if the state value is not 'none' then below code is executed:

```
if state is not None and total_pages > 0:
               print('Processing pages..')

                for p in range(2, total_pages + 1):
                    sleep(5)
                    print('Page No..{}'.format(p))

                    search_url = 'https://www.bundesbank.de/ac-
tion/de/{}/bbksearch?state={}&pageNumString={}'.format(
                        section_code[section], state, p - 1)

                    r = session.get(search_url, headers=headers, timeout=30)
                    print('============================================')

                    if r.status_code == 200:
                        html = r.text.strip()
                    soup = BeautifulSoup(html, 'lxml')

                    # Iterating Records
                    entries = soup.select('.resultlist .h2')

                    entries = soup.select('.resultlist .resultlist__item')

                    for entry in entries:
                        title_section = entry.select('.h2')
                        date_section = entry.select('.teasable__date')
                        author_section = entry.select('.teasable__authors')
                        post_link_section = entry.select('.teasable__link')

                        if author_section:
                            author = author_section[0].text.strip().replace('|',
'').replace('\n', '')

                        if date_section:
                            publish_date = date_section[0].text.strip()

                        if title_section:
                            title = title_section[0].text.strip()

                        if post_link_section:
                            post_link = post_link_section[0]['href']
                        if 'https://www.bundesbank.de/' not in post_link:
                            post_link = 'https://www.bundesbank.de' + post_link

                        if '.pdf' in post_link:
                            link_type = 'pdf'
```

```
                        else:
                            link_type = 'html'

                        print('Title = {}\n Publish Date = {}\n Post Link= {}\n Au-
thor= {}\n Section = {}\n'.format(
                            title_section[0].text.strip().replace('\n', ''),
                            publish_date,
                            title,
                            post_link,
                            author,
                            section
                        ))

                        store(author, publish_date, title, post_link, link_type, sec-
tion)
```

A new url is created with state value and scraping and value of records extraction is based on done on that.

Parsing

Once the data is extracted data from the webpages and stored in the database files, the files in the are parsed and stored in JSON format.

We have different python scripts for parsing different database files. Below, I will explain the parsing for speeches.

- parse.py
- parse_reden.py

Some differences between these scripts are the name of the output database file where data is saved.

Code for understanding parse_reden.py

We will discuss python script **parse_reden.py** here in detail.

1. Main Function

Input variable: LIMIT

Functionality: Fetch records from database file bundesbank_reden.db' and after further processing saves to json format

Functions called: get_links(), parse(...)

The first step is to pass the LIMIT variable value to the script as an argument, the LIMIT variable suggests the number of records needs to be fetched from the database. And the value to be passed is not necessary. If LIMIT is not mentioned then by default its value is taken as 10.

```
if __name__ == '__main__':
    headers = {
        'Connection': 'keep-alive',
        'Pragma': 'no-cache',
        'Cache-Control': 'no-cache',
        'Upgrade-Insecure-Requests': '1',
        'User-Agent': 'Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWeb-
Kit/537.36 (KHTML, like Gecko) Chrome/75.0.3770.142 Safari/537.36',
        'Accept': 'text/html,application/xhtml+xml,application/xml;q=0.9,im-
age/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3',
        'Accept-Encoding': 'gzip, deflate, br',
        'Accept-Language': 'en-US,en;q=0.9,ur;q=0.8',
    }

    args = sys.argv
    if len(args) == 2:
        LIMIT = args[1]
    else:
        LIMIT = 10

    print('Total links going to be processed: {}'.format(LIMIT))

    TABLE_NAME = 'links'
    DB_PATH = 'bundesbank_reden.db'
    links = get_links()
    conn = sqlite3.connect(DB_PATH)

    for link in links:
        link_id = link[0]
        author = link[1]
        title = link[2]
        post_link = link[3]
        link_type = link[4]
        published_date = link[5]
        section_name = link[7].strip()
```

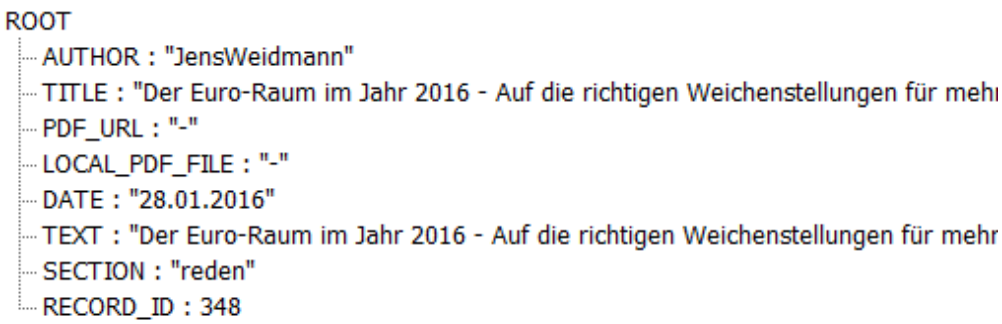
```
        result = parse(link_id, author, title, post_link, link_type, published_date,
section_name)

        if len(result) > 0:
            record_id = result['RECORD_ID']

            if conn is not None:
                cursor = conn.cursor()
                sql = 'UPDATE {} SET status = 3 where id = {}'.format(TABLE_NAME,
record_id)
                cursor.execute(sql)
                conn.commit()
            json_data = json.dumps(result, ensure_ascii=False)
            file_name = '{}_{}_{}.json'.format(section_name, published_date.re-
place('.', '_'), link_id)

            with open(file_name, 'w', encoding='utf8') as f:
                f.write(json_data)
        sleep(5)
```

Using get_links() function value of all variables: link_id, author, title, post_link, link_type, published_date and section_name is fetched.

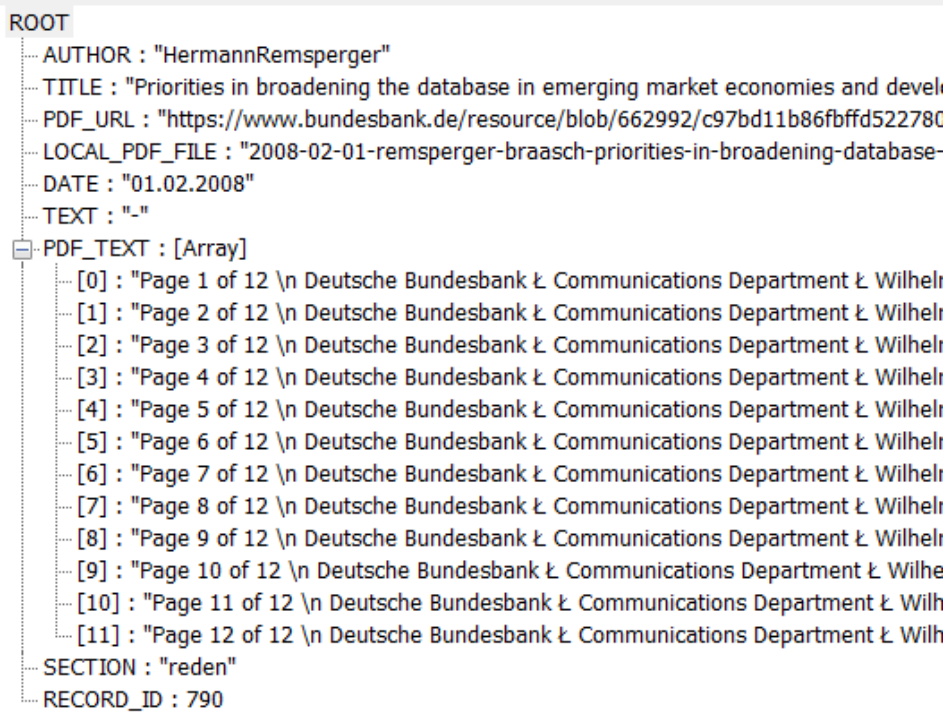
Using parse() function all the text details from the link present in post_link are fetched. And the status of the fetched record is set to 3.

All data is dumped into the JSON file using the JSON library. Name of Json file is 'section_name+published_date+link_id'.json. JSON file format looks as below:

JSON file with text data:



JSON file with PDF text data:



2. get_links () Function

Input variable: None

Functionality: Fetch records from database file ‘bundesbank_reden.db’ and return all records for further processing.

Output Variable: records

Called from: Main function()

The detail of the code of get_links():

```
def get_links():
    ids = []
    records = []

    try:
        TABLE_NAME = 'links'
        DB_PATH = 'bundesbank_reden.db'
        conn = sqlite3.connect(DB_PATH)

        if conn is not None:
            cursor = conn.cursor()
            sql = 'SELECT * FROM links where status = 0 LIMIT {}'.format(LIMIT)
            sql = "select * from links where post_link like '%.pdf%'"

            cursor.execute(sql)
            records = cursor.fetchall()

            for record in records:
```

```
                ids.append(record[0])
            # Update the status
            sql = 'UPDATE links set status = 1 where id IN (%s)' % ','.join('?' for i
in ids)
            cursor.execute(sql, ids)
            conn.commit()
    except Exception as ex:
        print('Error while fetching jobs')
        print(ex)
    finally:
        return records
```

Python sqlite3 API is used to connect to a database file. 'Links' is the table name in the database file. Records are fetched from the database file. Variable 'LIMIT' is used to set a limit on the number of records to be fetched.

Sample Output of records are:

```
[(82, 'ClaudiaBuch', 'Finanzstabilität und Kreditmärkte in Europa: Chancen und
Risiken im aktuellen Umfeld\nDinner Talk anlässlich der 2. Fachkonferenz der
Süddeutschen Zeitung "Private Debt und Direct Lending"', 'https://www.bundes-
bank.de/resource/blob/760008/bb7cff1d9225a1ff7b7b232535dc0428/mL/2018-09-18-buch-
download.pdf', 'pdf', '18.09.2018', 3, 'reden'),
(85, 'ClaudiaBuch', 'Wettbewerb und Stabilität im Finanzsektor in Zeiten technolo-
gischen Wandels', 'https://www.bundesbank.de/re-
source/blob/758264/1eed3dbb51eba9e0da8420e6a1fb33d9/mL/2018-09-03-buch-download.pdf',
'pdf', '03.09.2018', 3, 'reden')
```

And the status is updated for the fetched record and set to 1. And records are returned to the main function.

3. parse(record_id, _author, _title, _post_link, _link_type, _published_date, _section) Function

Input variable: record_id, _author, _title, _post_link, _link_type, _published_date, _section

Functionality: Parse the text from post_link and pdf file.

Output Variable: record('AUTHOR', 'TITLE', 'PDF_URL', 'LOCAL_PDF_FILE', 'DATE', 'TEXT', 'PDF_TEXT', 'SECTION':, 'RECORD_ID')

Called from: Main function()

Functions called: extract_pdf_text(downloaded_pdf_file_name) and not_dl_pdf(p_url)

```
def parse(record_id, _author, _title, _post_link, _link_type, _published_date, _sec-
tion):
    pdf_link = '-'
    main_text = '-'
    title = '-'
    pdf_text = []
    record = {}
    pdf_file = '-'

    try:
        session = requests.session()
        if 'https://' not in _post_link:
            _post_link = 'https://www.bundesbank.de{}'.format(_post_link)

        print('Processing...' + _post_link)

        r = session.get(_post_link, headers=headers, timeout=30)

        if r.status_code == 200:
            html = r.text.strip()
            soup = BeautifulSoup(html, 'lxml')
            pdf_link_section = soup.select('.collection__link')
            main_section = soup.select('.main')

            if _link_type == 'html':
                if main_section:
                    main_text = main_section[0].text.strip()
                    main_text = bytes(main_text, 'utf-8')
                    main_text = main_text.decode("utf-8")

                if pdf_link_section:
                    pdf_link = 'https://www.bundesbank.de{}'.format(pdf_link_sec-
tion[0]['href'])
                    pdf_file = dl_pdf(pdf_link)

            elif _link_type == 'pdf':
                pdf_link = _post_link
                pdf_file = dl_pdf(pdf_link)

            if pdf_file is not None and pdf_file != '-':
                pdf_text = extract_pdf_text(pdf_file)

            record = {'AUTHOR': _author, 'TITLE': _title, 'PDF_URL': pdf_link, 'LO-
CAL_PDF_FILE': pdf_file, 'DATE': _published_date,
                      'TEXT': main_text, 'PDF_TEXT': pdf_text, 'SECTION': _section,
'RECORD_ID': record_id}
    except Exception as ex:
        print('Exception in Parse')
        print(str(ex))
    finally:
        return record
```

Using requests and beautiful soap content of 'https://www.bundesbank.de' +post_link is parsed.

Now based on link_type, Html and pdf page parse differently.

Text is extracted from the page and in case of link_type is pdf or in Html page, there is a pdf file then using dl_pdf(pdf_link) function pdf_file name is extracted.

Text from pdf file is extracted using extract_pdf_text(pdf_file) function.

4. dl_pdf(p_url) Function

Input variable: p_url

Functionality: Extract pdf file name and download it

Output Variable: downloaded_pdf_file_name

Called from: parse() function

```
def dl_pdf(p_url):
    downloaded_pdf_file_name = None
    downloaded_pdf_file_name = p_url.split('/')[-1]

    try:
        if '.pdf' in p_url:
            print('Downloading the file...' + p_url)
            response = requests.get(p_url, headers=headers, timeout=30)

            if response.status_code == 200:
                file_name = downloaded_pdf_file_name

                with open(file_name, 'wb') as fi:
                    fi.write(response.content)
    except Exception as ex:
        print('Exception in dl_pdf')
        print(str(ex))
    finally:
        return downloaded_pdf_file_name
```

Using requests library pdf file name is extracted and downloaded and downloaded_pdf_file_name is returned to parse() function.

5. extract_pdf_text(pdf_file_name) Function

Input variable: pdf_file_name
Functionality: Extract text of pdf file
Output Variable: pages
Called from: parse() function

```
def extract_pdf_text(pdf_file_name):
    pages = []

    try:
        print('Extract Data from the PDF file:- {}'.format(pdf_file_name))
        pdfFileObj = open(pdf_file_name, 'rb')
        pdfReader = PyPDF2.PdfFileReader(pdfFileObj)
        total_pages = pdfReader.numPages
        for page in range(0, total_pages):
            pageObj = pdfReader.getPage(page)
            text = pageObj.extractText()
            text = text.encode('utf8').decode("utf-8").strip()

            pages.append(text)
    except Exception as ex:
        print('Exception in extract_pdf_text')
        print(str(ex))
    finally:
        return pages
```

All the text from pdf file is extracted using PyPDF2 library and returned as pages to parse() function where all detail is store as a record. In the main() function this record is transformed into the JSON file.