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ESSAYS ON CENTRAL BANKS COMMUNICATION AND
DECISIONS

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Docteur en Sciences Économiques

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"Words are but symbols for the relations of things to one another and to us; nowhere do they touch upon absolute truth....Through words and concepts we shall never reach beyond the wall off relations, to some sort of fabulous primal ground of things."

Friedrich Nietzsche

Remerciements

Edgar Morin disait que la vie est faite de prose et de poésie. Si les chapitres constituent la prose de cette thèse, cette page en est sa poésie.

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Abstract

This thesis focuses on issues related to the link between the communication policy of central banks, and their decision-making process.

The first chapter develops a theoretical framework allowing to examine the challenges for central banks' communication policies, when confronted to international markets and to the cultural heterogeneity of agents receiving the signals they send. While the former is linked to the international use of the currency, the latter dimension can notably cover linguistic heterogeneity, different degrees of financial literacy of the receptors of the banks' communicated messages, or some distance from the bank's emitting position. The framework also embeds the cases of inflation targeting or non-inflation targeting central banks. The model is then confronted to the empirical diversity of the communication by major central banks, assessed through a textual analysis of central banks' official discourses. It is shown that central banks tend to adapt the consistency of their communication with regard to the context they face. The dimensions we highlight are thus important to forecast central bank's decisions.

In the second chapter, through a textual analysis of national newspaper articles covering European central bankers' statements and policy decisions for the period 1999-2011, we derive the concerns expressed by national media in the EMU. We consider these concerns as a benchmark for national preferences, and thus, for the preferences of national central bankers in the EMU. In a next step, we test the existence of groups of national media (i.e., national publics) according to their shared expressed concerns. The results show that in the euro area, similar concerns are shared by different country groups, corresponding to a group of countries from Northern Europe (Belgium, Finland and the Netherlands), Southern Europe (Spain and Portugal), and the Periphery (Italy, Greece and Ireland), and that there are two isolated countries (France and Germany), whose newspapers do not share the issues raised by the rest of the newspapers. Finally, we compute a measure of stress, to assess how each group's concerns are reflected in the single monetary policy. The results reveal that during the period 1999-2011, the decision-making process of the Governing Council reflected, with a large weight, the preferences of Germany, France and a group of Northern countries, in the end being detrimental

to the preferences of countries from the South and the Periphery of Europe.

In the third chapter of the thesis, we ask whether the educational and professional backgrounds of the European central bankers matter for the type of reforms each of them advocated, in the context of the euro debt crisis. We make a textual analysis of public speeches delivered by the European central bankers to draw a cognitive map for each of them. Our results show that their occupational background is an important determinant of their respective reform proposals. Central bankers coming from the public sector favor more national measures, while central bankers with a banking and central banking backgrounds tend to promote measures that have to be adopted at a supranational level.

In the last chapter, we study the determinants of individual FOMC members disagreement with the decided policy rate. Utilizing a novel dataset of macroeconomic indicators for the Fed districts and preferences revealed by FOMC members in the transcripts, we construct individual reaction functions for each member for the period 1994-2008. Then, we explain the gap between each member's preferred rate and the adopted policy rate by individual background characteristics. We find, among others, that under Ben Bernanke the incentives to disagree decreased for all types of members. In general, however, female members and Professors tend to disagree more, whereas individuals holding a master degree or coming from either from private or public sector as well as governors nominated by a Republican President tend to disagree less (as compared to the "reference" member, who is a male, PhD holder, Regional Bank President with experience in the financial sector).

The policy relevance of this thesis is important for the central banks' communication strategy, especially in the years ahead of likely debates and reforms of central banks' monetary policy.

Keywords: Central Banks, Central Bank communication, Monetary policy, Taylor rule, Textual analysis.

Résumé

Cette thèse s'intéresse à des problématiques liées aux liens entre la politique de communication des banques centrales, et leurs processus de prise de décision.

Le premier chapitre développe un cadre théorique permettant d'examiner les défis des politiques de communication des banques centrales, lorsque ces dernières sont confrontées aux marchés internationaux et à l'hétérogénéité culturelle des agents recevant les signaux qu'elles envoient. Tandis que le premier cas est lié à l'utilisation internationale de la monnaie, la seconde dimension inclut l'hétérogénéité linguistique ainsi que les différents degrés d'éducation financière des agents. Ce cadre permet aussi d'inclure le cas des banques centrales ayant adopté un régime de ciblage d'inflation et celles sans régime de ciblage d'inflation. Le modèle est ensuite confronté à la diversité empirique de la politique de communication des principales banques centrales, illustrée à travers une analyse textuelle de leurs communications officielles. On démontre ainsi que les banques centrales adaptent la cohérence de leurs politiques de communication, par rapport au contexte auxquelles elles font face.

Dans le second chapitre, à travers une analyse textuelle des articles des journaux nationaux couvrant les déclarations des banquiers centraux Européens pour la période 1999-2011, on extrait les préoccupations exprimées par les médias nationaux dans la zone euro. On considère ces préoccupations comme un indicateur de préférences nationales, et donc, des préférences des banquiers centraux Européens. Dans une seconde étape, on vérifie l'existence de groupes de médias nationaux (i.e., publics nationaux) selon leurs préoccupations communes. Les résultats montrent que dans la zone euro, des préoccupations similaires sont partagées par différents groupes de pays, correspondant à des pays d'Europe du Nord (Belgique, Finlande et les Pays-Bas), d'Europe du Sud (Espagne et Portugal), et de la Périphérie (Italie, Grèce et Irlande), et qu'il y a deux pays isolés (France et Allemagne), dont les médias ne partagent pas les mêmes préoccupations que le reste des journaux. Par la suite, on crée une mesure de stress pour quantifier le poids des préoccupations de chaque groupe dans la politique monétaire unique. Nos résultats confirment la position forte de l'Allemagne et d'autres pays du Nord de l'Europe depuis le lancement de l'euro, mais suggèrent aussi une meilleure prise

en compte des préférences des pays du Sud et de la Périphérie ces dernières années. Dans le troisième chapitre de la thèse, nous nous posons la question de savoir si le parcours professionnel et éducatif des banquiers centraux Européens importe pour le type de réformes économique qu'ils proposent, dans le contexte de la crise de la zone euro. On effectue une analyse textuelle des discours publics prononcés par les banquiers centraux Européens, pour en extraire une carte cognitive pour chacun d'entre eux. Nos résultats montrent que leur parcours professionnel est un déterminant important de leurs propositions de réformes respectives. Les banquiers centraux ayant un parcours dans le secteur public favorisent des mesures à caractère national, tandis que les banquiers centraux ayant un parcours dans les secteurs de la banque et de la banque centrale promeuvent des mesures à adopter au niveau supranational.

Dans le dernier chapitre de la thèse, on étudie les déterminants des désaccords des membres du "Federal Open Market Committee" américain par rapport au taux d'intérêt proposé. On explique ce désaccord par les caractéristiques individuelles des membres. Parmi nos principaux résultats, on trouve que les désaccords ont diminué sous la période de Ben Bernanke, et que les membres de sexe féminin ainsi que les professeurs tendent à être plus en désaccord avec le taux d'intérêt proposé, tandis que les membres venant du secteur public et privé tendent à être moins en désaccord.

Les problématiques soulevées dans cette thèse sont importantes pour la stratégie de communication des banques centrales, surtout dans le contexte des années à venir, où des débats et des réformes sont à prévoir dans le cadre des politiques monétaires menées par les banques centrales.

Mots clés: Banques centrales, Communication des banques centrales, Politique monétaire, Règle de Taylor, Analyse textuelle.

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Abbreviations

BoC	B ank of C anada
BoE	B ank of E ngland
BoJ	B ank of J apan
ECB	E uropean C entral B ank
EMU	E conomic M onetary U nion
FED	F ederal R eserve
FOMC	F ederal O pen M arket C ommittee
GC	G overning C ouncil

General Introduction

0.1 “A revolution of thinking”

0.1.1 A progress towards more transparency

During the nineties, there has been a fundamental change in the practice of central banking. Monetary policy was considered prior to that date as an esoteric art shrouded of mystery and secrecy, that should be preserved from inquisitive eyes. As Alan Greenspan, the previous FED chairman, once famously said to a Congressional Committee (Carlson et al., 2006):

“I guess I should warn you, if I turn out to be particularly clear, you’ve probably misunderstood what I’ve said.”

But nowadays, transparency and communication have become regular instruments in the toolkit that helps central banks achieve their macroeconomic objectives, by managing expectations and making monetary policy decisions more predictable. In his 1996 Robbins lectures at the London School of Economics, Alan S. Blinder (1998, pp. 70-72) expressed a view that illustrate this change in practice:

“Greater openness might actually improve the efficiency of monetary policy...[because] expectations about future central bank behavior provide the essential link between short rates and long rates. A more open central bank...naturally conditions expectations by providing the markets with more information about its own view of the fundamental factors guiding monetary policy..., thereby creating a virtuous circle. By making itself more predictable to the markets, the central bank makes market

reactions to monetary policy more predictable to itself. And that makes it possible to do a better job of managing the economy.”

This view is now standard both in academia and in central banking circles. Blinder et al. (2008) describe this progress towards more transparency as a “revolution of thinking”. It is now widely recognized that two trends have led to this “revolution of thinking”. First, central banks became more independent, and needed thus, to be accountable in the way they conduct their monetary policy (Meade and Crowe, 2008). Therefore, they had to be transparent and to communicate about their policy decisions and the reasons underlying these decisions. Another driver is the management of expectations that became a fully-fledged tool for central banks. In their survey paper, Blinder et al. (2008) argue that central banks use communication to manage expectations by “creating news” (i.e., central banks “create news” to influence expectations, by anchoring and guiding financial market expectations), and “reducing noise” (to increase the predictability of monetary policy decisions and to decrease volatility in financial markets).

This “revolution of thinking” has marked central banks’ practices since the last decade. At the FED, it began in February 1994 when the Federal Open Market Committee (FOMC) started announcing its decisions on the federal funds rate target. In 2002, it began announcing FOMC votes after each meeting, and in August 2003, it introduced a “forward-looking” language into its post-meeting statements with the aim of conveying the probable direction of the federal funds target rate over the next one meeting. In February 2005, the FOMC started to release its minutes before the subsequent meeting. The recent financial crisis has brought further changes in the way the FOMC communicates, such as the introduction of the official inflation target in January 2012.

Concerning the ECB, it communicates mainly with the “President introductory statements” following monetary policy meetings, in which he reports on the decisions taken by the ECB’s Governing Council, and with the “Monthly Bulletin” published one week after the policy decision. The recent euro debt crisis has led the ECB to introduce a form of forward guidance about the future moves of its policy rate in July 2013, to help markets form correct expectations on future market rates.

The Bank of England uses an inflation targeting regime since 1992, it publishes the minutes of the meeting of the Monetary Policy Committee (MPC) 13 days after the monthly policy decisions, a quarterly Inflation Report that contains MPC's central projections for output growth and inflation, and regular speeches are given by the Governor and other Committee members.

0.1.2 A review of the literature

These changes in central banking practice brought a huge scholarly literature on both the empirical and theoretical aspects. Empirical studies of how central bank communication “create news” focus on how central banks' pronouncements influence expectations, and move asset prices in the intended direction. Studies of “reducing noise” focus on how communication increases the predictability of central bank actions. The idea is that if communication steers expectations successfully, asset prices should react and policy decisions should become more predictable. Up to now, the empirical literature has mainly focused on the effectiveness of the communication policy of three major central banks (The Federal Reserve, the European Central Bank, and the Bank of England). Both effects (i.e., the “creation of news” and the “reduction of noise”) seem to have materialized according to the findings.

For the FOMC, Pakko (2005) shows that post-meeting statements convey useful information for forecasting changes in the federal funds rate target, even after controlling for policy responses to inflation and the output gap. Swiston (2007) finds that increased FOMC communication has been associated with a reduction in the magnitude of short-term monetary surprises, and a greater flow of information about the long-term path of policy. Hayo and Neuenkirch (2010) find that FED's communication significantly explains target rate decisions.

As regards the ECB, Rosa and Verga (2008) find that the predictive ability of ECB statements is similar to that implied by market-based measures of monetary policy expectations. Musard-Gies (2006) shows that market interest rates react significantly to the bias in ECB's statements. Jansen and de Haan (2007) and Sturm and de Haan (2010) reveal that comments by euro area central bankers contain information on future ECB interest rate decisions. Ullrich (2008) and

Ehrmann and Fratzscher (2009) find that the ECB statements given at the press conferences following the interest rate decisions provide additional information to financial markets.

Concerning the Bank of England, Gerlach-Kristen (2004) shows that the voting record of the Bank of England's MPC helps predict future policy rate changes. Reeves and Sawicki (2007) find evidence that the publication of the Minutes and the Inflation report significantly affect near-term interest rate expectations, and Ehrmann and Sondermann (2012) show that market uncertainty in the United Kingdom rises until the Bank of England updates its communication.

Overall, thus, the empirical results for these central banks are consistent, even though the heterogeneity in communication strategies practices and monetary policy strategies makes the comparisons difficult. Central bank statements and speeches influence financial market participants, and help them predict the policy decisions to come.

However, on the theoretical side, there is still no consensus regarding the optimal level of transparency that central banks should adopt (Jensen, 2002; Walsh, 2007; Dale et al., 2008; Cukierman, 2009; van der Cruisjen et al., 2010; Rhee and Turdaliiev, 2013). The models differ notably with respect to the assumptions about how communication influence the monetary transmission mechanism and which aspects of central bank transparency they consider. Moreover, a recent brand of the literature has emphasized the need for central banks to be wary of communicating about issues on which it might receive noisy signals (Morris and Shin, 2002), such as economic fundamentals. Amato et al. (2002) justify this by arguing that central bank communication has a dual objective : it provides signals about the information of central banks, and it serves as a coordination device for the beliefs of financial market agents. The authors find that communication might be welfare reducing if agents put too much weight on central bank communication, and too little on their own private information¹.

On the one hand, many authors have criticized the validity of this result and its implications. Woodford (2005) argues that the Morris and Shin problem is even

¹Additional studies confirm the relevance of this result : James and Lawler (2011, 2012) consider the social value of public information in the presence of active central bank policy intervention, they confirm that public disclosure of the central bank's information is unambiguously undesirable. Baeriswyl (2011) presents a model to capture the endogenous nature of central bank information. He highlights the detrimental effects of transparency in this context.

less likely to arise if the coordination of private agents' actions is a welfare objective per se. Svensson (2006) interprets the main results of Morris and Shin (2002) as being pro-transparent, except in very special circumstances, and Gosselin et al. (2007) suggest that it is unrealistic to think that a central bank can withhold information as Amato et al. (2002) propose.

On the other hand, several studies have focused on the strategy that central banks should implement to avoid the negative effects induced by an overreaction on the public signal. Cornand and Heinemann (2008) find that public information should always be provided with maximum precision but, under certain conditions, not to all agents, and that this degree of publicity restriction is the best-suited instrument for preventing the negative welfare effects of public announcements. Following this insight, Cornand and Baeriswyl (2014) run a laboratory experiment to show that the central bank may reduce this overreaction by disclosing information to only a fraction of market participants (partial publicity) or by disclosing information to all participants but with ambiguity (partial transparency). In parallel, Demertzis and Viegi (2008, 2009) find that a monetary policy regime should have an explicit quantitative objective of inflation target, to provide individuals better anchors on which to coordinate their expectations, while Myatt and Wallace (2014) argue that an output-stabilizing central bank prefers "averagely public" information, and sometimes limits the clarity of its policy announcements to achieve this.

Hence, even though central banks disseminate information that has an empirical positive impact for financial markets, there is still no consensus reached about the optimal level of disclosure in the theoretical literature.

0.2 The limit of the existing literature

Despite the rich and abundant references on this topic, a very first look on the issues raised by the empirical studies about central banks communication shows a lack of matters related to the central banks' decision making process, although the increased communication devices used and published by central banks offer valuable tools to understand the way they take their decisions.

Among the few studies that has used communication to shed some light on central

bank's decision making process, Jansen and de Haan (2006) find that comments by central bankers on interest rates, inflation and economic growth in the euro-zone have often been contradictory, showing a potential conflict of views inside the Governing Council of the ECB the first years of the EMU. Berger et al. (2011) examine the role of money in the policies of the ECB, using introductory statements of the ECB President during the period 1999-2004. They find that over time, the relative amount of words devoted to the monetary analysis has decreased, and that the indicators of the monetary policy stance suggests that developments in the monetary sector only played a minor role most of the time.

For the Fed, Meade and Thornton (2011) use the FOMC transcripts to examine the role that the Phillips curve framework played in Fed policymaking from 1979 through 2003. Their analysis suggests that the Phillips curve was much less central to the formulation and implementation of U.S. monetary policy than it is in models commonly used to evaluate that policy. Chappell et al. (2012) use records from FOMC meetings to investigate the importance of deliberation and learning in monetary policy decision making in the period from 1970 to 1978, when Arthur Burns served as Chairman. They find that within-meeting deliberation might have had little effect on the quality of monetary policy decisions. Finally, Hansen et al. (2014) exploit a natural experiment in the FOMC in 1993 together with computational linguistic models to measure the effect of increased transparency on debate. They find both a beneficial discipline effect² and a detrimental conformity effect³. Hence, even though central banks (in particular the ECB) do not release similar information to the public (cf. Table 2 below), a potential driver of the scarcity of empirical studies is the standard economic tools that have been used until now in the context of central banks' communication. This has been emphasized by Calhoun (2011), who suggests that economics has not sufficiently used contributions from experiments, surveys, or textual analysis in the context of communication studies. He argues that this might be due to the boundaries of the analytic approaches that cannot use effectively the information derived from communication.

²The discipline effect has been emphasized in the Holmström (1999) career concerns. The more precise the signal the principal observes about the agent, the higher the equilibrium effort of the agent.

³The conformity effect is formalized in the career concerns literature (Prat 2005). Greater disclosure can induce experts who are concerned with their professional reputation to pool on actions that are optimal given available public signals even when their private signals would suggest that other actions are optimal.

Researchers that have an interest on communication are then pushed to break out of the approaches that have been standard in their respective fields.

A point of view shared by Wildman (2008), for whom both disciplines (communication and economics) share an interest in developing a better understanding of communication processes, even though there is little awareness in either field of theoretical advances and empirical findings of the other.

Therefore, given that the the provision and the publication of central banks' communication tools open perspectives to unveil further aspects related to the conduct of monetary policy, this thesis stands out from the existing empirical literature, by addressing issues related to central banks' communication and their decision-making processes, using tools from other social sciences, such as political science, sociology and psychology⁴, along with the standard econometric and theoretical models, as we show in the next section.

TABLE 2: Information made available by different central banks

	Federal Reserve	Bank of England	European Central Bank
Release of Minutes	Yes	Yes	No
Release of Transcripts	Yes	No	No

0.3 Outline and Contribution

0.3.1 Chapter 1 - Speaking in Tongues? Diagnosing the consistency of central banks' official communication

An important feature emphasized in the literature of central banks communication is that it consists in a two way street (Blinder et al., 2008) : it has both a transmitter (the central bank) and a receiver (e.g. the financial market), and this could be a source of uncertainty or confusion, in particular on the receiver side.

A similar message may be interpreted differently by the listeners due to different expectations or beliefs in different models. As an illustration, Fracasso et al., (2003) use survey data to analyze whether inflation reports of central banks reach

⁴The relevance of this approach has been emphasized by Sparviero (2010), who argues that the task of understanding the complex evolution of some fields (like, e.g., monetary policy) should be undertaken by adopting a multi-disciplinary framework.

different audiences equally well. They find that the same inflation report is perceived differently by different respondents, and that interest rate surprises tend to increase with the divergence in perceptions.

The assumption of a common interpretation of the public signal has also been questioned in other parts of the literature. Lahiri and Sheng (2008) show that professional forecasters, although observing the same statistical data, persistently disagree on the future rates of inflation, unemployment and GDP growth. Psychological studies find that one reason for these persistent differences may be overconfidence : Ben David et al. (2010) reveal that top financial executives are too confident with respect to their own knowledge and own understanding of the model of the world. They are persistently failing in learning how to make correct inferences from the data. Odean (1998) also provides empirical evidence that agents keep on following their convictions, even after learning that they disagree and that they may be wrong.

Hence, given that agents might process the same information differently (de Haan et al., 2004), the trade-off between precision of information and common interpretation of the public signal is central in the context of central bank communication. In other words, the conduct of monetary policy and the theoretical debates on central bank transparency are tied to the nature of common understanding of central banks' communicated messages, and the best policies that would foster such common understanding (Morris and Shin, 2007).

The first chapter of this thesis proposes, in a first step, to embed the assumption of a different interpretation of the public signal in a theoretical model, as follows: the central bank (the transmitter), communicates with agents (the receivers) who come from different countries or have a different cultural and/or linguistic background. This is justified by the fact that some central banks manage a currency that is internationalized (the U.S. dollar being a case in point), and thus communicate to an international audience, or implement their monetary policy in a currency area where people have a different cultural and linguistic background (like, e.g., in the euro area). These features would induce different perceptions of the public signal.

This assumption is modeled in an otherwise standard Morris and Shin framework (Morris and Shin, 2002), to put the emphasis on the importance of the public and

the private signals in the expectational process of the agents.

The results reveal that, in the context of an internationalized currency and/or an heterogeneous audience, the weight given to the public signal is stronger in the expectational process of the agents than in a standard framework. Therefore, central banks confronted to receivers that might process the public information differently should improve the consistency of their communication policy, so that (different) agents can make similar expectations of the policy rate. In a nutshell, these central banks should try to be more predictable through their communication policy.

In a second step, we propose to test the consistency of the communication policy of central banks using the Wordscores methodology. Implemented mainly in the political science literature, Wordscores proceed to a textual analysis of the communication tools delivered by central banks, such as their *Monthly Bulletin*, to check if, using only the official words, different agents can process the public signal similarly, and make the good expectation of the policy rate.

The results of this second step reveal that central banks that manage an internationalized currency, or have an heterogeneous audience (among which, the FED and the ECB), have the most consistent, and thus the most predictable, communication policy.

The Wordscores methodology

Wordscores infers policy positions, or scores, for new documents “virgin texts” on the basis of documents with known scores, “reference texts”. It uses the frequency of words in each document, relative to the total number of words in a text, based on the assumption that central banks with different policy positions use different wording which reflects their monetary policy stance. For instance, a central bank such as the ECB will use more frequently the word “vigilance” if it aims to implement a hawkish monetary policy (Jansen and de Haan, 2007).

The relative frequency of a given word w contained in a given reference text r , $F_{w,r}$, is used to compute the conditional probability that we are reading text r given that we are reading word w . This probability is then used to construct a score, S_w , for each word w as a weighted average of all the scores of reference texts where word w shows up, weighted by the calculated conditional probability.

In a second stage, the calculated word scores are used to compute an overall document score for each virgin text v , ωv , as the sum of the scores of words contained in it weighted by their relative frequency F_{wv} :

$$\omega v = \sum (F_{wv} \cdot S_w)$$

The contribution of this chapter is two-fold : First, it contributes to the literature on central bank communication by considering into a theoretical framework the heterogeneity of the receivers of central banks’ public signals, and emphasizes its impact on their expectational process. Second, it shows the specificity of the communication policy of central banks which are confronted to this heterogeneity. The results reveal that central banks tend to design their communication policy to adapt to the specificity of their audiences, and the constraints that this specificity, i.e, agents’ heterogeneity, might raise.

0.3.2 Chapter 2 - Is the euro area a stressful monetary union? Learning from newspapers' monetary policy coverage

In the second chapter, we put the emphasis not on the implications of the heterogeneity of central banks' signal receivers, but on the heterogeneous policy preferences inside the committee decision of a central bank, such as the Governing Council (GC) of the ECB.

The choice of the ECB is motivated by the persistent economic divergences inside the euro area (Benalal et al., 2006; Eickmeier, 2009), that have led to a growing empirical literature with a focus on the degree of monetary policy stress. Stress is defined as the difference of the actual policy rate determined by the common central bank, i.e. the ECB, and the "optimal" rate which would prevail if the policy rate would be determined by a country's central bank focused on its economic conditions alone (Clarida et al., 1998). The findings point out the existence of a persistent degree of monetary stress between euro member countries, and thus, between national central bankers. The main assumption underlying these studies is that the degree of economic heterogeneity between member countries in the euro area have lead to an heterogeneity in their monetary policy preferences.

Among the main findings, Flaig and Wollmershäuser (2007) show that for most of the Euro-zone countries interest rates have been too low over the 1999-2005 period, while stress in Germany is close to zero, implying that the ECB closely follows the policy of the Bundesbank during the pre-EMU period. Sturm and Wollmershäuser (2008) find that countries of the Periphery of Europe (Ireland, Greece, Portugal, and Spain) experience a negative stress level⁵, while average stress levels for the Netherlands and Finland were close to zero. Finally, Quint (2014) finds that monetary policy stress within the euro area has been steadily decreasing prior to the recent financial crisis.

However, a potential limit of these studies is due to the non publication of the GC's minutes of policy meetings. It remains then questionable whether central bank governors take into account data at the national level in their decision making process, or have a euro area wide view, as the ECB officially pretends. Hence,

⁵A negative stress level occurs when the interest rate implemented by the common central bank (ECB) is lower than the interest rate that a country's central bank would set.

even though empirical studies suggest that the former case is more likely than the latter given the path of the ECB's policy rate (Hayo and Méon, 2013; Bouver and King, 2013), it still rests on questionable assumptions.

In this chapter, in order to overcome the absence of GC's minutes of meetings, and to reveal central bankers' preferences in the euro area, we proceed to a textual analysis of the national newspaper articles covering central bankers' monetary policy decisions and statements. This approach is motivated by the evidence that newspapers are considered as demand-driven profit maximizing firms (Mullainathan and Shleifer, 2005; Gentzkow and Shapiro, 2006, 2010). Then, newspapers in the euro area may respond to national publics' demand through their monetary policy coverage, revealing their preferences on monetary policy issues. And given that national central bank governors in the euro area may react to public pressures in their home countries (Maier and Bezoen, 2004), they may respond to the national preferences voiced through the press of their home countries via their monetary policy decisions.

We follow Schonard-Bailey and Bailey (2009, 2013) and use Alceste software to reveal the topics and issues raised by the national newspapers when covering European central bankers' statements and policy decisions. We obtain a set of topics referring to economic issues for each national newspaper, with different allocated weights.

The Alceste methodology

ALCESTE was developed by Max Reinert in 1983 and was mainly used in human and social sciences like sociology and psychology (Reinert et al., 1995; Lahlou, 1996; Schonhardt-Bailey, 2009). This software combines textual and statistical features. It identifies a speaker's association of ideas and main arguments following his discourse. For this purpose, the software relies upon co-occurrence analysis, which is the statistical analysis of frequent word pairs in a text corpus, in order to realize a Hierarchical Decreasing Classification (HDC) process: this process uses a methodology that combines different statistical methods like segmentation, hierarchical classification and dichotomization.

ALCESTE starts by classifying words distribution within a text, to obtain a classification of simple statements and to reveal the keywords, which in turn are distinguished as word classes that reveal different forms of discourses in the speech. ALCESTE uses its dictionary to distinguish the forms of the words and uses the "content words" that carry all the information about the meaning of the discourse. It creates a data matrix to quantify the presence of these content words in the corpus. Then, it uses a Hierarchical Decreasing Classification to identify word classes using these content words. Research has shown that these structures are closely linked to the distribution of the words in a text (Benzécri, 1982). It is worth noting that ALCESTE cannot analyze corpora with multiple discrete topics. Therefore, the textual data must be consistent and large enough.

In a second step, and after determining the weight of the topics raised by the national press in the euro area, we proceed to a cluster analysis with the results of the textual analysis to regroup the national central bankers according to the issues raised by the press of their respective countries. We consider that the identified groups of central bankers share common preferences inside the GC, and can form coalitions with common interests.

We identify three coalitions of countries, a group from Northern Europe (Belgium, the Netherlands, Finland), a group from the Periphery of Europe (Italy, Ireland, Greece), a group from Southern Europe (Spain, Portugal), and two isolated countries (France and Germany).

Finally, we compute a degree of stress measure for each of the identified coalitions

and the isolated countries, by comparing a counterfactual interest rate derived from their pre-EMU monetary policy rules, with the ECB's key policy rate.

The findings reveal a persistent low stress measure for Germany, France and a group of countries from Northern Europe (Belgium, the Netherlands, and Finland) during the first years of the EMU, while stress measure for countries from the Periphery (Greece, Ireland, and Italy) and the South (Spain, Portugal) has a higher value, although decreasing over time. This suggests that the ECB followed a policy rule that was in line with the one of the Bundesbank during the pre-EMU period (at least in the first years of the EMU), and that the common monetary policy fits further the heterogeneous preferences of countries composing the euro area, and thus, the different preferences of the European central bankers.

This chapter thus adds to the literature on ECB's communication by providing a novel textual analysis method to assess the preferences of its GC's members, and identifying coalitions of countries that share similar preferences, as established by the press coverage of their home countries. This approach has the advantage of combining the contribution of a textual analysis tool and an econometric one, to shed further lights on the ECB's decision-making process.

0.3.3 Chapter 3 - Dissecting the brains of central bankers: The case of the ECB's Governing Council members on reforms

As emphasized in chapter 2, it is now widely recognized that inside the monetary policy committees of central banks, members may have different policy preferences. The literature has identified two main determinants that explain this heterogeneity in preferences. First, a different position in the business cycle of the regions composing the currency area. This is notably the case for Fed district representatives inside the FOMC (Meade and Sheet, 2005), and for the national central bankers inside the GC of the ECB (Heinemann and Huefner, 2004). Both are known to potentially have a "regional bias" when expressing their policy preferences (Chappell et al., 2008 ; Cancelo et al., 2011; Hayo and Neuenkirch, 2013).

Another source of heterogeneity may come from the background of central bankers, i.e. the educational and professional experiences that shape their policy preferences, which is referred as the indoctrination process in the literature (Frank et

al., 1993). For example, Harris et al. (2011) and Eichler and Löhner (2013) find that having experience in the central bank, the industry sector, and in academia is a source of variation in policy preferences inside the monetary policy committee of the Bank of England and the FOMC, respectively.

In this context, the recent economic and financial crisis has also been a source of heterogeneity in policy preferences between central bankers, in particular on the economic reforms that should be implemented. This is notably the case in the euro area, where member countries advocate the implementation of sometimes diverging reforms. Hence, national central bankers have expressed different opinions in the media, on the necessary reforms to implement in the context of the euro debt crisis (van Esch and de Jong, 2013). The case of the Eurobond is illustrative, as Klaas Knot has expressed a favorable opinion about the implementation of the Eurobonds in the euro area⁶, while, Jens Weidmann was against the implementation of such a reform⁷.

In chapter three, we assess whether the indoctrination process has played a role in the heterogeneity of central bankers' opinions, in particular on the economic reforms they advocate through their public speeches.

In a first step, we extract the reform proposals European central bankers have advocated in their speeches since the onset of the euro debt crisis. For that purpose, we use the cognitive map methodology. This approach has been widely used in Political Science, essentially to unveil the mental maps and beliefs of political leaders on certain political and economic issues (Hart, 1977).

Cognitive Mapping

Cognitive map is a method for uncovering decision makers' beliefs such as central bankers, it has been successfully applied in political science, social psychology and organizational studies (Axelrod 1976; Bougon et al. 1977; Curseu et al. 2010).

This method enables a qualitative and quantitative comparison of central bankers' beliefs, and it allows for a more discrete focus on European economic and monetary issues.

⁶Source: <http://www.bis.org/review/r120308b.pdf>

⁷Source: http://www.lemonde.fr/economie/article/2012/05/25/jens-weidmann-croire-que-les-eurobonds-resoudront-la-crise-est-une-illusion_1707264_234.html

In order to create the cognitive maps of central bankers, their public speeches on the topic of European economic and monetary union and the euro debt crisis are analyzed to derive all the causal relationships they make between economic concepts. Doing so, this approach allows to determine all the reforms European central bankers proposed in the context of the euro debt crisis. In a second step, we regress the reform central bankers' proposed through their speeches (derived from their cognitive maps) on their educational, professional, and political backgrounds.

The results reveal a clear influence of the educational and professional backgrounds of central bankers on their economic reform proposals. This shows that the indoctrination process central bankers experienced in their past has a significant impact on their economic reforms' preferences, such as for their monetary policy preferences. Among the main findings, we highlight that central bankers coming from the public sector tend to favor national measures through their speeches (i.e., reforms that should be adopted at the national level), while central bankers with a banking and central banking backgrounds tend to promote measures that have to be adopted at the supranational level (like, e.g., by the European commission). The political affiliation of governments that appointed the central bankers plays also a key role, as those appointed by leftist governments support structural reforms and the bond purchasing program. Overall, our empirical results confirm that the indoctrination process European central bankers experienced in their careers is important for the type of policy reforms they would like to see implemented.

Hence, this chapter sheds some light on an additional source of heterogeneity among the European central bankers, in particular on their economic policy preferences in the context of the euro debt crisis. We consider that this source of heterogeneity can be explained (at least partially) by the indoctrination process central bankers experienced in their past. We find a significant influence of their educational and professional background on their economic reform proposals.

Again, this chapter has contributed to the literature on central bank's communication by using both a textual analysis tool and an econometric model, with the

aim to deliver further insights on the ECB's decision making process.

0.3.4 Chapter 4 - FOMC Members' Incentives to Disagree: Regional Motives and Background Incentives

Following the line of thought of chapter 2 and 3, the last chapter of this thesis focuses on central bank's decision-making process, but unlike the two previous chapters, we examine the case of the Federal Reserve. More specifically, we study the influence of the regional and the background motives on FOMC members' incentives to disagree on the proposed policy rate.

Since the beginning of the nineties, and the studies of Gildea (1990), Havrilesky and Schweitzer (1990), Havrilesky and Gildea (1991) and Chappell et al. (1995) on the FOMC decision making, it has been shown that the professional experience of a central banker is determinant for his monetary policy preferences. Since then, many studies found this result also relevant for other central banks, such as for the Bank of England (Harris et al., 2011), and the Riksbank (Jung, 2013). In parallel, another strand of empirical studies has assessed the significant influence of the economic situation of the home district on FOMC member policy preferences, in particular for Fed presidents (Meade and Sheets, 2005 ; Eichler and Löhner, 2014). This chapter starts by pointing out an important limit in these two distinct but not unrelated literatures : the evidence that both the regional and the background effects were generally considered separately in explaining FOMC members' disagreements during monetary policy meetings, despite the fact that they can have a simultaneous impact on FOMC members' monetary policy preferences.

This chapter thus contributes to the existing literature by considering and providing a way to disentangle the two effects, that were generally confused in the literature, either because the authors searched for regional economic influences without considering background effects or, on the opposite, were looking for background effects without controlling for regional developments.

First, an important contribution of this paper is to build a consistent dataset of economic aggregates coinciding with each Reserve Bank's area. Second, we derive FOMC members' policy preferences from the transcripts for the period 1994-2008.

Then, we estimate an individual Taylor-type rule for each FOMC member to derive their reaction functions, explicitly taking into account the “regional bias” in their decision making process. This allows to simulate their desired interest rates for the period 1994-2008.

In a final step, we estimate the impact of the FOMC members’ background on their policy preferences (i.e. their desired interest rates), to assess how backgrounds shape their preferences. The results of the estimations show a significant impact on the background of FOMC member on their policy preferences. They also show that, under the chairmanship of Bernanke, the propensity to disagree seem to have declined for all types of members.

The contribution of this paper is thus two-fold : we built a novel macroeconomic dataset coinciding with the Fed’s districts, and we add on the literature on the FOMC decision making process by considering simultaneously two effects that have an impact on their expressed policy preferences.

Hence, with the issues raised in each of the chapters, this thesis is of interest for economic policymakers as it unveils some aspects related to the conduct of central banks’ communication policy. These aspects are seen as a value added to assess and understand the new challenges that central banks face nowadays, particularly in the light of the recent financial crisis.

Chapter 1

Speaking in Tongues? Diagnosing the consistency of central banks' official communication¹

1.1 Introduction

As emphasized in the introduction, it is now widely recognized that communication policy is an important instrument in the central banks' toolbox. An effective communication policy is more and more seen as a mean to enhance the consistency (i.e., clarity and, thus, the predictability) of monetary policy decisions, improve monetary policy's effectiveness and, in the end, meet the objective of price stability (see, e.g., Issing, 1999, Woodford, 2001 or Mishkin, 2004).

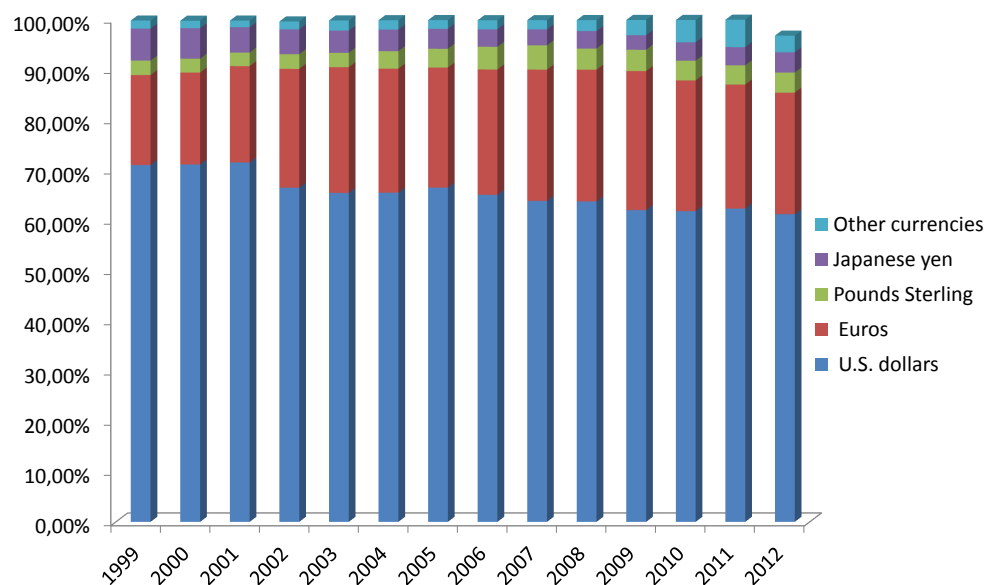
Clearly, the choice of a communication strategy by a central bank, and of the tools used to implement it, does not only depend on the framework adopted (among which, inflation targeting). It should also be adapted to the audiences that receive the signals sent by the central bank. However, these audiences can differ in several dimensions. The ones on which this paper focuses are, (i), the use of the domestic currency in the international markets (or, the relative importance of the international audience, compared to the national one) and, (ii), the cultural heterogeneity of the public (a feature which can be related, e.g., to the linguistic diversity, the

¹This chapter is based on a joint work with Etienne Farvaque.

degree of financial literacy of the audience, or a measure of the distance of an agent from the central bank's position - say, its headquarters).

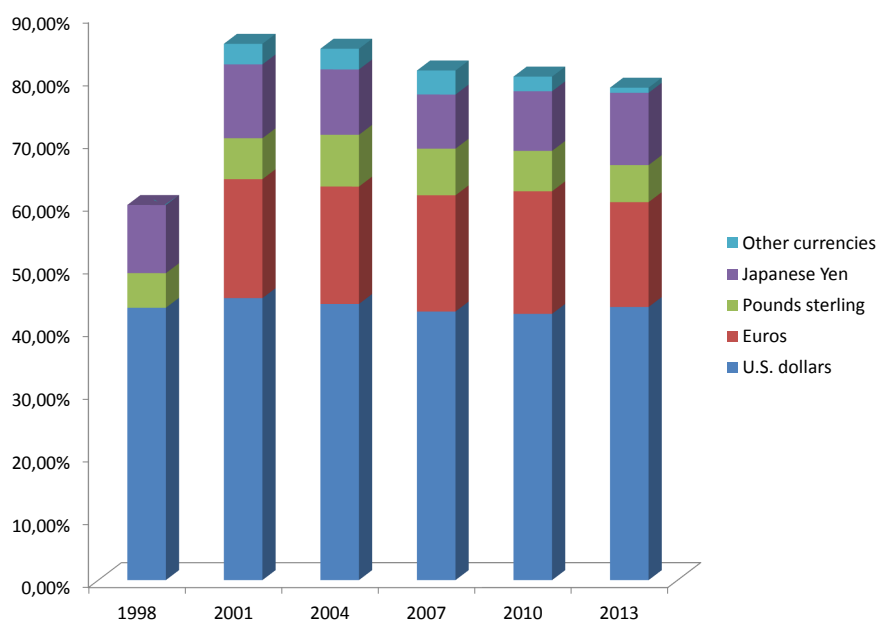
The first dimension - that domestic currencies traded in other countries (i.e., "xenocurrencies") are more numerous and more traded today - has been described by, e.g., Thimann (2008), and is illustrated by the American dollar. The latter is a paragon of the situation, as at least half of the U.S. currency circulates abroad (Judson, 2012). But the dollar is not alone: since its inception, the euro has also internationalized, and rapidly so, reaching an important position in international financial flows (see, e.g., Gourinchas et al., 2012). Figures 1.1 and 1.2 illustrate the increasing importance of the euro, and the non-negligible share of other currencies, in the conduct of international trade and finance. As shown in Figure 1.1, in the 1999-2012 period, 80%-90% of official foreign exchange reserves were held in U.S. dollars or euros. The U.S. dollar and the euro are also heavily used as means of effecting payments in international trade. An indication of this is that dollars and euros passed hands in 60% to 70% of all transactions in foreign-exchange markets (Figure 1.2). The figures also reveal that, even though two currencies strongly dominate, the importance of international audiences is also a concern for other central banks, whose currency is also internationally exposed. In a word, central banks now have to expect their communications to impact not only their own residents, but also international actors (themselves potentially of different kinds: fund managers, insurers, exporters, tourists, etc.).

FIGURE 1.1: Currency Composition of Official Foreign Exchange Reserves.



Source: IMF(2013)

FIGURE 1.2: Currency distribution of global foreign exchange market turnover.



Note: As two currencies are involved in the each transaction, the percentage shares of individual currencies sums to 200%.

Source: BIS(2013)

On the second dimension, the heterogeneity of the central banks' audiences, the literature has been relatively divided. On the theoretical side, the stress has been put on the reception of the messages sent by the central bank, and the implied degree of transparency of the central bank. In particular, Morris and Shin (2002), Cornand and Heinemann (2008), Demertzis and Viegi (2008), Hellwig and Veldkamp (2008), Gizatulina (2013), and Cornand and Baeriswyl (2014) have analyzed the optimal communication of central banks confronted with agents that receive noisy information and conflicting signals. The assumption of this strand of the literature, which we share, is that central banks are not able to affect similarly the expectations of all private-sector members at all times. Empirically, the focus, up to now, has essentially been on the degree(s) of financial literacy of the general public and the understanding (and, in the end, endorsement) of monetary policy (see, e.g., van der Cruijsen et al., 2011, or Carvalho and Nechio, 2014). But the heterogeneity also characterizes professional policy forecasters, if only because of their distance to the central bank as an "informational hub" (Berger et al., 2009), or because of different priors (Berger et al., 2011).

As a consequence, we here develop a framework that allows to consider the two dimensions simultaneously, and we analyze the implications of the heterogeneity of the "receivers" of the messages or signals sent by the central banks, both theoretically and empirically. We consider the two dimensions in the same model because the internationalization of the currencies itself brings a new twist to the issue, as the language agents speak in their everyday life may not be the same as the one used by the central bank that manages the currency they use or trade in. This may typically be the case in countries with a large population of immigrants (Canada, for example) or when the currency is used by agents with different cultural backgrounds and belongings (as in the euro area or in the U.S.). One can thus expect that the communication policies of central banks that act in such a context have to be different than for the ones that interact with a more homogeneous population (as the Bank of Japan, for example).

However, to our knowledge, if the communication by central banks has been studied, the presence of an international audience in parallel to the national one, and the interaction with heterogeneous backgrounds (cultural and/or linguistic) has

not been fully investigated. The case we make in this paper is that both dimensions have to be considered, as they do not systematically overlap or are not present to the same degree. More precisely, if, in some cases, the two dimensions are related, they are clearly distinct in other ones. For example, the international use of the dollar means that, in many parts of the world, the Federal Reserve communicates with agents that do not belong to her national audience, nor share her language. In this case, the two dimensions overlap. The euro area is a different case in point, as the euro “national” market does not coincide with a - culturally and linguistically - homogeneous audience while, in parallel, the European Central Bank has to deal with the international role of the euro. Hence, the euro area is a case where the two dimensions are not superposed on each other. These two central banks thus provide two cases in a spectrum that can host the other central banks.

Our assumption is that a larger degree of internationalization and / or of heterogeneity of the audience should induce the central bank to communicate in a more consistent way², to allow agents to “learn” her language, so that they can make similar expectations on the future stance of the policy rate. In other words, our argument is that the more diverse the audience, the more consistent (and thus, predictable) should the central bank’s communication be.

The model we build on is Morris and Shin’s (2002), which has become the workhorse model to study communication policies. We modify it to embed explicitly the different dimensions outlined above, to check how it should impact the central banks’ communication consistency. The model also includes, more standardly, the monetary policy framework chosen. As the adoption of an inflation target by many central banks in developed countries has contributed to dug the institutional differences between monetary institutions, it is now usual to compare the targeting institutions with the non-targeting ones. This dimension has been the most studied and, although a consensus still has to be established on the relative benefits of inflation targeting (see, e.g., Mishkin and Schmidt-Hebbel, 2007; Blattner et al., 2008; Capistran and Ramos-Francia, 2009), it has been shown that inflation targeters have a reinforced duty to anchor the agents’ expectations (Johnson, 2002;

²By being consistent, we mean that a central bank communicates with a similar vocabulary/lexicon through time.

Levin et al., 2004; Vega and Winkelried, 2005; Gurkaynak et al., 2010). Communicating consistently is certainly crucial here, and the fact that non-targeting central banks appear to be more predictable than targeting ones (Willhelmsen and Zaghini, 2011) may be due to the fact that these central banks (among which no less than the European Central Bank and the Federal Reserve) have had to overcome the absence of an inflation target in their strategy by a better (i.e., more consistent) communication policy.

In our view, the existence and relative importance of the dimensions exposed here probably explain that Ehrmann and Fratzscher (2007) find a large variation in communication strategies across central banks and, more generally, that a consensus about an optimal communication strategy has not yet emerged, as Blinder et al. (2008) expose. This is probably only a revelator of the fact that central banks try to manage expectations in different ways because they have to, due to the different frameworks they have adopted and to the relative importance of the different types of audiences they have to communicate to. In Table 1.1, we synthesize the dimensions that communication policies of central banks have to take into account. As one can see, diversity rules, as no central bank is confronted with a comparable situation.

TABLE 1.1: Central banks' characterization

Central Bank	Currency internat.	Inflat. Target	Ethnic fract.*	Language fract.*
European Central Bank (ECB)	24%	NO	0.23	0.27
Federal Reserve (FED)	62%	NO	0.49	0.25
Bank of England (BoE)	4%	YES	0.12	0.05
Bank of Japan (BoJ)	4%	NO	0.01	0.01
Bank of Canada (BoC)	n/a	YES	0.71	0.57
Riksbank	n/a	YES	0.06	0.19
Norges Bank	n/a	YES	0.05	0.06

*frac: fractionalization.

Source : authors, based on IMF (2013) and Alesina et al. (2003).

Of course, this has not forbidden the literature to test the effectiveness of central banks' transparency and, thus, their different means of communicating their policy stance. For instance, Carlson et al. (2006) show that the communication

apparatus built by the FOMC has improved the public's ability to predict interest rate decision. Hayo and Neuenkirch (2010) find that FOMC communications help predict target rate decisions, while Apel and Grimaldi (2012) observe that the sentiment and tone of Swedish central bank's minutes is useful in predicting future policy decisions. For the Norges Bank, Holmsen et al. (2008) show that the publication of its interest rate forecasts improves the financial markets participants' understanding of central bank's reaction. Transparency being a component of what may constitute an optimal communication strategy, the literature has also brought some results. For example, Walsh (2007) stresses that more-accurate central bank forecasts of demand shocks reduce the optimal degree of transparency, while more-accurate forecasts of cost shocks increase it. Also, van der Cruijsen et al. (2010) show that, beyond the optimal level of transparency, the accuracy of private sector expectations starts to worsen.

Our argument thus builds on these established facts and results. We contend that each central bank has to adapt and design the consistency of its communication policy depending on the underlying environment it is confronted with: the presence of a multi-cultural factor, the pressures that it may undergo due to the internationalization of its currency, and the adoption (or not) of an inflation target. Each of these features may induce the monetary authority to send more consistent messages to the audiences with which she has to communicate, to increase the influence of her communication by allowing her audience(s) to learn her own language. We thus confront the intuitions from the theoretical model to the actual communication of 7 central banks (representative of the different possible cases, as summarized in Table 1.1), using the official statements to assess the consistency of the guidance delivered by central banks. In other words, we examine whether central banks' communication has remained consistent over time, in order to reduce the various discrepancies that may exist between different types of agents' expectations, and if the more exposed central banks (to the dimensions outlined above) have managed to be more consistent than their less exposed peers. We thus offer a diagnosis, comparing the theoretical optimal policy with the one actually used by these central banks.

The remainder of the paper is thus organized as follows: Section 1.2 introduces the theoretical model. Section 1.3 tests the empirical accuracy of the model with

regard to central banks' communication consistency and presents the results, while section 1.4 concludes.

1.2 The Model

1.2.1 The central banks' objectives

We start with a standard framework, fundamentally based on Morris and Shin's (2002) referential model, so as to facilitate comparisons with previous works and to avoid relying on debatable assumptions. As such, we look at the discretionary case and consider that a central bank that does not adopt an inflation targeting framework receives the following instantaneous loss function:

$$L_t^{NT} = \frac{1}{2} E_t [(1 + \lambda) y_t^2 + (\delta - \lambda) (\pi_t - \pi^*)^2] \quad (1.1)$$

where π_t denotes the inflation rate at time t , π^* the inflation objective, E_t the expectations operator, y_t the output gap, and where uncertainty about the central bank's preferences is represented by the random variable λ . It is assumed that $\lambda \in [-1, \delta]$ and that $E(\lambda) = 0$; $E(\lambda^2) = \sigma_\lambda^2$. In other words, there is an informational asymmetry between the central bank and the general public about the weight of the arguments in the monetary authority's objective function, as in, e.g., Chortareas and Miller (2003) or Ciccarone and Marchetti (2012).

An inflation targeting central bank is assigned the following standard loss function, as in, for example, Walsh (2010):

$$L_t^{IT} = \frac{1}{2} E_t [(1 + \lambda) y_t^2 + (\delta - \lambda) (\pi_t - \pi^*)^2 + h (\pi_t - \pi^T)^2] \quad (1.2)$$

where π^T is the central bank's inflation target. The central bank, whatever the regime it has adopted, acts under the constraint of a standard Lucas-type supply function³:

$$y_t = \omega (\pi_t - \pi_t^e) - \varepsilon_t \quad (1.3)$$

³Fendel and Rülke (2012) and Abott and Martinez (2008) provide empirical evidence on the Lucas supply function for developed economies, showing in particular that the inflation surprises positively correlate with the output gap.

where π_t^e denotes private sector expectations about the relevant state of inflation, and ε designates the supply shock, with zero mean and constant variance, σ_ε^2 .

Standard resolution by minimizing the loss function with regard to inflation delivers the inflation rate under each policy framework:

$$\pi_t^{NT} = \frac{(\delta - \lambda)^2 \pi^* - \omega^2 (1 + \lambda)^2 \varepsilon_t}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2} + \frac{\omega^2 (1 + \lambda)^2}{\zeta^{NT}} \pi_t^e \quad (1.4)$$

$$\pi_t^{IT} = \frac{(\delta - \lambda)^2 \pi^* - \omega^2 (1 + \lambda)^2 \varepsilon_t + h^2 \pi^T}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2 + h^2} + \frac{\omega^2 (1 + \lambda)^2}{\zeta^{IT}} \pi_t^e \quad (1.5)$$

where $\zeta^{NT} = \omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2$ and $\zeta^{IT} = \omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2 + h^2$. It can be seen easily from the comparison of the two expressions that an inflation targeting regime reduces the risk of a drift of the inflation process the central bank has to control (as can be seen by comparing the coefficients associated with the expectation term in the two equations, and noting that $\frac{\omega^2 (1 + \lambda)^2}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2 + h^2} < \frac{\omega^2 (1 + \lambda)^2}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2}$). This result, now standard (see Walsh, 2010), can however be mediated (and even reversed) by the uncertainty surrounding the central banks' preferences (δ). Inflation targeting is thus not necessarily a winning strategy in presence of uncertainty.

1.2.2 Private agents' expectations

Adopting the point of view of any agent i , member of a continuum of agents spread over the unit interval $[0, 1]$, the agent has to chose an expectation of inflation, $\pi_{i,t}^e$, to maximize a Morris and Shin's (2002) type of utility function given by:

$$u_i(\pi_{i,t}^e, \pi_t) = -(1 - r)(\pi_{i,t}^e - \pi_t)^2 - r(L_i - \bar{L}) \quad (1.6)$$

where π_t is the "fundamental" rate of inflation the agent has to expect and r is a constant, such that $0 < r < 1$ and

$$L_i \equiv \int_0^1 (\pi_{j,t}^e - \pi_{i,t}^e)^2 dj \quad \text{and} \quad \bar{L} \equiv \int_0^1 L_j dj$$

The first part of the utility function is a standard quadratic loss in the distance between the agent's expectation and the underlying state of the economy, π_t . The

second part is the beauty contest element of the framework, which increases in the distance between each agent's action and the average action. The parameter r is the weight given to the beauty contest part (thus, a larger r corresponds to a greater consideration given to the externality related to the coordination motive of the population of agents). It has to be noted that, even though the (socially inefficient) externality disappears when one considers the aggregate population, there exists a conflict between individual decisions and the socially optimal solution.

The optimal expectations process for any agent is the first order condition:⁴

$$\pi_{i,t}^e = (1 - r) E_i(\pi_t) + r E_i(\bar{\pi}_t^e) \quad (1.7)$$

where π_t is the period inflation rate, and $\bar{\pi}_t^e$ the average expectations of the whole set of private agents living in the economy.

To inform their expectations, agents observe a public signal, p , related to inflation:

$$p_t = \pi_t + \eta_t \quad (1.8)$$

where η is normally distributed, with mean zero and variance σ_η^2 . Given the fact that the public signal is common knowledge, the best any agent can do is to second-guess what the others, the j agents, will anticipate. Hence, the expectation process can be rewritten as:

$$\pi_{i,t}^e(p) = (1 - r) E_i(\pi_t | p_t) + r \int_0^1 E(\bar{\pi}_{j,t}^e | p_t) d_j = p_t \quad (1.9)$$

In addition to the public signal, the agents will take into account a private signal, $s_{i,t}$. However, as stated in the introduction, given the evidence that agents differ in their degree of financial literacy, as well as the fact that some domestic users of a currency do not necessarily share the language used by the central bank, the information given by the central bank may not be interpreted in the same way by all agents. Thus, we consider that some agents have more precise private signals than others. Berger et al. (2009, 2011) make the case for the eurozone

⁴This expression is the same as the one used in Morris and Shin (2002).

and the U.S. respectively while, e.g., Farvaque et al. (2013) have shown that the European Central Bank (ECB) is confronted with differing degrees of trust depending on the country of residence. However, these observations can easily be generalized, as all the central banks that have to communicate with people of different origins⁵, languages⁶, backgrounds⁷ or degree of financial literacy⁸. Hence, the audience of the central bank can be divided into two categories. On the one hand, a category of people that do not necessarily understand perfectly the language used by the central bank, as it generally makes use of another one in its everyday life, or is further from the central bank's information hub (Berger et al., 2009). This category is referred to by an o subscript, and represents a fraction ρ of the population. And, on the other hand, the “vernacular”, regrouping the people that use (that is, understand perfectly) the idiom of the central bank, referred to by a v subscript, representing a fraction $(1 - \rho)$ of the total population. Hence, a proportion $(1 - \rho)$ of the population has a better handling of the information delivered by the central bank (i.e., the public signal), which translates in a smaller variance of the private signal processed by this share of the population. Formally, for the private signal, we have:

$$s_{o,t} = \pi_t + \kappa_{i,t}$$

$$s_{v,t} = \pi_t + \kappa'_{i,t}$$

with $\kappa_{i,t} \sim N(0; \sigma_\kappa^2)$ and $\kappa'_{i,t} \sim N(0; \frac{\sigma_\kappa^2}{\gamma})$.⁹

Considering agent i as a member of continuum of agents, the aggregate private signal is thus a weighted average of the private signals received by the two fractions of the central bank's audience and can then be written as follows:

$$s_{i,t} = \rho s_{o,t} + (1 - \rho) s_{v,t} = \pi_t + \rho \kappa_{i,t} + (1 - \rho) \kappa'_{i,t} \quad (1.10)$$

⁵Thinking of immigrants for example, one can consider the situation of Canada, where 20% of the population has a birthplace located out of the country.

⁶The European situation may come to one's mind, but the Fed has also to consider, for example, the situation of Puerto Rico.

⁷Backgrounds can be related to one's history (having known a situation of hyperinflation, for example), field of study, professional experience, etc. See Farvaque et al. (2013) for a discussion of these factors.

⁸On this dimension, see, e.g., Bucher-Koenen and Ziegelmeyer (2013) or Carvalho and Nechio (2014).

⁹See Cornand and Heinemann (2008) for a similar treatment of heterogeneity in a Morris and Shin (2002) framework.

The weight of the error term $\kappa_{i,t}$ in the agent's private signal depends on the value of ρ , i.e., the share of the audience that does not use a similar language as the central bank, and the weight of the error term $\kappa'_{i,t}$ depends on the share of the population that has a good understanding of central bank's communication $(1 - \rho)$. Hence, given that $\kappa_{i,t} > \kappa'_{i,t}$, the more an audience is culturally and linguistically heterogeneous, the more $\kappa_{i,t}$ has a large weight in the agent's private signal, the less this private signal is accurate, and vice versa.

Moreover, given the fact that some central banks have a wider scope in their communication process, if only because the currency they manage is more often used on international markets (see above and BIS, 2013), we include the possibility that central banks have to communicate to two types of agents. The first type is their “natural” destination, that is the people living in the currency area they manage, whose expectations process has been derived right up to here. The second type are the agents who use the currency they manage, if only for professional reasons (importers, exporters, fund managers, etc.), but do not live in the currency area (and for whom, as a consequence, their currency is not a “natural habitat”). An immediate analogy is with the “domestic bias” often observed in international finance (see, e.g., Karlsson and Nordén, 2007). This second type is considered here to rely more on information cascades or mimetic behavior (see Akerlof and Shiller, 2009) and, as a consequence, to discount further (or process worse, see Berger et al., 2009, 2011) the central bank's communication. This is introduced to take into account, for instance, that investors tend to fly back towards their “natural habitat” in times of crisis, or to herd, as has been seen regularly (see, for a recent illustration, Mobarek et al., 2014). Hence, in the continuum of agents in the economy, a fraction $(1 - P)$ of them discounts the central banks' communication. We thus assume that agents $i \in [P, 1]$ will de facto rely more on their private signals than the others.

As in Morris and Shin (2002) or Cornand and Heinemann (2008), we know, from the first order condition, that the expected inflation by an agent that receives both types of signal is given by:

$$E(\pi_t \mid p_t, s_{i,t}) = \frac{\alpha p_t + \beta s_{i,t}}{\alpha + \beta} \quad (1.11)$$

where $\alpha = 1/\sigma_\eta^2$ and $\beta = \gamma/(\rho\gamma + (1-\rho))\sigma_\kappa^2$ are the precision of the two information sources, while the others' expectation, as the agent can guess them, is:

$$E(s_{j,t} | p_t, s_{i,t}) = E(\pi_t | p_t, s_{i,t}) = \frac{\alpha p_t + \beta s_{i,t}}{\alpha + \beta}$$

Thereby, as demonstrated by Cornand and Heinemann (2008), the optimal strategy of any agent is a linear strategy of the form:

$$\pi_{j,t}^e = \varphi s_{i,t} + (1 - \varphi) p_t \quad (1.12)$$

The optimal weight given to the private (versus the public) signal, φ , depends on an agent's expectations about the behavior of the other agents. As the best response of any agent is unique, in equilibrium, all of them will select the same value for this parameter.

Given our assumption about the distribution of the agents along the continuum (i.e., the distinction of a part of the population that discounts more the central bank's communication), the conditional estimate of the average action across all agents is then given by the following:

$$\begin{aligned} E(\bar{\pi}_t^e) &= P[\varphi E(s_{j,t} | p_t, s_{i,t}) + (1 - \varphi) E(p_t | p_t, s_{i,t})] \\ &\quad + (1 - P)[\tau E(s_{j,t} | p_t, s_{i,t}) + (1 - \tau) E(p_t | p_t, s_{i,t})] \end{aligned} \quad (1.13)$$

where we assume that $\tau \equiv \varphi + \epsilon > \varphi$, to represent the higher discount of the public signal by the second part of the population, which is "further" (in terms of, e.g., language, distance, or background) from the central bank than the other part.¹⁰ Substituting with the expressions given above delivers:

$$E(\bar{\pi}_t^e) = [P(1 - \varphi) + (1 - P)(1 - \tau)]p_t + [1 - P(1 - \varphi) + (1 - P)\tau] \frac{\alpha p_t + \beta s_{i,t}}{\alpha + \beta}$$

As a consequence, for any resident agent i , the optimal expectation is of the form:

$$\pi_{i,t}^e = r E_i(\bar{\pi}_t^e | p_t, s_{i,t}) + (1 - r) E_i(\pi_t | p_t, s_{i,t})$$

¹⁰As a consequence, ϵ is only a distance parameter and can not be considered as a control variable for the typical agent.

By successive simplifications, this delivers:

$$\pi_{i,t}^e = p_t \frac{\alpha (1 + r (1 - P) + r \beta [P (1 - \varphi) + (1 - P) (1 - \tau)])}{\alpha + \beta} + s_{i,t} \frac{\beta (r [(1 - P) \tau - P (1 - \varphi)] + 1)}{\alpha + \beta} \quad (1.14)$$

Using $\tau = \varphi + \epsilon$, we get:

$$\pi_{i,t}^e = p_t \frac{\alpha (1 + r (1 - P) + r \beta [(1 - P) (1 - \epsilon) + P - \varphi])}{\alpha + \beta} + s_{i,t} \frac{\beta (r [\varphi - P + (1 - P) \epsilon] + 1)}{\alpha + \beta} \quad (1.15)$$

Then, comparing the value of the coefficients in (1.11) and (1.14) and solving for φ , we get the equilibrium value of this parameter:¹¹

$$\varphi^* = \frac{\beta (r [(1 - P) \epsilon - P] + 1)}{\alpha + \beta (1 - r)} \quad (1.16)$$

Hence an optimal expectation process by any agent i is equal to:

$$\pi_{i,t}^e = \frac{\beta (r [(1 - P) \epsilon - P] + 1)}{\alpha + \beta (1 - r)} s_{i,t} + \frac{\alpha - \beta r (1 - P) (1 + \epsilon)}{\alpha + \beta (1 - r)} p_t \quad (1.17)$$

and the average optimal expectation, (1.12), can thus be obtained - by successive substitutions - and be written as:

$$\bar{\pi}_t^e = s_{i,t} (\varphi + \epsilon (1 - P)) + p_t ((1 - \varphi) - \epsilon (1 - P))$$

or:

$$\bar{\pi}_t^e = s_{i,t} \left\{ \frac{(1 - P) \epsilon (\alpha + \beta) + \beta (1 - r P)}{\alpha + \beta (1 - r)} \right\} + p_t \left\{ \frac{\alpha - (1 - P) [\beta r (1 - \epsilon) + \epsilon (\alpha + \beta (1 + r))]}{\alpha + \beta (1 - r)} \right\}$$

¹¹And thus: $1 - \varphi = \frac{\alpha + \beta [1 + r(2 + 3P - \epsilon(1 - P))]}{\alpha + \beta (1 - r(1 - 2P))}$.

1.2.3 Central banks' communication impact on expectations

Inserting this expectation process in the central bank's control variable allows to analyze the impact of its communication, according to the chosen framework (π_t^{NT} and π_t^{IT}) and to the importance of the other factors we consider. Formally, combining equations (1.4), (1.5) and (1.15), we can write the inflation process the central bank has to manage as:

$$E_t(\pi_t^{NT}) = \frac{(\delta - \lambda)^2 \pi^*}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2} + \frac{\omega^2 (1 + \lambda)^2}{\zeta^{NT}} \bar{\pi}_t^e \quad (1.18)$$

$$E_t(\pi_t^{IT}) = \frac{(\delta - \lambda)^2 \pi^* + h^2 \pi^T}{\omega^2 (1 + \lambda)^2 + (\delta - \lambda)^2 + h^2} + \frac{\omega^2 (1 + \lambda)^2}{\zeta^{IT}} \bar{\pi}_t^e \quad (1.19)$$

These equations can be analyzed (through comparative statics) by differentiating with regard to our variables of interest. Doing so delivers the following results:

- First, as an inspection of ζ^{NT} and ζ^{IT} reveals, the impact of the expectation process ($\pi_{i,t}^e(p, s_i)$) on the inflation process is reduced in case of an inflation-targeting central bank. The adoption of an inflation target thus benefits the central bank by reducing any potential drift the expectation process could induce on inflation. As a consequence, inflation-targeting central banks could be allowed to communicate less consistently, relying instead on the anchor provided by the target. However, the impact of the other features of the contexts in which central banks operate could offset this benefit, as the other results show.
- Second, with regard to the proportion of people that are not belonging to the currency area managed by the central bank, P , we have:

$$\frac{\partial E(\pi^f)}{\partial P} = (\cdot) \left[\frac{-\epsilon(\alpha + \beta) - \beta r}{\alpha + \beta(1 - r)} s_{i,t} + \frac{(1 - \epsilon)\beta r + \epsilon(\alpha + \beta(1 + r))}{\alpha + \beta(1 - r)} p_t \right]$$

where (\cdot) is the coefficient attached to the expectation process in equations (1.16) and (1.17), conditionally on the framework adopted by the central bank (i.e., $f = IT, NT$). The first term of this expression is negative, while the second is positive. This reveals a negative influence of the proportion of “outsiders” on the average private signal and, by way of consequence, on the

control the central bank has on this part of the expectation process. However, this is offset, at least in part, by the influence of the parameter on the importance of the public signal, p_t . This combination should thus induce a central bank whose currency is internationally traded to have a more consistent communication policy, to reinforce the weight of the public signal with regard to the private one. This is confirmed by the influence of the distance parameter, ϵ , as we have: $\frac{\partial E(\pi^f)}{\partial \epsilon} = (\cdot) \left[\frac{(1-P)(\alpha+\beta)}{\alpha+\beta(1-r)} s_{i,t} + \frac{(1-P)\beta r + \alpha + \beta(1+r)}{\alpha+\beta(1-r)} p_t \right]$. This expression is positive. In other words, the larger the distance with regard to the central bank's informational hub - to use Berger et al.'s (2009) expression -, the harder it will be for the central bank to avoid any drift in the inflation process in presence of an heterogeneous audience. As a consequence, according to these results, we can expect that the more internationalized the use of a currency, the stronger the consistency of its managing central bank's communication should be. Typically, as shown in Table 1.1, this case applies to the Fed and the ECB, and much less to the other central banks in the sample we study below. The latter two central banks should thus communicate more, or try to communicate even more effectively than their peers, a result that will be tested empirically below.

- Third, we look at the impact of the precision of the public signal, α . Here, we get:

$$\begin{aligned} \frac{\partial E(\pi^f)}{\partial \alpha} = (\cdot) & \left[\frac{(1-P)\epsilon(\alpha + \beta(1-r)) - [(1-P)\epsilon(\alpha + \beta) + \beta(1-rP)]}{(\alpha + \beta(1-r))^2} s_{i,t} \right. \\ & \left. + \frac{(1 - (1-P)\epsilon)(\alpha + \beta(1-r)) - [\alpha - (1-P)[\beta r(1-\epsilon) + \epsilon(\alpha + \beta(1-r))]]}{(\alpha + \beta(1-r))^2} p_t \right] \end{aligned}$$

The first term between brackets is negative, while the second one is positive. Hence, the higher the precision of the public signal, the larger the impact on the public signal itself (p_t), with the opposite effect on the private signal ($s_{i,t}$). This result is basically reminiscent of the ones obtained in the literature on the topic (e.g., Morris and Shin, 2002, Cornand and Heinemann, 2008, or, in an even closer set-up, Demertzis and Viegi, 2008) and, as such, acts as a check of the conformity and coherence of the model with regard to the literature on the topic. It also confirms that a more consistent communication may

help private agents to coordinate, and avoid the destabilizing effects of the specularity induced by the beauty contest part of the expectation process. This is confirmed by the impact of the precision of the private signal, β . We have:

$$\frac{\partial E(\pi^f)}{\partial \beta} = (\cdot) \left[\frac{(1-P)\epsilon\alpha r + (1-rP)\alpha}{(\alpha + \beta(1-r))^2} s_{i,t} + \frac{-2(1-P)\epsilon\alpha - \alpha(1-r(P + \epsilon(1-P)))}{(\alpha + \beta(1-r))^2} p_t \right]$$

where the signs of the terms between brackets are the opposite of the ones with regard to α , revealing symmetric impacts of the precision of the private signal. Better coordination could thus be favored by, for example, the use of a recurrent lexicon by the central bank, which the agents would get to learn, to build better forecasts of the policy moves.

- Finally, with regard to the parameter measuring the heterogeneity of the currency circulating area, we get :

$$\frac{\partial E(\pi^f)}{\partial \rho} = \frac{\partial \pi}{\partial \beta} \frac{\partial \beta}{\partial \rho} = \frac{\partial \pi}{\partial \beta} \cdot \left[\frac{-\gamma(\gamma-1)\sigma_\kappa^2}{[(\rho\gamma + (1-\rho))\sigma_\kappa^2]^2} \right]$$

The last term of this expression is negative. As a consequence, the relative degree of cultural heterogeneity (and / or of financial illiteracy) has a negative impact on the influence the private signal ($s_{i,t}$) has on the expectation process, and a positive one on the impact of the public signal by being more predictable. This shows that, if this type of heterogeneity can threaten the efficacy of the central bank's policy, it can be fought by increasing the consistency of the communication, to improve the impact of the public signal. As a consequence, consistency in their communication will be all the more important for central banks confronted with more heterogeneous contexts, be they linked to the spread of a currency over a large territory (as in the European monetary union) or to differences in financial literacy.¹²

¹²A side result of our framework is thus that in countries with lower degrees of education, as a proxy to financial literacy, the central bank should increase and sharpen their communication. The framework has thus also some relevance for emerging and developing countries, although our empirical analysis below does not include central banks from these categories of countries.

To sum up, more internationalized currencies should induce central banks to communicate more. This is also the case for central banks facing more heterogeneous (or less literate) audiences. At least, they should try to communicate more effectively than their peers who are less confronted with these features. Importantly too, our framework reveals that inflation targeting does not systematically act as a one-stop shopping solution, as its potential benefits may be offset (at least, partially) by the other dimensions we consider here. We now turn to check if the evidence does confirm the theoretical results.

1.3 Assessing the consistency of central banks' communication

As revealed by the theoretical framework, the internationalization of a currency and the presence of a cultural/linguistic heterogeneity in a territory require a consistent communication policy by central banks, whether they have adopted an inflation targeting regime or no. Therefore, although central banks have to disseminate public information in a consistent way, the pressure is even stronger if they manage a “xeno-currency”, or work in a multi-cultural environment. Hence, our aim now is to examine whether central banks' communication has remained consistent over time, in order to reduce the various discrepancies that may exist between agents' expectations, and if the more exposed central banks have managed to be even more consistent than their less exposed peers. The main assumption underlying this procedure is that central banks with a consistent communication policy can be considered as being more predictable than their peers with a less consistent communication policy, given that they use a similar lexicon through time to describe their policy decisions, the evolution of economic aggregates, and the future stance of their policy rates.

1.3.1 The method and the data

In order to test for central banks' communication consistency, and thus predictability, we focus on a central instrument that they use to communicate, their “Monthly

Bulletin” (or its equivalent) and apply the Wordscores methodology to these texts for the period 1999-2014. Introduced by Laver et al. (2003), this technique, which relies on computerized content analysis, compares the patterns of words used in a set of “reference texts” (i.e., with known policy positions) with words contained in a series of “virgin texts”, to estimate their respective policy positions. Words are then treated as data (Krippendorff, 2004)¹³, and the assumption is that the relative frequencies of the use of specific words provide information on future monetary decisions. However, the meaning of a specific word often depends on the context in which it is used. For instance, while the word “growth” appears to be a positive signal, the phrase “slow growth” does not. Therefore, we here rely on two-word combinations of a noun and an adjective in this analysis, such as “lower inflation” or “higher unemployment”.

The reliability of the Wordscores approach is enhanced by removing the human factor from the coding process¹⁴. Previous Empirical studies have mainly used a hand-coding approach to code central banks’ communication (from hawkish to dovish for instance), as in Musard-Gies (2006), Gerlach (2007), Heinemann and Ullrich (2007), Rosa and Verga (2008), and Jansen and de Haan (2009). However, a drawback of this approach is its subjectivity, that is, researchers base their coding on different communication devices or may interpret the same information differently, thereby rendering their results inaccurate in the context of our study. The Wordscores approach differs notably from these (otherwise comparable) methods in that it does not use predefined coding dictionaries as in Bligh and Hess (2010), nor subjective judgments by human coders as in Bulir et al., 2010. Therefore, it is the most adequate textual-analysis approach that allows to check if different agents (with a different cultural and linguistic background, a dimension outlined above) will be able to engineer a similar expectational process about the future stance of the monetary policy, relying on the same public signal.

The method we use requires estimates of the positions of the references texts by using a tightening/easing classification. Given that we are interested in the consistency (predictability) of central banks’ statements, we rely on central banks’

¹³According to Laver et al. (2003): “this method treats the texts not as discourses to be read, understood and interpreted for meaning, but as collections of word data containing information about the position of the texts’ authors on predefined policy statements”.

¹⁴Practically, Wordscores can be implemented using a command line version for Stata. See [http : //www.tcd.ie/PoliticalScience/wordscores/](http://www.tcd.ie/PoliticalScience/wordscores/) for more details on the method.

next policy decision following the public signal to code the reference texts on the policy dimension. For instance, as the ECB increased its main refinancing rate to 0.25 basis point in December 2005, the statement (public signal) of the ECB on November 2005 is then coded +0.25. Wordscores then provides estimates of the “score” of a two-word combination, based on its relative frequency in the set of reference texts where the combination was followed by a tightening/easing monetary policy. These estimates will then serve as the basis (reference) for estimating policy stances in the set of virgin texts.

More precisely, the Wordscores methodology is defined as follows (Laver et al., 2003):

$$Probability_{w,r} = \frac{Frequency_{w,r}}{\sum_r Frequency_{w,r}} \quad (1.20)$$

$$Wordscore_w = \sum_r Probability_{w,r} \cdot Value_r \quad (1.21)$$

where w denotes a two-word combination in the set of reference texts, denoted by r , and $Value_r$ denotes the assigned value of the reference text. For instance, assume that the two-word combination “high vigilance” appears 10 times in the set of reference texts as followed by a tightening policy¹⁵ and twice in by an easing policy¹⁶. Then, the probability of “high vigilance” followed by tightening in the set of reference texts (i.e., $Probability_{((w:high) vigilance, r: tightening)}$) will be 0.84 ($= \frac{10}{10+2}$), while the probability of “high vigilance” followed by easing (i.e., $Probability_{(w:high vigilance, r: easing)}$) will be 0.16 ($= \frac{2}{10+2}$). Using these probabilities, the wordscore of “high vigilance” is:

$$\begin{aligned} Wordscore_{(w:high vigilance)} &= Probability_{(w:high vigilance, r: easing)} \cdot Value_{(r: easing)} \\ &\quad + Probability_{(w:high vigilance, r: tightening)} \cdot Value_{(r: tightening)} \\ &= 0.16 \cdot (-0.25) + 0.84 \cdot (0.5) = 0.38 \end{aligned}$$

Therefore, if a virgin text contains the combination “high vigilance”, Wordscores assumes that it contributes 0.38 to the virgin text’s estimation policy. Point estimates on the policy dimension are generated for virgin texts, being computed as the mean of the scores of the combinations, weighted by their relative frequencies

¹⁵denoted with a hypothetical value of +0.5.

¹⁶denoted with a hypothetical value of −0.25.

within these texts. This procedure also computes confidence intervals, delivering a measure of the uncertainty associated with each position score. In a nutshell, this technique matches virgin texts probabilistically, given their patterns of words usage, to reference texts with known policy positions. Hence, we analyze the central bank's communication consistency by measuring the ability of different agents to predict the future direction of the policy rate at time $t + 1$, following the words contained in the statement at time t ¹⁷. The procedure thus provides a measure of the consistency (predictability) of central banks' communication policy.

Finally, it is crucial for the validity of this approach to select the appropriate reference texts. They should provide enough information on the different policies dimensions for which one would like to evaluate where the virgin texts lie. Therefore, the reference texts should be used in the same context as the virgin ones, i.e. Wordscores requires similarity between the set of reference texts and the set of virgin texts. Central banks' communications from the 1999-2005 period are considered here as the reference texts, given that there has been enough variations in terms of the number of policy (and notably, policy rates) changes, the direction of changes, and changes in the central banks' vocabulary as well. This allows to acknowledge the flexibility (or adaptation) central banks use in the way they communicate their policy decisions, given that their constraints, objectives and priorities may evolve over time. Two cases in point are the clarification by the ECB, in May 2003, of its monetary policy strategy, discussing the importance of the role of money in its policy (Berger et al., 2011), and the discussion of the quarterly macroeconomic projections made by the Eurosystem staff since June 2004. These have led the ECB to use new words to describe its monetary policy decisions (Jansen and de Haan, 2010). Therefore, central banks' communications from 1999 until 2005 contain enough information about policies dimensions, and are used to estimate the policy positions of the virgin texts from 2006 onwards.

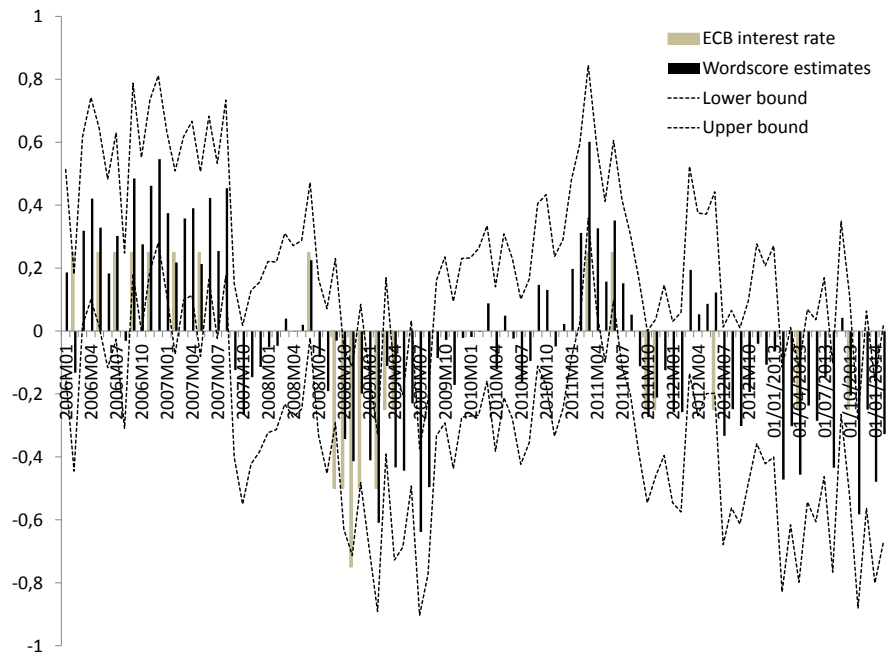
¹⁷As an illustration, Wordscores computes the policy decision of the ECB in February 2006 by analyzing the words contained in the ECB's statement of January 2006.

1.3.2 The ECB as an illustrative case

Given that the ECB faces an heterogeneous audience and manages a currency that is relatively internationalized, we consider it as a typical case for exposing the Wordscores methodology.

The ECB uses various instruments to communicate with different target groups. We here consider that the editorial of the *Monthly Bulletin* is a relevant source of information for central bank watchers if not a one-stop-shopping piece of information, if only for the easy access agents can have to it (Gerlach, 2007). The editorials contain an explanation of why interest rates were changed (or not), plus a summary statement of the Governing Council's view of the economy, hence, self-containing the information released by the President's introductory statements. The editorials of the *Monthly Bulletin* of the ECB from the period 1999 to 2005 form the set of reference texts, while the posterior ones form the set of virgin texts. Figure 1.3 provides a comparison between the estimated policy positions of virgin texts obtained through the Wordscores methodology with the actual policy decisions of the ECB.

FIGURE 1.3: Results of the Wordscores approach for the period 2006-2014, ECB.



The dark bars show the Wordscores simulation results for the virgin texts, i.e., the

policy dimension of the introductory statements between January 2006 to January 2014¹⁸, and the grey bars show the change of the main refinancing rate of the ECB. The figure also shows the 95% confidence interval around the scores. The bars indicate the timing and direction of changes of both the ECB's rate and the Wordscores simulation. The ECB's key interest rate and the Wordscores simulation have remarkably similar evolutions. There has been a persistent increase of the ECB's rate from the beginning of 2006 until mid 2007, followed by a downward trend from mid 2008 until the beginning of 2009. The Wordscores simulated rate accurately reproduces these movements, only relying on the words contained in the editorials of the Monthly Bulletin. After this period, and until mid 2011, the rate did not vary and the Wordscores policy estimation is also lying around 0. Finally, the increase and decrease of the ECB's rate in the beginning and the end of 2011, respectively, are properly predicted as well.

Therefore, the analysis reveals that the ECB's communication has remained quite consistent, using a constant vocabulary to send signals related to its policy decisions. Given that the ECB acts in a context marked by the strong internationalization of the euro and by a relatively large degree of cultural/linguistic heterogeneity (cf. Table 1.1), such a constancy can only help different agents to predict more accurately, and similarly the direction of the future path of its policy rate, as was expected from our theoretical framework.

Interestingly, as can be seen in Figure 1.3, the Wordscores methodology does not preclude forecasts of relatively strong variations, nor of negative policy rates. This lies in contrast to the need for central banks to smooth interest rates changes, if only to prevent troubles in financial markets (Woodford, 2003) and to their consideration of a zero lower bound for their policy rate. The relative discrepancy between these features and the forecasts obtained from Wordscores does not mean that the latter is “wrong” but, on the contrary, reveals that the messages conveyed by the ECB are not always followed by the appropriate (i.e. expectable) deeds^{19,20}.

¹⁸It is worth reminding that the estimated policy position for January 2014 is obtained by analyzing the words of the editorial of December 2013.

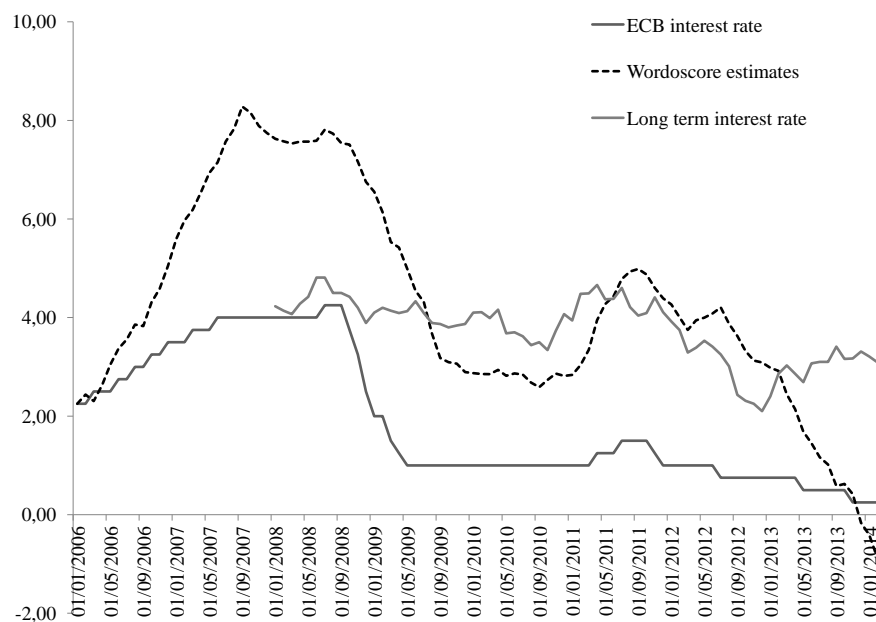
¹⁹Given that agents are aware of the policy constraints faced by the central banks, the Wordscores methodology remains a relevant approach to predict the directions of future changes in the policy rate.

²⁰Interestingly, this observation occurs for the KOF monetary policy communicator as well, which predicts larger variations of the key interest rate, but is still broadly in line with the qualitative evolution of the MRR. See <http://www.kof.ethz.ch/en/indicators/monetary-policy-communicator/>.

Figure 1.4 delivers another view of the results, displaying the cumulative Wordscores value (i.e. the sum of all previous values of the Wordscores estimations and of the current value.), the behavior of the ECB’s policy rate, and the moves of the long-term interest rate from 2008 to 2014. The latter is introduced because the ECB and other central banks have been confronted to the zero lower bound of interest rates in the last part of the period we cover, and it has been shown that long-term rates are more informative in such a context (Wu and Xia, 2014). Clearly, the time courses of the Wordscores estimates and the ECB’s policy rate are closely related from 2006 to the end of 2007 while, from 2008 on, it is the long term interest rate that moves closer with the Wordscores estimates, showing the qualitatively good forecasts obtained with the Wordscores methodology and the reliance of the ECB on unconventional measures to reduce longer maturities. Interestingly, the correlation grows over time, again revealing the increased consistency of ECB’s communication through its editorials.

The approach is thus relevant to assess the consistency (predictability) of the ECB’s communication policy, and it delivers interesting insights. We now turn to other central banks, to assess if it can be relevant for other central banks working in different contexts.

FIGURE 1.4: ECB main refinancing rate and cumulative Wordscores estimates.



1.3.3 Are other central banks as consistent as the ECB?

We replicate the Wordscores approach for a set of inflation targeting and non targeting central banks in developed countries, facing different contexts in terms of currency internationalization, and of cultural (and language) heterogeneity. As shown in Table 1.1, the sample includes Canada, Norway, Sweden, and the United Kingdom for the inflation targeting central banks²¹, and Japan and the United States for the non targeting ones²². Compared with the ECB, each of these central banks acts in a different environment, all of them coinciding with different values of the model's parameters.

We here rely on communication tools that are considered as relevant for central banks watchers and that have an impact on financial markets, hence, the latter may be different across central banks. One might then argue that we compare “apples and pears” when considering different communication tools, but for some central banks, the structure of communication instruments, such as press releases or post-meeting statements, have evolved through time (e.g., for the Riksbank and the Bank of Japan), thereby rendering the Wordscores analysis irrelevant if used (cf. Section 1.3.1). We then only consider communication tools that have had a consistent structure throughout the period (1999-2014).

For the Bank of Canada, we use the “Fixed Announcements Dates” press releases, which were introduced in November 2000, whereby it announces decisions on its target for the overnight policy rate on eight pre-specified dates each year. Each release includes the reasons underlying the policy decision, a forward-looking policy guidance, and the Council's view of the economic outlook (Fay and Gravelle, 2010; Hendry and Madeley, 2010; Hayo and Neuenkirch, 2011). For the Bank of England, we use the Monetary Policy Committee minutes, which deliver an assessment of the economic conditions in the national and international markets, and reflect the policy actions conditional upon future developments of macroeconomic variables (Gerlach-Kristen, 2004; Reeves and Sawicki, 2007; Dow et al., 2009). For the FED, we rely on the Federal Open Market Committee post-meeting statement, as it contains the Committee's view about future economic development and an

²¹Canada adopted a target on February 1991, the United Kingdom on October 1992, Sweden on January 1993 and Norway on March 2001.

²²The evolution in Japan is too recent to influence our sample and analysis.

outlook on the future federal funds target rate (Pakko, 2005; Hayo and Neuenkirch, 2010). We use the summary of the Monthly Report of Recent Economic and Financial Developments for the Bank of Japan, which contains a summary of economic and financial developments, and which forms the basis of the decision for money market operations (Fujiwara, 2005). Concerning the Norges Bank, the Press releases of the Executive Board's monetary policy decision are used. Each Press release contains forecasts of inflation, the output gap and other variables, along with an assessment of the general economic situation (Holmsen et al., 2008). Finally, for the Riksbank, we use the Minutes of the Executive Board's monetary policy meeting, as they report the views of all MPC members about the economic outlook and the future path of key variables (Apel and Grimaldi, 2012).

As for the ECB, for the Wordscores simulation, we consider the releases from 1999 until 2005 as the set of reference texts, and the releases published afterward as virgin texts. Figures 1.5 to 1.10 below show the results of the Wordscores approach for these central banks.

FIGURE 1.5: BoC interest rate and cumulative Wordscores estimates.

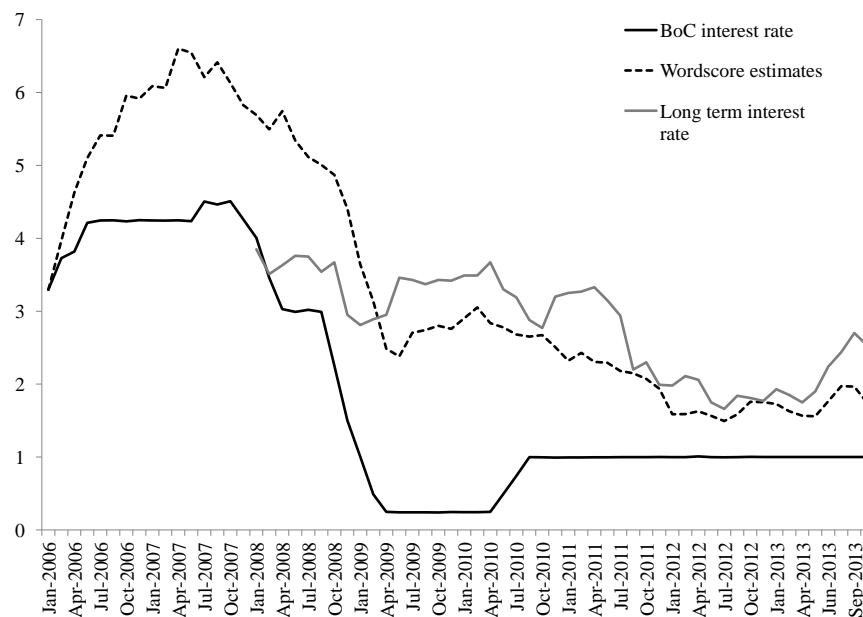


FIGURE 1.6: BoE interest rate and cumulative Wordscores estimates.

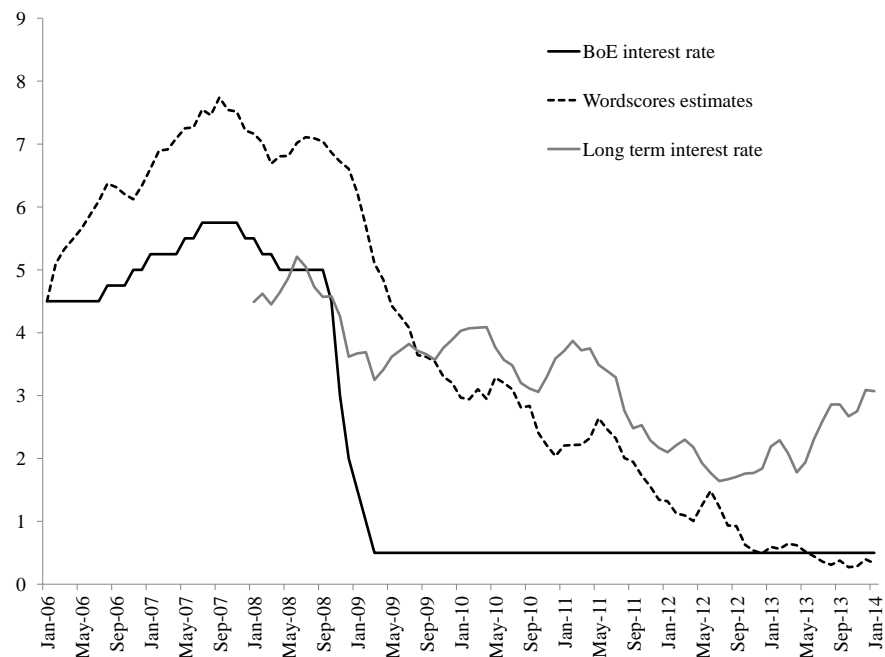


FIGURE 1.7: FED interest rate and cumulative Wordscores estimates.

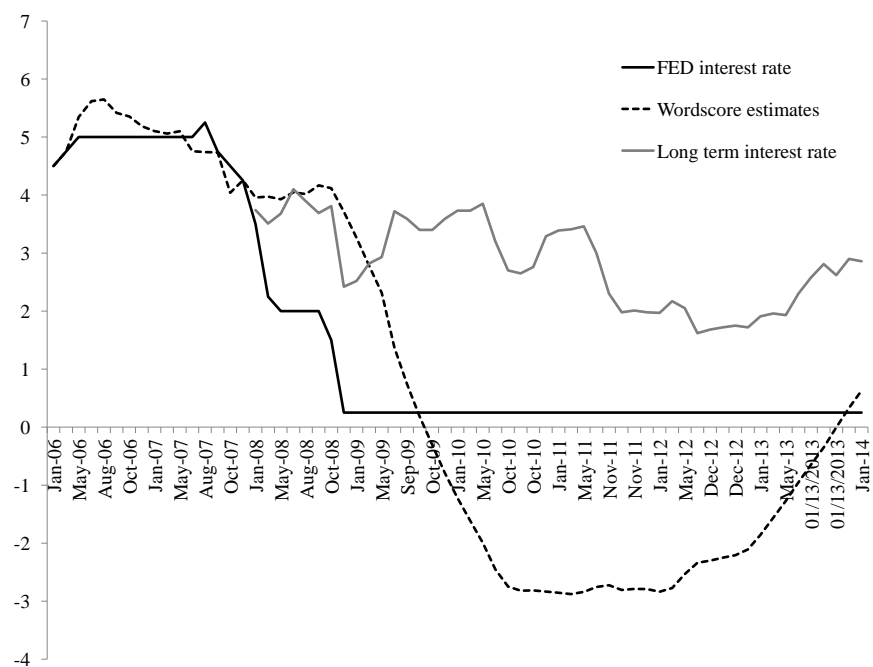


FIGURE 1.8: BoJ interest rate and cumulative Wordscores estimates.

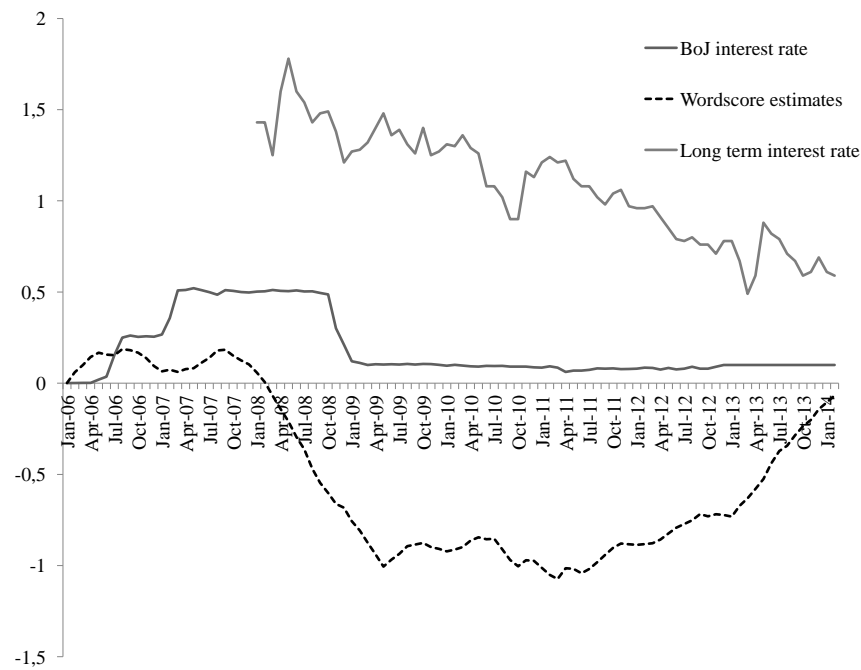


FIGURE 1.9: Norges Bank interest rate and cumulative Wordscores estimates.

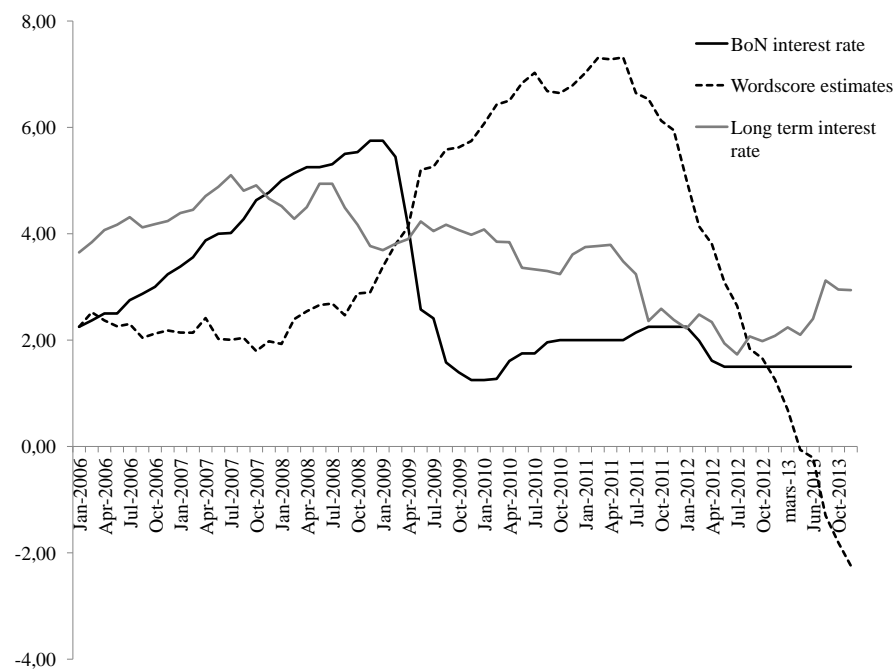
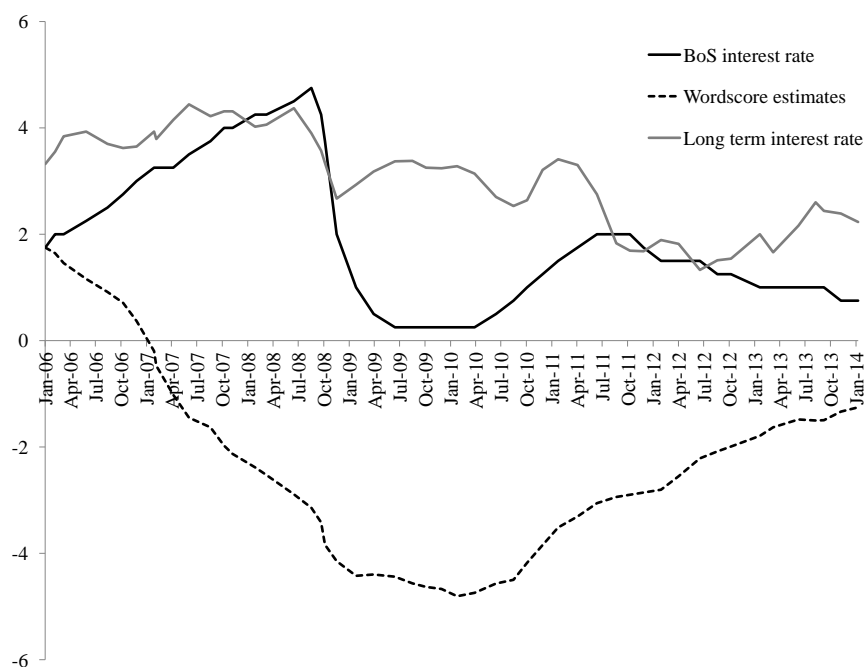


FIGURE 1.10: Riksbank interest rate and cumulative Wordscores estimates.



On the one hand, it appears that the cumulative Wordscores estimates for the Bank of Canada, the Bank of England, and to a less extent for the FED, replicate accurately the moves and directional changes of the short-term interest rates from 2006 to 2007, and of the long-term interest rates from 2008 on. We interpret these results as confirming that, given that these central banks receive important scrutiny from international markets (i.e. agents from financial markets in different countries pay a particular attention to the policy guidance they provide) and have relatively strong ties with foreign exchange markets, they need their messages to be understood uniformly by heterogeneous agents (a situation quite similar to the ECB's) to make their expectational processes similar, and thus, to achieve their objective of price stability. This explains the consistency trait of their communication policy.

On the other hand, the result for the Bank of Japan and for FED in a lesser degree is interesting in the sense that it illustrates one caveat of the methodology: given that the BoJ and the FED decreased their interest rates at the end of 2008 to 0.1 basis point, they were confronted to the zero lower bound, as they could not decrease further their interest rates, even though their communication policy had an accommodative stance. Therefore, the Wordscores cumulative value for the BoJ

and the FED decreases and remains negative from 2008 onwards, while the value of their interest rates did not change throughout this period. Nevertheless, for the Federal Reserve, the long-term rates provide better guidance, and the Wordscores proves reliable, correctly reflecting the direction of the changes from the end of 2011 to 2014.

Finally, the results for the Riksbank and the Norges bank reveal that the consistency of their press releases and statements can hardly be helpful for predicting the future path of their respective policy rates. These results do not mean that these central banks are not predictable, as many empirical studies find that other forms of their communication policy help predict their future policy decision(s) (e.g., speeches, interviews, interest rate forecast..., see Holmsen et al., 2008 or Apel and Grimaldi, 2012). However, given that these central banks do not have the constraints the ECB and other major central banks have²³, i.e., the presence of agents from different countries and with different languages which are attentive to the messages they provide, they may not need to be as consistent in the way they communicate their policy decisions. This explains the fact that the Wordscores approach can in particular replicate with accuracy the moves of the ECB's rate and the FED's FFR, but fails to reproduce the changes of the policy rate of the other central banks. In other words, it seems that the constraints faced by the different central banks in our sample are relatively well understood, and that their communication has a degree of consistency (and, thus, of predictability) that lies in conformity with the audience(s) they target²⁴.

This is verified by the comparative statistics displayed in Table 1.2 and 1.3, which reveal the effectiveness of the Wordscores approach for the various central banks' rates and for the long term interest rates, as Jansen and de Haan (2010) did for the first years of the ECB. As shown in Table 1.2 and 1.3, the central banks which have to deal with an heterogeneous audience and a strongly internationalized currency are more likely to have a consistent communication policy than the ones which are less subject to these pressures. It clearly emerges that the Wordscores approach allows the most accurate predictions (either for an easing or a tightening monetary

²³The FED, the BoE, the BoC.

²⁴It is worth noting that, to take into account the possibly more important of the forward guidance by inflation targeting central banks, we have considered the predictions made at $t + 2$ or $t + 3$ with central banks' public statements at time t , obtaining similar results (available upon request).

policy) for the ECB, the Bank of Canada, the Bank of England and the Federal Reserve²⁵ rates and the long term interest rates of the currency areas they manage, whereas the estimated forecasts for the Riksbank and the Norges Bank are of poor quality, thereby confirming the previous observations about the communication strategies of these central banks. Although it is important to remind that the Wordscores approach is more likely to complement rather than to substitute itself to other predictive methods based on macroeconomic projections for instance, it still gives important insights about the specificity of the communication policy of these central banks, even when the zero lower bound strikes, as long-term rates may then contain more relevant information than the short-term ones.

Hence, different agents located in different countries or with a different culture/language can better predict the future path of the policy rates of the ECB, the BoE, the BoC, and the FED using the same public signals. Therefore, it seems that these institutions take into account the constraints they face and their potential impact on the volatility of the inflation rate when setting their communication policy, as could be expected from our theoretical framework. The results thus confirm that there is no such thing as a “one-size-fits-all” communication framework that is optimal for all central banks, given the different environments in which they have to define and implement their monetary policies.

TABLE 1.2: Effectiveness of the Wordscores approach for central bank’s interest rates

Currency area	Correlation	% correct prediction	% corr.* ease	% corr. tight	% corr. no change
Euro area	0.83	60	90	43	42
Canada	0.89	61	35	88	60
England	0.88	73	80	88	52
United States	0.84	50	66	38	45
Japan	0.55	N/A	N/A	N/A	97
Sweden	0.32	35	32	36	40
Norway	-0.21	24	16	30	27

*corr.:correct.

²⁵Given that the Bank of Japan has rarely moved its policy rate during that period, such statistics (% correct ease or % correct tight) would be meaningless.

TABLE 1.3: Effectiveness of the Wordscores approach for long term interest rates

Currency area	Correlation	% correct prediction	% corr.* ease	% corr. tight	% corr. no change
Euro area	0.60	57	70	30	60
Canada	0.74	60	61	40	70
England	0.84	55	48	44	55
United States	0.51	52	46	46	60
Japan	N/A	N/A	N/A	N/A	N/A
Sweden	0.19	40	40	42	40
Norway	0.24	57	61	60	50

*corr.:correct.

1.3.4 Robustness check

A full-fledged econometric test of the theoretical predictions of the framework is unfortunately out of reach, given the nature of the data involved. For instance, currency internationalization data are only available for 4 currencies out of the 7 considered for the period under review. This precludes to quantify the effect of the evolution of currency internationalization on the consistency of central banks' communication policy.

Therefore, we test for the consistency, and thus, the predictability of central banks' communication by regressing the accuracy of the Wordscores estimated value (i.e. accuracy = Wordscores estimate - central bank's policy rate) on the degree of ethnic diversity of the currency areas managed by the central banks²⁶. We also add a dummy variable that takes the value 1 if the central bank has an inflation target, and 0 otherwise. We run the following estimation:

$$WS_t = c + \alpha.EF + \beta.IT + \varepsilon_t \quad (1.22)$$

where WS_t is the difference between the Wordscores estimated value and the actual policy rate at time t. WS_t measures then the degree of the predictability of the central bank's communication policy. EF represents the ethnic fractionalization index, IT is the dummy variable, and ε_t is the error term with constant variance

²⁶We do not include the language fractionalization index given that it has a high degree of correlation with the ethnicity index.

and normal distribution. There are 527 observations. The estimation delivers a value of α negative and equal to -0.61 (significant at the 1% level, with a S.D. equal to 0.22), and a β positive and equal to 0.79 (significant at the 1% level, with a S.D. equal to 0.12), which tend to show that the non targeting central banks and the central banks that have a high degree of ethnic diversity in their currency area (such as the ECB) are, on average, more predictable through their communication policy than the inflation targeting central banks, and those with a low degree of ethnic diversity, in other words, forecasters make less forecast errors of the policy rate at time $t + 1$ of non targeting central banks and in currency areas where there is a high degree of ethnic diversity, if they were relying on central banks' public information at time t (and we obtain similar results when considering the forecasts made at time $t + 2$). As such, this result is a rejoinder to some previous empirical studies (Willhelmsen and Zaghini, 2011). All in all, this set of results lends support to our theoretical framework, as well as to the relevance of the Wordscores approach.

1.4 Conclusion

Given that the ECB, the Fed and other major central banks are implementing a monetary policy that has an international impact, it is a challenge for these institutions to be understood uniformly when explaining their monetary policy decisions. In this paper, we theoretically highlight the negative effects induced by the presence of a multi-cultural factor, and the internationalization of a currency, when central banks communicate about their monetary policy. Afterward, we use the Wordscores methodology to assess if these central banks' communication policy remained consistent through time to tackle these negative effects. Our results show that these central banks have used a somewhat similar lexicon to explain their policy decisions, and that they have adapted their policies to the constraints raised by the heterogeneity of the agents they have to convince of the credibility of the message they convey.

Chapter 2

Is the euro area a stressful monetary union? Learning from newspapers' monetary policy coverage

2.1 Introduction

In the previous chapter, we highlight the specificity of the communication policy of central banks confronted to different contexts, notably with different types of audiences. In this chapter, we choose to focus on the decision-making process of a particular central bank: the European Central Bank (ECB).

The choice of the ECB is motivated by the fact that, unlike for the other monetary institutions, its transparency is more limited (de Haan et al., 2010). It uses the traditional tools of communication by making a press conference after every meeting, “the Introductory Statement of the President” and by publishing monthly reports, “the Monthly Bulletin”. However, the ECB has never published voting records nor minutes of its policy meetings (cf. Table 2 in the introduction). This policy has an impact on financial actors' views about the ECB: de Haan et al. (2004) show survey evidence suggesting that private-sector economists do not

consider the ECB as transparent (compared to the other central banks). Therefore, and as a consequence of this lack of transparency, empirical studies did not use ECB communication to understand its decision-making process, e.g., to detect heterogeneous policy preferences among the Governing Council (GC) members¹. However, there are many reasons to think that this heterogeneity may occur inside the GC of the ECB.

The existence of asymmetries among euro area members may likewise generate different preferences. Among them: the speed and the size of the propagation of monetary policy changes, and the different position in the business cycle of the member states. Moreover, countries like Belgium, the Netherlands, Finland and Ireland have strong trade links with non-euro area countries, meaning that they are more sensitive to foreign shocks. The asymmetry problems are obvious in small open economies where monetary policy has a different impact on the tradable sector from the non-tradable one (Mayes and Virén, 2002). According to the literature on the optimum currency areas, the instruments that can overcome the asymmetry problems in a monetary union are labour mobility, wage and price adjustments and fiscal policy. However the potential for these tools is limited in the euro area (Mongelli, 2002).

These difficulties in adjustment processes may create tensions in the decision-making process of the ECB, as member states can be affected by adverse impacts. As a consequence, most existing studies² suggest that the appropriate policy requires that monetary authorities should take into account national developments, and that individual countries will vote for the policy that would be best suited to their own needs (Hayo and Méon, 2013), thereby suggesting that GC members may have different preferences. This is exemplified by the experience of the Fed where differences in regional economic developments lead to differences in voting behavior in the FOMC. As an illustration, Meade and Sheets (2005) find that Fed policymakers take into account regional unemployment when setting the interest rate, and conclude that this result may also be relevant for the ECB in light of the regional differences within the euro area (Benalal et al., 2006; Eickmeier, 2009).

¹The literature about heterogeneous preferences inside the Federal Open Market Committee, the UK's Monetary Policy Committee and other central banks is abundant, see, e.g., Belden (1989), Meade (2005), Meade and Sheets (2005), Chappell et al. (2007), Harris et al. (2011) and Horváth et al. (2012).

²Among others, Aksoy et al. (2002), De Grauwe and Piskorski (2001), Angelini et al. (2008), Farvaque et al. (2009).

However, this issue is obviously an almost blank point in the literature of the ECB given the absence of minutes from GC meetings.

Nevertheless, recent findings emphasize the correlation between public concerns and the interest rate setting behavior of central banks (Neuenkirch, 2014), suggesting that national central banks in the euro area are likely to be bashed not only by politicians and international organizations, but also by national groups (Maier and Bezoen, 2004). Then, monetary policy in the euro area may be the result of interrelated economic and political factors, among which public support (Maier and Knaap, 2002). Issing (2006) justifies the need for public support by arguing that it preserves central bank's independence from government pressures. Following this, we consider that European central bankers may be receptive to the publics' concerns voiced through the press of their home countries, such as for the U.S. (Havrilesly, 1995).

The choice of the press to reveal public concerns is motivated by the evidence that media are an important tool to convey information about central bankers' decisions and statements (i.e., the media's perception of monetary policy is crucial for the central bank's influence on the public's view of the credibility of the monetary policy- see Berger et al., 2011), and that there is a media bias on the demand side, which reflects the news providers' profit-maximizing choice to cater to the preferences of the public.

The insight for this demand-side media bias could be traced back to Lazarsfeldt et al. (1948)³, who find evidence of consumers' selective exposure to information. More recently, Mullainathan and Shleifer (2005) find that readers have a confirmatory bias, i.e. they want to see confirmed what they already think, otherwise, there is a punishment term for deviating from the initial point of view of the readers. This preference has been extensively documented in psychology (see Lord et al., 1979; Nisbett and Ross, 1980). Another motivation is suggested by Gentzkow and Shapiro (2006), who show that readers rate the quality of reporting higher if this confirms their prior expectations. Again, a large body of evidence in psychology shows that subjects tend to remember evidence better, and rate its quality more highly when it supports their prior beliefs. As an illustration, both U.S. consumers

³Lazarsfeld et al. (1954) express: "Most individuals expose themselves most of the time to the kind of material with which they agree to begin with". This empirical finding has been called Self Selection of Audience Theory (see Cotton, 1985).

and consumers in Muslim countries rate the quality of news outlets whose slant matches their own views to be higher (Gentzkow and Shapiro, 2007). According to the authors, this outcome could occur because of information-processing heuristics, coarse thinking, or a subconscious process of justification⁴.

Another strand of the literature has measured this bias empirically, Groseclose and Milyo (2005) show that news producers are adequately catering to the demands of their consumers, and Gentzkow and Shapiro (2010) find that it is the ideology of potential readers that drive the demand bias. However, correlation does not necessarily imply causation, while their model argues that media follows readers, it can also be the reverse: readers follow the ideology of the media. To correct for this concern, the authors instrument political position with race and religion (factors that are closely linked with political position, but are not likely to be influenced by media coverage). They still find that the variation in consumer preferences significantly explains the variation in media bias. Jones et al. (2011) find evidence of selective exposure, and that this exposure reinforced readers' predispositions, and Gentzkow et al. (2012) show that households prefer like-minded news in the U.S. press.

The demand-driven view of media slant has also found empirical support in many other studies (George and Waldfogel, 2003 ; Andina-Díaz, 2007; DellaVigna and Kaplan, 2008; Chan and Suen, 2008; Uscinski, 2009; Iyengar and Hahn, 2009; Larcinese et al., 2011; Puglisi, 2011; Hopkins and Ladd, 2012; An et al., 2013 ; Raymond and Taylor, 2013; Koelsch, 2014). Thus, the majority of current contributions designate the demand-side argument, such as like-minded readers, as the most convincing source of media bias (Andina Díaz, 2011).

However, there is also a supply driven explanation for media bias (Baron, 2006), that can be related to the influence of media ownership (Noam, 1987; Corneo, 2006; Anderson and McLaren, 2009; Balan et al., 2009; Dunaway, 2013), and of the advertisers (Herman and Chomsky, 1988; Baker, 1994; Bagdikian, 1997). Still, McChesney (2001) argues that the European media are less likely to suffer from a supply side media bias (like, e.g., from the owners) than the U.S. media, given the commitment of the European Commission to promote a competitive market

⁴For a detailed theoretical explanation of the demand-driven media bias, see Gentzkow et al., (2014).

and to reject proposed media mergers as being anti-competitive, and the popular pressure towards the democratic institutions that is more unsympathetic to commercial interests. This argument is supported by Hackett (2000) and Petrova (2008), who show that lower inequality in democratic regimes (such as in the European countries) is associated with higher press freedom. An additional piece of evidence is given by Hallin and Mancini (2011), who suggest that the European media model do not converge to the U.S. one (i.e., conglomerates), due to the different economic and legal systems. An empirical proof is provided by Durante and Knight (2012), who find a persistent demand-side bias for the Italian media. Therefore, and given the theoretical and empirical evidences that public demand responds strongly to the fit between a newspaper's slant and the ideology of potential readers, implying an economic incentive for newspapers to tailor their slant to the ideological predispositions of the public (Gentzkow and Shapiro, 2010)⁵, we consider that the information conveyed by the national press in the euro area act as a revelator of national public concerns on monetary policy issues, and that the latter may reflect the heterogeneous preferences among GC members.

Hence, in a first step, we collect and analyze national newspapers' articles about European central bankers' statements and policy decisions to determine their information processing. We consider the national newspapers with the largest coverage, given that they target the largest share of the publics, and we focus on newspapers' news content, because of its centrality to public policy debates and its importance as a source of information to the public. The aim of this analysis is to unveil national publics' concerns.

In a next step, given the conjunction of member states' heterogeneity in the EMU and the lack of procedural transparency, we argue that if European central bankers have similar interests (as revealed by the concerns of their respective publics), they could build alliances or coalitions inside the GC (Sousa, 2009; Buf et al., 2013). Therefore, we regroup into clusters the national presses according to their information processing, and consider that it corresponds to a regroupment of their respective national publics⁶, and thus of national central bankers. This procedure thus deliver further insights about the persistent heterogeneity between member

⁵By contrast, they find much less evidence for a role of newspaper owners in determining slant.

⁶By virtue of their common concerns voiced through the press of their home countries.

countries in the EMU.

Finally, in a third step, we assess how each group's monetary preferences is considered in the decision making process of the GC, by estimating the monetary policy rules of their respective countries during the pre-EMU period (1980-1998). The comparison between a counterfactual interest rate derived from the pre-EMU monetary policy rule and the actual common rate allows to measure a degree of stress⁷ for the groups of countries, and to determine how each group's preferences is reflected in the single monetary policy.

The remainder of the paper is organized as follows: Section 2.2 describes the textual analysis method, the data, and analyzes the results. Section 2.3 integrates the results in a Taylor rule and estimates the stress measure for the groups of countries in the euro area, while Section 2.4 concludes.

2.2 Monetary policy coverage

2.2.1 A textual analysis of newspapers statements

Despite the economic integration process of the euro area, a pan-European newspaper and a pan-European public still do not exist, European central bankers are then mostly quoted in their home country's media. For instance, statements of a governor from France or Spain are rarely cited in German newspapers, while their opinions and analyzes are highly considered in their countries' media. We thus collect national newspaper articles where the names of the European central bankers are quoted (for example, articles from *El País* for the Spanish central banker, articles from *Le Monde* for the French central banker). Most of the articles report statements made by central bankers and an analysis surrounding these statements⁸ (for an example, see Appendix A.1). We use Factiva and Europresse databases for this purpose. National newspapers were chosen according to the following criteria : their large coverage and their credibility (see Appendix A.2).

⁷The common stress measure is defined as the difference between the country's actual short-term interest rate and the interest rate that would prevail if that country was able to follow an "autonomous" monetary policy (Clarida et al., 1998).

⁸It is worth noting that the frequency of statements clearly differs among central bankers, hence the number of articles where they are quoted as well.

However, it must be noted that media reports on the central bank's members statements and decisions may be influenced, in particular for the ECB. De Haan et al. (2004) show that between 1999 and 2000, the *Financial Times* paid little attention to money growth, in contrast to the *Frankfurter Allgemeine Zeitung*, for which money should be given a prominent role in the strategy of the ECB. They explain these results with the fact that the German audience is very sensitive to inflation issues. Berger et al. (2011) emphasize that the coverage of the ECB policy in the print media is more negative when inflation is relatively high. According to them, the media assume a monitoring role by evaluating the performance of the central bank. Böhm et al. (2012) find that the Czech National Bank's decisions that surprised financial markets were not negatively perceived by the media, and that interest rate changes increased both favorableness and extent of media coverage. It is then assumed that the selection of the newspapers can have an impact on the results. Nevertheless, we address this bias by selecting the national newspapers that target the largest share of national publics, given that the aim is to assess the general publics' concerns.

Next, the approach consists in a textual analysis of the national newspaper articles in which European central bankers' statements and policy decisions are quoted for the period 1999-2011. As our focus is on the analysis of monetary policy by large newspapers, we do not make a distinction between central bankers of the same country through the samples, considering that they are all representatives of the same country⁹.

Using the dedicated Alceste software, the aim of the analysis is to exhibit the main topics raised by the national media when communicating about national central bankers' decisions and statements. Researchers in political science have used this method to measure the policy positions of political actors from their speeches (Gabel and Huber, 2000; Bara et al., 2007 and 2012; Schonhardt-Bailey, 2008). In the context of central banks' communication, Schonhardt-Bailey and Bailey (2009, 2013) use Alceste with FOMC transcripts to disclose FED policy makers' preferences from 1979 to 1999.

Unlike most of the textual analysis softwares, Alceste does not need any pre-coding

⁹For instance, the Belgian central banker corresponds to Guy Quaden from 1999 to 2011 and to Luc Coene from 2011 afterwards.

reference document with fixed parameters. In this way, it overcomes the difficulties that may emerge from problems of sampling and coding. Alceste starts by classifying words distribution within a text, to obtain a classification of simple statements and to reveal the keywords. Then, it uses a dictionary of words of 10 languages (including the languages of our selected samples - French, English, Spanish, Portuguese, German, Dutch, and Italian), to distinguish the forms of the words and uses the content words that carry all the information about the meaning of the corpus. It creates a data matrix to quantify the presence of these content words in the corpus. Afterwards, it uses a Hierarchical Decreasing Classification (HDC) to identify word classes using these content words, by relying upon co-occurrence analysis, which is the analysis of frequent word pairs in a text corpus. This method carries out by successive splits of the text to extract categories of the most representative statements. The goal is to quantify a text so as to extract the most significant structures (for more details, see Appendix A.3).

Although Alceste generates categories of word lists, the categorization of these word lists by topics remain a construction of the author, based on the meaning of the characteristic words in the word lists (see Appendix A.3). The basic idea is that words are indicative of topical content, and the task is to map the words into topics. Alceste is then most effective when it is joined with substantive knowledge of the subject matter, since contextual knowledge is essential for interpreting the form of argumentation¹⁰. As topics are ranked in terms of their statistical significance, we allocate to each of them a percentage depending on their presence in the newspaper articles. We consider that this percentage reflects the importance the newspaper gives to the topic. This method allows then to associate to each national newspaper a set of topics, and to show their tendency to focus on particular ones.

Finally, it must be noted that all European central bankers are concerned with this analysis, except the ECB President and the Executive Board members. The textual analysis of their statements through newspaper articles reveal that they are mainly concerned about issues at the euro area level, and thus, that they might not be subject to national pressures.

¹⁰Lahlou (1995) provides a detailed description of the interpretation procedure and its theoretical basis.

2.2.2 Results of the Hierarchical Decreasing Classification

After processing Alceste, the Hierarchical Decreasing Classification allows to obtain the following topic categories for which national newspapers have expressed positions (see Appendix A.3 for an illustration of the word-lists included in these topics):

- Governance Framework of the ECB : *ECB Gov.*
- Economic and Financial news : *Econ. News*
- Explicitly National Considerations : *National*
- Economic Policies : *Policy*
- Euro Area Crisis : *Crisis*
- Monetary Policy Orientation : *Monet. Pol.*
- National or European Political System : *Pol. Sys.*

Tables 2.1-2.3 below show the percentages allocated to each of the identified topics by each national newspaper for three samples: the full period, 1999-2011, and for two subperiods, 1999-2007 and 2008-2011. The reason for this sampling is that we consider 2008 as a crucial year. Not only did four countries join the euro area since that year (Cyprus, Malta, Slovakia and Estonia), but the financial crisis was at its peak as well. It is worth noting first that the sum of the topics for each newspaper is not necessarily equal to 100%, as some of the word lists determined by the HDC process are not classifiable in the categories outlined above, and second, that a percentage of 0% for a topic does not mean that it is absent in the articles, but that its presence is not significant enough to appear in the HDC process.

Interestingly, all the newspapers treat the same kinds of topics, showing that the European newspapers raise similar issues when they analyze central bankers' statements and policy decisions. Hence, there are minor differences in the word lists provided by the HDCs processes for the various media outlets. However, Alceste makes a clear distinction between each topic. Even though it might seem confusing to have three different categories named, "Economic Policies", "Euro area Crisis", and "Explicitly National Considerations", the HDC process distinguishes

the general monetary operations, the policies related to the euro debt crisis (rescue package, bailout...), and those concerned by the national contexts. Moreover, although the topics treated by all the newspapers are similar, their relative importance differs. As an illustration, the analysis for the period 1999-2011 shows that the topic “Economic Policies” represents 33% of the articles of the Greek newspaper, while it represents only 7% of the articles of the German newspaper. The distribution of topics differs according to the sample as well: for instance, the topic “Economic policies” represents 22% of the articles of the Greek newspaper and 20% for the German one for the subperiod 1999-2007.

An interesting observation from Table 2.3 indicates that the topic *Monet. Pol.* is not sufficiently present in the newspapers’ articles during the sub-period 2008-2011, to appear in the HDC processes. This is due to the shift of concerns of the European media and national publics on issues related to the euro sovereign debt crisis (the topic *Crisis* is sufficiently processed by many newspapers from that period to appear in the HDC processes), and on the great weight given to European political questions (a very first look on the topic *Pol. Sys.* shows that its importance is greater during the subperiod 2008-2011 than the subperiod 1999-2007), as a result of the divergences that characterized European leaders on the monetary measures to implement (such as Quantitative Easing) to cope with the euro debt crisis (de Jong and van Esch, 2013).

Moreover, the topic *ECB Gov.* is significantly present in the newspapers of very few countries for all the samples, such as Malta, Italy, and the Netherlands. This may be the result of particular national circumstances that pushed some newspapers to focus on issues related to the governance of the ECB, like e.g., the accession of Malta to the eurozone on 2008, the election of Mario Draghi as President of the ECB on 2011, and the appointment of Klaas Knot as President of the central bank of the Netherlands on 2011.

In a next step, given that the analysis of newspapers’ information processing reveals publics’ concerns on monetary policy issues (Gentzkow and Shapiro, 2010), we suppose that if the topics raised by some newspapers are distributed with a close proportion across the samples¹¹, the national publics which are targeted

¹¹For instance, considering the topic “Explicitly National Consideration” as an indicator of the consequences of the asymmetry in the euro area, for the period 1999-2007, it represents 24% of the articles of the Portuguese newspaper and 24% of the Spanish one.

by these newspapers have close concerns as well. Therefore, regrouping national newspapers according to their common topics corresponds to a regroupment of their respective publics.

Hence, we look if the different percentages obtained through the classification process highlight common economic issues shared by the media, thus revealing groups of national publics with common economic concerns. This is the aim of the cluster analysis.

TABLE 2.1: Results of the HDC process for the period 1999-2011

NP's* country	<i>ECB Gov.</i>	<i>Econ. News</i>	<i>National</i>	<i>Policy</i>	<i>Crisis</i>	<i>Monet. Pol.</i>	<i>Pol. Sys.</i>
Austria	0%	27%	24%	0%	0%	36%	13%
Belgium	0%	27%	40%	0%	0%	9%	24%
Cyprus	0%	21%	31%	14%	15%	0%	19%
Finland	0%	19%	7%	0%	0%	0%	27%
France	0%	32%	37%	0%	11%	10%	10%
Germany	0%	27%	4%	7%	23%	0%	35%
Greece	0%	28%	15%	33%	0%	0%	24%
Ireland	0%	30%	12%	19%	13%	0%	17%
Italy	12%	23%	24%	5%	4%	0%	28%
Luxembourg	0%	49%	8%	0%	22%	0%	21%
Malta	17%	59%	0%	24%	0%	0%	0%
Netherlands	9%	46%	0%	0%	0%	0%	18%
Portugal	0%	45%	10%	13%	0%	0%	33%
Slovenia	0%	17%	37%	0%	0%	0%	46%
Spain	0%	42%	23%	12%	0%	0%	24%
Slovakia	0%	43%	25%	0%	0%	0%	32%
Estonia	0%	14%	0%	25%	32%	0%	29%

*NP: Newspaper

TABLE 2.2: Results of the HDC process for the subperiod 1999-2007

NP's* country	<i>ECB Gov.</i>	<i>Econ. News</i>	<i>National</i>	<i>Policy</i>	<i>Monet. Pol.</i>	<i>Pol. Sys.</i>
Austria	0%	19%	26%	0%	13%	0%
Belgium	0%	23%	12%	0%	0%	26%
Finland	0%	25%	10%	11%	0%	26%
France	0%	34%	31%	9%	9%	17%
Germany	0%	53%	19%	20%	0%	8%
Greece	0%	40%	0%	22%	18%	21%
Ireland	0%	27%	46%	0%	9%	18%
Italy	0%	21%	29%	22%	6%	16%
Luxembourg	23%	41%	0%	0%	11%	25%
Netherlands	0%	15%	37%	0%	0%	0%
Portugal	0%	19%	24%	0%	0%	58%
Spain	0%	25%	24%	10%	0%	41%

*NP: Newspaper

TABLE 2.3: Results of the HDC process for the subperiod 2008-2011

NP's* country	<i>ECB Gov.</i>	<i>Econ. News</i>	<i>National</i>	<i>Policy</i>	<i>Crisis</i>	<i>Monet. Pol.</i>	<i>Pol. Sys.</i>
Austria	0%	58%	11%	0%	0%	0%	32%
Belgium	0%	31%	26%	0%	0%	0%	13%
Cyprus	0%	21%	31%	14%	15%	0%	19%
Finland	18%	57%	0%	0%	0%	0%	25%
France	0%	26%	0%	0%	40%	0%	17%
Germany	0%	14%	16%	0%	18%	0%	52%
Greece	0%	12%	0%	21%	20%	0%	47%
Ireland	0%	20%	16%	15%	23%	0%	25%
Italy	12%	10%	20%	18%	10%	0%	17%
Luxembourg	-	-	-	-	-	-	-
Malta	17%	59%	0%	24%	0%	0%	0%
Netherlands	7%	43%	9%	0%	0%	0%	20%
Portugal	0%	10%	38%	13%	10%	0%	32%
Slovenia	0%	17%	37%	0%	0%	0%	46%
Spain	0%	24%	45%	0%	11%	0%	21%
Slovakia	0%	43%	25%	0%	0%	0%	32%
Estonia	0%	14%	0%	25%	32%	0%	29%

*NP: Newspaper

2.2.3 Cluster analysis results

To identify groups of newspapers, and thus of national publics, that share common economic concerns, we use cluster analysis with the percentages of the topics obtained from the Hierarchical Decreasing Classification. Cluster analysis allows to define groups that share the same characteristics, i.e., a close distribution of topics in the media's processing of European central bankers' statements and policies. This process calculates first the Euclidean distance between the topics of each media to determine the closest ones.

Considering that there are 7 topics, the Euclidean distance (or the (dis)similarity coefficient) between two newspapers, e.g., “*France*” and “*Germany*”, is:

$$D(\textit{France}, \textit{Germany}) = \sqrt{\sum_{i=\textit{topic}(1)}^{\textit{topic}(7)} (FR_{\textit{topic}(1)} - GE_{\textit{topic}(1)})^2 + \dots + (FR_{\textit{topic}(7)} - GE_{\textit{topic}(7)})^2}$$

The newspaper “*France*” is declared to be closer (more similar) to the newspaper “*Germany*” than to the newspaper “*Spain*” if $D(\textit{France}, \textit{Germany}) < D(\textit{France}, \textit{Spain})$.

Then, we use the single linkage (or nearest neighbor) hierarchical method to determine the distance between the groups of newspapers. This method calculates the distance between two groups as the distance between the two closest elements in the two groups (Sibson, 1973). In other words, we merge in each step the two groups whose two closest members have the smallest distance. The distance is then defined by the two most similar objects:

$$D(X, Y) = \min_{x \in X, y \in Y} d(x, y)$$

where X and Y are two groups, i.e., $D(\textit{France}, \textit{Germany})$ and $D(\textit{France}, \textit{Spain})$, and $d(x, y)$ is the distance between the two elements in the two groups.

This method produces a tree decision called a dendrogram, which shows the hierarchical structure of the clusters. We use this dendrogram to determine the number and the composition of country groups for a distance value of 10¹² (for more details, see Appendix A.4). Hence, we let the algorithm run until the end (until all points are merged into 1 cluster), and set a distance at which clusters are identified. Table 2.4 details the results of the cluster analysis.

¹²Subgroups that join at a distance below this value are put in the same cluster. Subgroups that join at a distance greater than this value are placed in different clusters.

TABLE 2.4: Results of cluster analysis

	1999-2011	1999-2007	2008-2011
Northern European group	BE-FI-NL-FR	BE-FI-NL	BE-FI-NL
Peripheral European group	GR-IE-IT	FR-GR-IE-IT	PT-ES-GR-IE-IT
Southern European group	ES-PT	ES-PT	-
Isolated newspapers	DE	DE	DE-FR

According to the results obtained, there are three groups of newspapers that can be considered as stable, in that they consistently raise very close issues across the different samples:

- Northern European group: The Belgian newspaper, the Finnish and the Dutch ones.
- Peripheral European group: The Greek newspaper, the Irish and the Italian ones.
- Southern European group: The Spanish and the Portuguese newspapers.

Moreover, two newspapers seem not to belong to any stable group across time. First, the German newspaper seems to be isolated. This media is distant from the identified groups for all the samples. Second, and differently, the French newspaper appears as unstable, floating between different groups across the periods. For the sample 1999-2011, it belongs to the Northern European group, given that it is raising similar issues than the newspapers composing this group. Then, when we proceed to the same analysis for the first subperiod 1999-2007, we notice that the French newspaper is rather linked to the Peripheral European group. For the second subperiod 2008-2011, the French newspaper is isolated from all the identified groups. This apparent instability of the French newspaper and, by extension, of the French concerns, in fact hides the pattern of a movement from the periphery to a stronger coincidence with the German concerns. This itself may be related to the central role these two countries have played historically, and in particular with their joint role in the recent crisis¹³.

A first observation on the structure of the groups shows a strong similarity in macroeconomic aggregates among countries composing the groups (like, e.g., Spain and Portugal for the Southern European Group), and which face similar problems in the euro area,

¹³A number of newspapers from small countries (Cyprus, Estonia, Slovakia and Slovenia) have unstable positions as well (see Appendix A.5). They belong to different groups according to the period of the sample. However, given that they have integrated the euro area in 2008, there is a lack of data for the analysis of the period 1999-2011. Therefore, we do not consider their positioning for the full period.

such as a large youth unemployment rate. It is then not surprising that their respective newspapers raise common concerns about monetary policy issues in the euro area, given the common topics of interest for their national publics. This is a shared feature for the two other groups, which not only have a similar economic situation, but also a common position in terms of economic policies for the eurozone (e.g., Finland and the Netherlands).

Finally, the isolated position of Germany in all the samples may be due to its role as a “leader” in the euro area. Therefore, the German newspaper may have not expressed the same concerns as the ones of the newspapers from the other eurozone countries.

The approach adopted shows that from the point of view of national publics in the EMU, the concerns (revealed through national newspapers’ information processing) are generally shared by neighboring countries. Moreover, the fact that the division into groups that follows from the textual analysis and the cluster analysis (three groups and two isolated countries) is finer than the “traditional” and “natural” division of the euro zone, into North vs. South, or Core vs. Periphery, may be due to the way the textual analysis approach takes into account larger issues than just the economic ones, such as political matters, and questions about the governance of the monetary institution (ECB) (cf. Table 2.1-2.3). This allows to better distinguish the persistent differences between member countries in the euro area, and gives a more precise picture of the heterogeneity that might occur inside the GC of the ECB.

Hence, even though the textual analysis approach is likely to complement rather than to substitute itself to other statistical methods based on macroeconomic data, it still gives important insights about the persistent heterogeneity between member countries on economic issues, and thus, on the different policy preferences between national central bankers in the EMU.

2.3 Assessing the Euro area degree of stress

The persistent economic heterogeneity in the eurozone and the lack of procedural transparency (i.e., non publication of voting records and minutes of meetings) suggest that individual members of the GC may follow national objectives, and bargain over the interest rate (Hayo and Méon, 2013). Hence, one cannot get rid of the possibility that

European central bankers may adopt strategic behaviors and form coalitions with similar interests during GC meetings (Mangano, 1999; Belke and Styczynska, 2006; Buf et al., 2013).

Given the evidence that public concerns are positively correlated with central bankers' policy decisions (Neuenkirch, 2014), we consider that the regroupment of national publics, corresponds to a regroupment of their respective central bankers.

The aim of the subsequent section is then to assess to what extent monetary preferences of central bankers' groups¹⁴ are reflected in the decision making process of the GC, through the estimation of a measure of a degree of stress for each group.

2.3.1 The model

The Taylor rule has become a popular tool for evaluating the monetary policy of central banks. The initial aim was to describe the monetary policy of the Federal Reserve in the U.S. and concluded to the following formulation:

$$i_t^* = r + \pi_t + \beta(\pi_t - \pi^*) + \gamma y_t \quad (2.1)$$

where i_t^* is the policy interest rate, r the equilibrium real rate, π_t the rate of inflation, π^* the inflation target and y_t the output gap.

Taylor (1993) suggested the value of β and γ , the relative weights associated by the central bank to inflation and output stabilization, respectively, to be equal to 0.5 for the Fed:

$$i_t^* = r + \pi_t + 0.5(\pi_t - \pi^*) + 0.5y_t = (r^* - 0.5\pi^*) + 1.5\pi_t + 0.5y_t \quad (2.2)$$

According to Svensson (1999), this rule is the optimal reaction function for a central bank with a backward-looking model. However, a successful stabilization policy needs to be forward-looking. The augmented Taylor rule with forward-looking specification was set by Clarida et al. (2000) within a New Keynesian framework. This function allows to take into account the prospective behavior of central bankers. Currently considered as an important tool for evaluating the monetary policy, it takes the following form:

$$i_t^* = r + \beta(E_t[\pi_{t+k}] - \pi^*) + \gamma E_t[y_{t+q}] \quad (2.3)$$

¹⁴NEG, PEG, SEG, France, and Germany.

where $E_t[-]$ is the expectation operator conditional on all the information available at time t .

Furthermore, at least since the nineties, central banks worldwide tend to smooth their policy rates. In that case, it is generally considered necessary for the central bank to smooth the variability of its interest rate through time as abrupt changes can induce troubles in bond markets. Hence, the actual short-term nominal interest rate has to be modeled as a weighted average of the lagged interest rate and the policy interest rate:

$$i_t = \rho i_{t-1} + (1 - \rho)i^* \quad (2.4)$$

where the parameter ρ measures the degree of interest rate smoothing.

If we substitute the second formula in the first one, we obtain:

$$i_t = \rho i_{t-1} + (1 - \rho)r + (1 - \rho)\beta(E_t[\pi_{t+k}] - \pi^*) + (1 - \rho)\gamma E_t[y_{t+q}] \quad (2.5)$$

In order to assess how each group's preferences is reflected in the single monetary policy, we develop a measure of monetary policy stress by proceeding in two steps.

We start by estimating a Taylor rule for the countries composing the identified groups¹⁵ and the isolated ones¹⁶ found in the cluster analysis during the pre-EMU period (1980-1998)¹⁷. The aim is to determine their monetary policy rules before the adoption of the single currency and before the start of the EMU stage processes in the beginning of the nineties. Clearly, the countries have not been subject to a full monetary policy autonomy in that period as most of them followed an exchange rate target against the German mark, but they could readjust the par-value in the EMS and implement capital controls (Flaig and Wollmershäuser, 2007). Hence, we have:

$$i_{j,t} = \tilde{\rho}_x i_{t-1} + (1 - \tilde{\rho}_x)r + (1 - \tilde{\rho}_x)\tilde{\beta}_x(E_t[\pi_{j,t+k}] - \pi_j^*) + (1 - \tilde{\rho}_x)\tilde{\gamma}_x E_t[y_{j,t+q}] + (1 - \tilde{\rho}_x)\tilde{\delta}_x x_{j,t} \quad (2.6)$$

where $j = \{1, \dots, 10\}$ corresponds to the countries composing the groups, $i_{t,j}$ is the three-month money market interest rate for country j , r its long run equilibrium value, π_j^* reflects the country-specific inflation target¹⁸, $\pi_{j,t+k}$ and $y_{j,t+q}$ are, respectively, the

¹⁵Northern European group, Peripheral European group and Southern European group.

¹⁶France and Germany.

¹⁷It is worth noting that we consider France as being isolated given that its newspaper had unstable positions in the different samples.

¹⁸For countries which had not an explicit inflation target, the latter is derived from the trend of their actual inflation rate through the sampling period.

inflation rate and the output gap of the country j , and $x_{j,t}$ represents the effective exchange rate of country j with the German Mark. We determine the monetary policy parameters $\tilde{\beta}_x$ and $\tilde{\gamma}_x$ for each group and the isolated countries.

In a next step, we define group's stress measure as the difference between the actual money market rate in the group of member countries of the EMU, and the market rate that the countries' central banks policy would have induced if they still had the power to do so. This approach assumes that central banks were in position to conduct an unconstrained monetary policy, adjusting the interest rate level to changes in inflation and the output gap according to national needs.

Hence, we compare a counterfactual interest rate, which is determined by estimating a pre-EMU interest rate rule (eq.6), with the common euro area interest rate, such as in Hayo (2007), Flaig and Wollmershäuser (2007), and Hayo and Méon (2013). The main assumption underlying this procedure is that both structural parameters and preferences of individual countries did not change following the implementation of the single currency. Kindelberger (1986) argues that this might be the case given the national self-interest of countries sharing an international public good (e.g., a common currency) without an international government. However, even if these assumptions could be questioned given the delegation of monetary policy to an independent supranational central bank, Hayo (1998) and Vaubel (2003) argue that monetary policy preferences are determined by social processes that are unlikely to change quickly over time. Moreover, there is no empirical evidence that structural break occurs in European economies after the adoption of the single currency (Mihov, 2001; Peersman, 2004; Clausen and Hayo, 2005).

Therefore, we use ex-post data of the EMU period to determine a series of counterfactual interest rates for each group of countries ($\tilde{i}_{x,t}$), which would be a product of their pre-EMU monetary policy rules ($\tilde{\rho}_x, \tilde{\beta}_x, \tilde{\gamma}_x$). The comparison between the counterfactual interest rate and the common rate allows to check to what extent the common rate is different from the one that the group of countries would have implemented if they still had control on their currency. We call this difference a measure of the *group monetary stress*.

$$S_{x,t} = | i_{Euribor,t} - \tilde{i}_{x,t} | \quad (2.7)$$

where $i_{Euribor,t}$ is the 3 month-money market rate in the euro area, i.e., the Euribor¹⁹, and $\tilde{i}_{x,t}$ represents the market rate of the group x following its monetary policy rule in the pre-EMU period. We consider the Euribor as an indicator to reveal groups' stress measures, given that it is an indicator of similar nature (i.e., a 3-month money market rate) that we use as a dependent variable in (eq.6) to determine groups' monetary reaction function.

Stress is then measured as the difference between a policy rate generated by a Taylor rule estimated for the pre-EMU period, and the common market rate in the EMU. As the value of $S_{x,t}$ moves away from 0, it means that stress measure of the group x increases, and thus, that the preferences of its central bankers are not fully reflected in the decision-making process of the GC.

2.3.2 Data

The estimated period starts from the first quarter of 1980 to the fourth quarter of 1998, the interest rate variable is proxied by the three-month money market interest rate of each country. The inflation rate is measured by the Consumer Prices Index, and the output gap variable is captured by real GDP (for quarterly data). We use ex-post realized data, given that forecasts data are not available for that period.

We use the Ordinary Least Squares (OLS) estimator, we check whether there is heteroscedasticity or non-normality of the residuals and find that the results are consistent²⁰. Given that monetary policy needs some lags to be effective, i.e., it takes several quarters for a policy change to have its full effects on the real economy and actual inflation rates, we determine the number of lags (4) by minimizing the Akaike Information Criterion (AIC).

The ex-post data of the inflation rate and the output gap are extracted from the International Financial Statistics database (IFS) of the IMF, whereas the interest rate, the exchange rate and the monetary aggregate M3 are from the Eurostat database.

¹⁹The Euribor rates remain relatively close to the ECB's main refinancing rate (see Appendix A.6). Nevertheless, there are also a number of external economic circumstances that influence the level of the Euribor, such as economic growth, inflation, solvency of banks, trust or even future expectations of the official interest rate.

²⁰Test results available upon request

2.3.3 The stress measure

Following (eq.6), we estimate the value of the parameters linked to the inflation gap ($\tilde{\beta}_x$) and the output gap ($\tilde{\gamma}_x$) for the stable and the isolated groups of countries during the pre-EMU period. Table 2.5 below gives the results of the OLS regression.

TABLE 2.5: OLS estimation for the period 1980-1998

Explanatory variable	Parameter	NEG	PEG	SEG	France	Germany
c		-8.48 (0.12)	10.59 (4)	6.16 (3.9)	3.30 (2)	0.20 (1)
i_{t-1}	$\tilde{\rho}_x$	0.93 (24.01)	0.61 (8.48)	0.78 (13.83)	0.91 (21.66)	0.95 (34.38)
$E_t[\pi_{t+4}]$	$\tilde{\beta}_x$	0.17 (1.44)	-0.09 (-0.13)	0.07 (0.69)	0.25 (1.56)	0.12 (2)
$E_t[y_{t+4}]$	$\tilde{\gamma}_x$	0.05 (0.82)	-0.67 (-1.48)	-0.06 (0.03)	0.11 (0.728)	0.03 (0.64)
$x_{j,t}$	$\tilde{\delta}_x$	9.14 (-0.09)	-10.5 (-3.21)	-0.05 (-3.55)	-0.83 (-1.9)	- -
R^2		0.93	0.90	0.95	0.93	0.96
No. of observations		76	76	76	76	76

(1)NEG: Northern European Group/PEG: Peripheral European Group/SEG: Southern European Group.

(2)t-values are shown in parentheses.

(3) The number of lags are determined by minimizing the Akaike criterion.

According to Table 2.5, the smoothing parameter $\tilde{\rho}$ lies between 0.6 and 0.95 and is highly significant. The estimated values of $\tilde{\beta}_x$ and $\tilde{\gamma}_x$ for Germany, France and the NEG show that central banks reacted positively to the inflation rate and the output gap in these countries, but with an accommodative stance given that the Taylor principle does not hold (i.e., $\tilde{\beta}_x < 1$). The negative value of the parameters $\tilde{\beta}_x$ and $\tilde{\gamma}_x$ for the PEG seem counter-intuitive, but is insignificant. This may be related to the necessary alignments countries adopted at that period in order to be in accordance with the Maastricht criteria (inflation or money targeting, financial market restructuring).

Next, group monetary stress is calculated for the EMU period by replacing $\tilde{i}_{x,t}$ from (eq.7) with the estimated parameters, along with ex-post EMU data²¹. Given that we are interested in the weight of groups' preferences in the GC decisions, we include all the parameters that reflect the monetary policy rules of their respective countries before the

²¹It is worth noting that we use national data for the groups of countries.

adoption of the single currency $(\tilde{\rho}_x, \tilde{\beta}_x, \tilde{\gamma}_x)$, and ignore the exchange rate parameter.

$$S_{x,t} = | [i_{Euribor,t}] - [\tilde{\rho}_x \cdot (i_{t-1}) + (1 - \tilde{\rho}_x) \cdot r + (1 - \tilde{\rho}_x) \cdot \tilde{\beta}_x \cdot \pi_{x,t} + (1 - \tilde{\rho}_x) \cdot \tilde{\gamma}_x \cdot y_{x,t}] | \quad (2.8)$$

where i_{t-1} is the lagged value of the Euribor, and r its long run equilibrium value.

Table 2.6 below shows the average value of the stress measure for the countries corresponding to the groups of central bankers for the period 1999-2011.

TABLE 2.6: Average group stress measure

	NEG	PEG	SEG	France	Germany
Average value of stress measure	0.49	0.84	1.5	0.5	0.49

NEG: Northern European Group/PEG: Peripheral European Group/SEG: Southern European Group.

According to Table 2.6, stress measure for Germany, France and the NEG has the lowest value (0.50), while it has a higher value for the SEG and the PEG. These results suggest that Germany benefited from a monetary policy during the period 1999-2011 that was close to the rule implemented by the Bundesbank during the pre-EMU period. The same observation holds for the NEG given that they are known to be “policy-followers” to Germany. This result is in accordance with the findings of Sturm and Wollmershäuser (2007) and Drometer et al. (2013), and allows us to pursue our investigation. However, the value of stress measure might be surprising for a country such as France, which is known to have a different monetary behavior than the German one. Nevertheless, Flaig and Wollmerhäuser (2007) argue that the Banque de France changed its monetary policy rule during the EMU stage processes in the nineties to be in accordance with the Maastricht criteria, and set its policy rate in a way the Bundesbank had also done it. This explains the low value of its average stress measure. Thus, the results show that monetary preferences of central bankers from Germany, France and the NEG were reflected in the single monetary policy of the ECB (through the pre-EMU monetary policy rules of their respective central banks), while it seems not to be the case for members of the two remaining groups: the PEG and the SEG.

Next, we decompose stress measure for each group of countries to assess how their monetary preferences were considered in the GC decisions throughout the period 1999-2011. Figure 2.1 below shows the evolution of the group monetary stress since the adoption of the single currency.

Figure 2.1: Group monetary stress measure

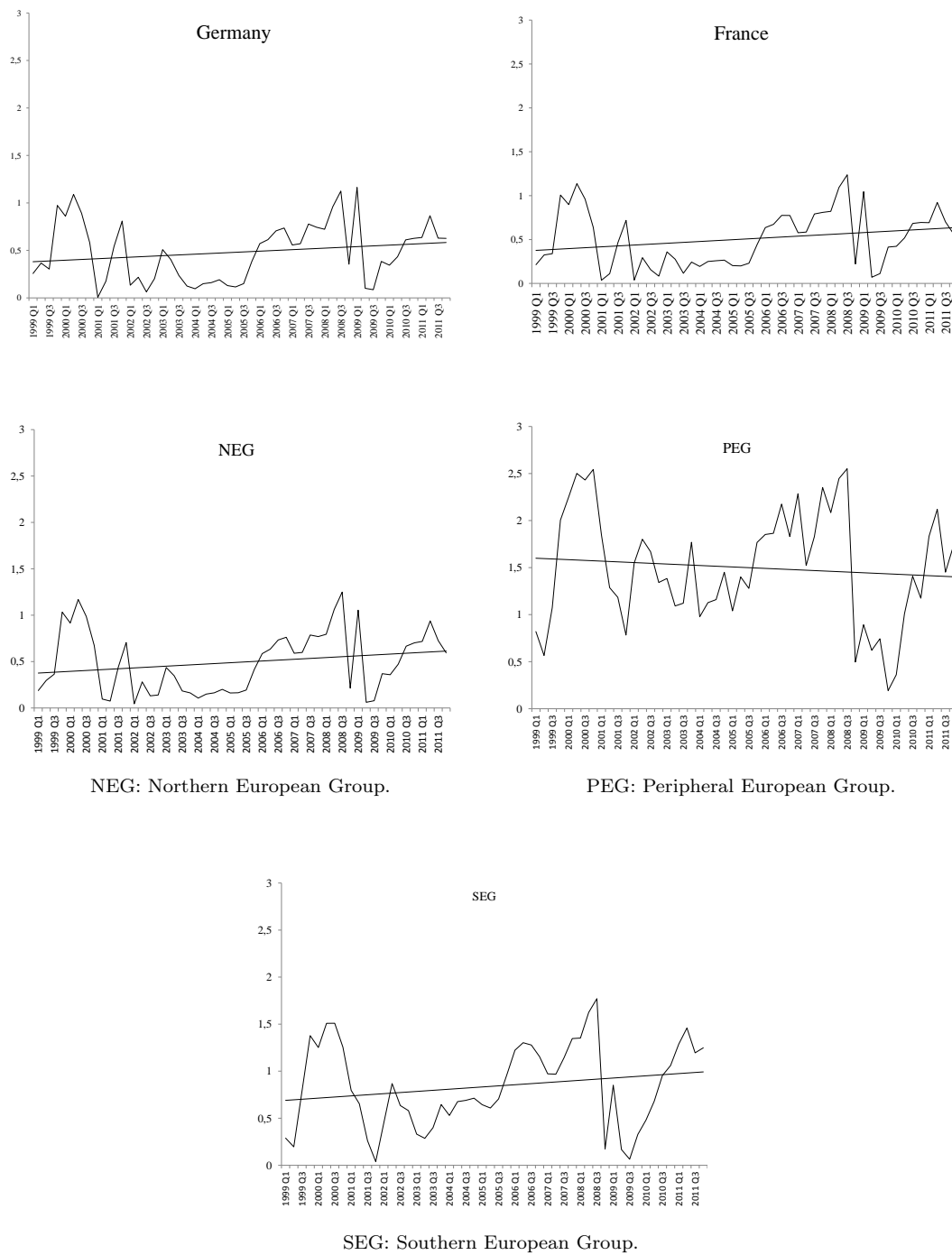


Figure 2.1 shows that stress measure for Germany, France and the NEG had a consistently low value since the establishment of the single currency, except for a period starting from 2006 until the end of 2009, where the value of S slightly increased. This means that the preferences of their central bankers were considered in the decision-making process of the GC (via the pre-EMU monetary policy rules of their respective

national central banks) until the beginning of the financial crisis, when the monetary preferences of these countries were put aside during that period. Obviously, this is due to the euro debt crisis given that the ECB had to relax its monetary policy rule to thwart the negative effects induced by the economic downturn. This probably ostracized the preferences of these countries, which explains the surge of their stress measures during that period. Concerning the PEG and the SEG groups, their stress measures remain relatively high during the first years of the EMU. However, from 2008 onwards, there is a modest downward trend of the value of S for the PEG. The trends reveal then a declining level of stress for the Periphery group, while there is an increase for Germany, France and the Northern group. Clearly, the particular circumstances at that time have given to groups that had their preferences relatively marginalized (e.g., countries from the Periphery) a better reflection, which explains the decrease of their stress level as shown in Figure 2.1.

Finally, in order to get an insight in the evolution of the degree of reflection of groups' preferences, we compute the following aggregate measures of the stress indicator for the whole EMU:

$$S_{avg,t} = \frac{\sum_{i=1}^5 S_{x,t}}{5} \quad (2.9)$$

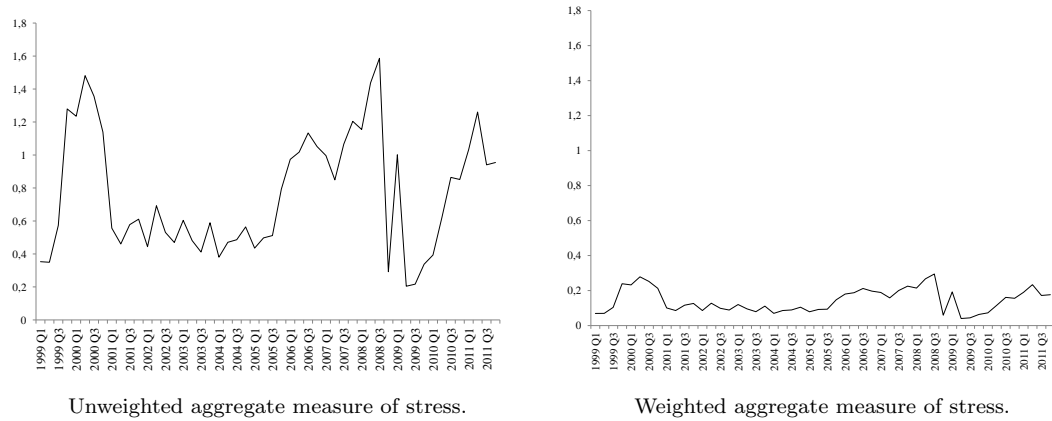
and

$$S'_{avg,t} = \frac{\sum_{i=1}^5 w.S_{x,t}}{5} \quad (2.10)$$

where w is the GDP weight of the group x in the euro area.

As noted by Berger (2006), economic size does not represent the voting distribution of the GC. Therefore, we consider two cases, one where each group is represented equally, which implies that each group-specific stress measure receives the same weight, and one where each group of countries is represented by the weight of its GDP in the euro area.

Figure 2.2: Unweighted and weighted aggregate measure of the level of stress for EMU



The evolution of the levels of aggregate stress measures provide important insights about the institutional governance of the GC. Figure 2.2 shows that the level of stress has decreased over time during the first years of the EMU (2001-2005), both if we consider the unweighted and the weighted aggregate measures. However, from the period corresponding to the financial and the euro debt crisis, the degree of stress measures have increased. Nevertheless, the value of the weighted aggregate stress is much lower than the unweighted one, suggesting that the common monetary policy fits further the heterogeneous preferences of countries composing the euro area, and thus, the different preferences of their central bankers, when taking into account countries' GDP weights in the GC decision-making process.

Hence, the evolution of the aggregates measures of stress shown in Figure 2.2 reveal that the financial and the euro debt crisis challenged the common monetary policy in the euro area, and has strengthened the discrepancies in monetary policy preferences between committee members. This reflects an increased uncertainty and more dispersed views among policy-makers regarding the best possible policy responses to shocks from that period. It also raises the question of the sustainability of the single currency, following the exacerbation of the economic discrepancies between member countries, and the enlargement process of the euro area.

Overall, the results of this analysis have shown that the common monetary policy was in line with the preferences of some groups of central bankers²², identified by the common concerns of their national publics. Nevertheless, the recent economic and financial crisis has put in question this configuration, notably by giving more weight on monetary

²²Germany, France, NEG.

preferences of central bankers from the South and the Periphery of Europe in the GC decision making process. Moreover, with the euro debt crisis that has reduced ECB's monetary policy leeway (with the zero lower bound), and the recent integration of countries with different monetary practices in the EMU, further research prospects about the change in ECB's monetary policy behavior should be raised in the near future.

2.4 Robustness test

In this section, we propose an additional measure of the degree of stress for each group of countries, by comparing their counterfactual interest rate ($\tilde{i}_{x,t}$) with the ECB's policy rate instead of the Euribor as in the last section:

$$S_{x,t} = | [i_{ECB,t}] - [\tilde{\rho}_x \cdot (i_{t-1}) + (1 - \tilde{\rho}_x) \cdot r + (1 - \tilde{\rho}_x) \cdot \tilde{\beta}_x \cdot \pi_{x,t} + (1 - \tilde{\rho}_x) \cdot \tilde{\gamma}_x \cdot y_{x,t}] | \quad (2.11)$$

where $i_{ECB,t}$ is the ECB's policy rate at time t , i_{t-1} its lagged value, and r its long run equilibrium value.

Table 2.7 shows the average group stress measure.

TABLE 2.7: Average group stress measure

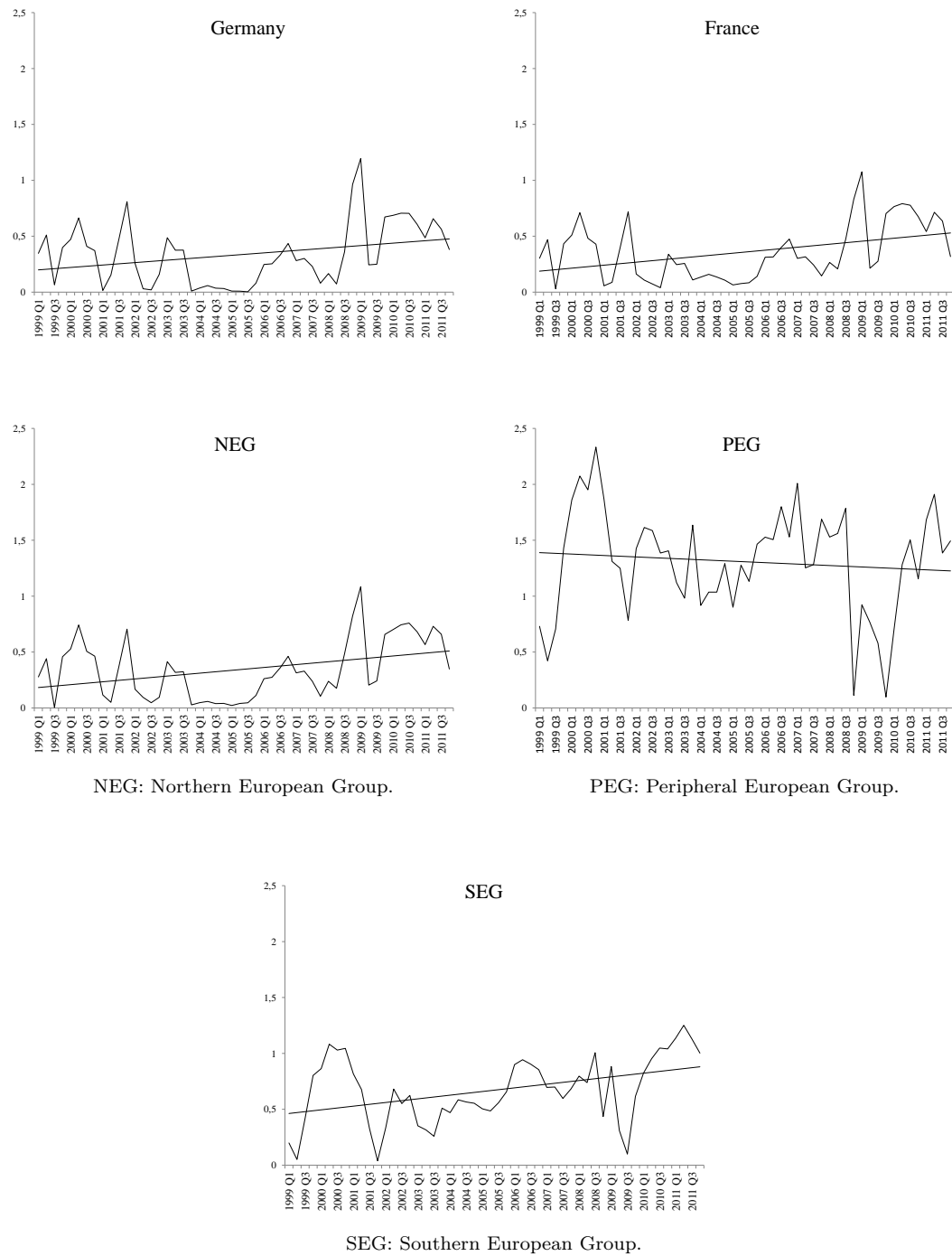
	NEG	PEG	SEG	France	Germany
Average value of stress measure	1.05	2.03	1.41	1.07	1.03

NEG: Northern European Group/PEG: Peripheral European Group/SEG: Southern European Group.

Even though the value of the average group stress measure is higher when we compare the counterfactual interest rate with the ECB's policy rate rather than the Euribor, similar observations can be still drawn. The value of the stress measure is the lowest for Germany, France, and the Northern countries, while it is higher for countries from the South and the Periphery of Europe. Again, this suggests that the ECB's monetary policy rule was, on average, closer to the policy rule implemented by the Bundesbank and central banks from Northern Europe, than the policy rule implemented by central banks from the Periphery and the South of Europe during the pre-EMU period.

Next, Figure 2.3 shows below the evolution of the groups' stress measure from 1999.

Figure 2.3: Group monetary stress measure

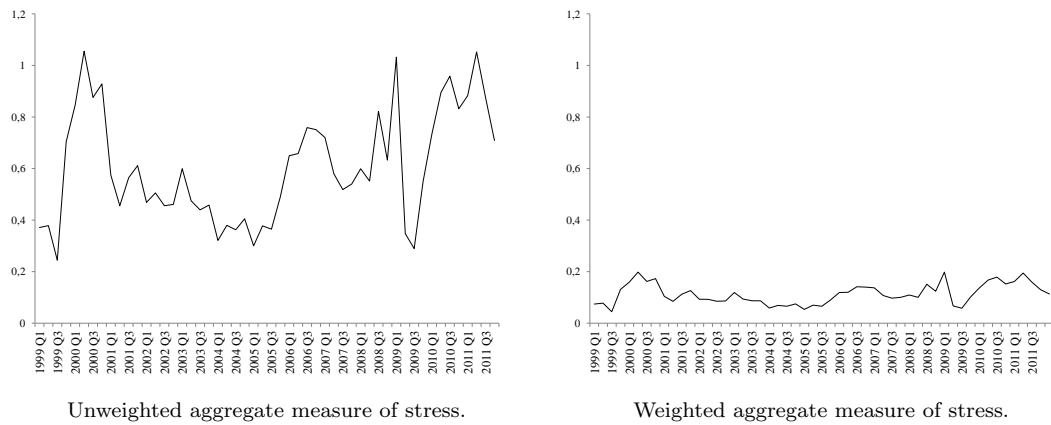


The individual group stress measures highlighted in Figure 2.3 confirm the relevance of the previous findings, i.e., a persistent low stress measure for Germany, France and the NEG during the first years of the EMU, and a sudden increase of its value from 2008, coinciding with the beginning of the euro debt crisis. The ECB's policy rate was then more in accordance with the monetary preferences of central bankers from these countries, than with the ones of central bankers from countries of the South and the

Periphery in Europe, as shown by the high value of their stress measures.

Nevertheless, the recent economic and financial crisis has led to an increase of stress measures for all groups of central bankers, thus suggesting that the policy rule used by the ECB was not in line with the preferences of the groups of central bankers from that time. This exacerbated the aggregate degree of stress as shown in Figure 2.4 below, and caused an increase of uncertainty regarding ECB's best policy responses.

Figure 2.4: Unweighted and weighted aggregate measure of the level of stress for EMU



2.5 Conclusion

Since it is recognized that the ECB lacks transparency compared to other central banks (de Haan et al., 2010), the literature about the inner working of the GC is scarce due to the absence of voting records and minutes from policy meetings. It is then a challenge to try to understand and quantify the decision-making process of the GC by relying on economic and statistical tools solely.

We then see one major contribution from this paper. We introduce textual analysis to the literature related to ECB communication, a process frequently used in political science and sociology. From a methodological point, this method enables to extract the concerns of newspapers covering European central bankers' statements and policy decisions, and thus, the concerns of national publics in the EMU. The statistical tool used afterwards allows to regroup the newspapers, and thus, the national publics, according to their expressed concerns. The results show that there are 3 groups of countries that have similar concerns, as revealed through their respective newspapers' coverage on monetary policy issues, and two isolated countries. Hence, this approach sheds some light on the

persistent heterogeneity between member countries in the euro area on economic and political issues, and thus, on the resulting various policy preferences among the European central bankers inside the GC of the ECB.

Next, we assess the weight of the groups of countries in the decision-making process of the GC since the inception of the single currency. The results confirm the strong position of Germany and other countries from the North since the launch of the euro, but they also suggest a better inclusion of the preferences of countries from the South and the Periphery of Europe these last years.

Given the recent integration of new member countries in the euro area since 2008, the euro debt crisis, and the enlargement process that will result in new voting rules, the methodology used in this chapter might be useful to check how the preferences of national publics in the EMU will evolve the next years, and thus, the configuration of the groups of countries with similar concerns as well, and how the heterogeneous preferences of the new entrants will be considered in the decision-making process of the GC.

Chapter 3

Dissecting the brains of central bankers: The case of the ECB's Governing Council members on reforms

3.1 Introduction

As shown in the previous chapter, there are persistent heterogeneous policy preferences between central bankers in the EMU. A crisis period may, however, exacerbate these differences, as illustrated hereafter.

It is now well established that financial crises are necessarily followed by structural and economic reforms, as Tommasi and Velasco (1996, p. 197) state: “That economic crises seem either to facilitate or outright cause economic reforms is part of the new conventional wisdom on reform”. Rodrik (1996, p. 27) adds further that: “...if an economy in crisis has not yet reformed, the frequently proffered explanation is that the crisis has not yet become severe enough”. This comes in accordance with the results of Tornell (1998), who finds that between 1970 and 1995, almost 80% of the trade reforms occurred during periods of either economic crisis or drastic political changes. Drazen and Easterly (2001) find also evidence for the “crisis-induces-reform” hypothesis, but only for some variables like the inflation rate or the black market premium, and not for the current

account deficit and the budget deficit. According to the authors, the ease of correcting different types of crises may explain these results. Alesina et al. (2006) argue that the term “reform” in such a context means a major change in policy, and they distinguish two types of reforms: stabilization reforms like major fiscal adjustment, and structural reforms like liberalization of good markets, changes in the regulatory environment, or labor market reforms.

As a case in point, the emergence of the euro sovereign debt crisis at the beginning of 2010, and the exacerbation of the incompleteness of EMU’s institutional framework and its vulnerabilities, required new measures and immediate reforms from the ECB as well as other policy makers (Aizenman, 2013). There is now wide recognition of the need to secure sustainable public finances, and to reinforce supervision, regulation and resolution procedures across euro area countries. Then, the euro debt crisis constitutes a sort of experiment for the “crisis-induces-reform” hypothesis.

As European central bankers have had to cope with the crisis, they have suggested to implement reforms to solve it. They have notably used their speeches to convey their opinions about the economic reforms to implement¹ (Bodea and Huemer, 2010; de Jong and Van Esch, 2013).

The empirical literature has shown that monetary policy decisions of central bankers are affected by their occupational and educational background, e.g., Havrilesky (1993) shows that career background influences the voting behavior of Federal Reserve Bank Presidents and Board Governors, while Harris et al. (2011) and Eichler and Lähner (2013) find that having experience in the central bank, the industry sector, and in academia is a source of variation in policy preferences inside the monetary policy committee of the Bank of England and the Federal Market Open Committee. Here, we investigate whether these background characteristics have an influence on European central bankers’ economic reform proposals. More precisely, we check whether education and former occupation affect their respective preferences with respect to the crisis.

The relationship between a person’s education and his or her economic preferences has been studied by Frank et al. (1993, 1996), Frey et al. (1993), Frey and Meier (2003), Rubinstein (2006) and Goossens and Méon (2010). These authors have shown that education strongly influences behavior in economic decision-making.

However, one major point of discussion in this literature is whether such differences in economic attitudes stem from indoctrination or from self-selection, i.e., they could be the

¹Likewise they send signal about their monetary policy decisions (de Haan and Jansen, 2006).

result of studying different topics or from a selection process whereby students choose a field that is closer to their prior beliefs. Some studies find evidence of the selection hypothesis, such as Carter and Irons (1991), Yezer et al. (1996), Frank and Schulze (2000), Gandal and Roccas (2002), Frey and Meier (2003). According to the self-selection hypothesis, economics students deliberately choose to study economics because they are already different or have different views than other students. This view implies that the study period of several years has no effect on the students' value system. This theory is in line with the crystallization thesis of Hess and Torney (1967), which suggests that values are determined in the first 13 years of life and that these values remain stable thereafter. However, most sociologists tend to reject this view of value formation as being static. Instead, it is argued that one's socialization is an ongoing process (Hurrelmann 2002). This would be consistent with Becker's (1996) model of man's values and attitudes, according to which values and attitudes result from an ongoing investment in human and social capital². This hypothesis is in line with studies that report evidence of indoctrination effect, such as Frank et al. (1993), Haucap and Just (2004), Gross (2005), Cipriani et al. (2009), Bauman and Rose (2011), and Giuliano and Spilimbergo (2014).

In addition to education, other influences might shape a person's economic preferences, such as the profession the person exerts after receiving his education. As an illustration, Frey (1986) shows that economists working in the government had less trust in the market than academic economists; while, for instance, 45% of academic economists believed that minimum wages increase unemployment, only 33% of economists working in the government held the same belief. Coleman (1992) finds that economists have different opinions about the justice of redistributive transfers, the merits of privatization and the need to manage demand to avoid unemployment, and that these differences are correlated with the place of employment, gender and age. For instance, male economists under 40 years of age working in the government and business sectors appear to be the strongest supporters of the market mechanism.

Against this background, we expect that the educational and the professional indoctrination European central bankers experienced influence their economic reform preferences: central bankers with an experience in the private sector might favor measures that aim

²According to this model, university education has a strong impact on one's values, and differences in education should lead to different value sets.

to stabilize the banking sector, while central bankers from the public sector might promote the implementation of reforms that help sustain public finances.

Hence, we focus on the education and career background of central bank governors in the EMU, and how these features impact on the reform proposals they made during their tenure, since the start of the euro debt crisis. To the best of our knowledge, this paper is the first which studies the relationship between EMU central bankers' reform proposals since the onset of the euro debt crisis and their personal characteristics. For that purpose, we rely on central bankers' public speeches to extract their reform proposals, using the technique of cognitive mapping introduced in section 3.2. In section 3.3, we outline the model and, in section 3.4, we assess the extent of the influence of central bankers' personal characteristics on their economic reform proposals. Section 3.5 provides further extensions while the last section concludes.

3.2 Mapping the brains of central bankers

To determine the reform proposals made by the European central bankers to stimulate the economy after the euro debt crisis, we proceed to a textual analysis of their public speeches using a hand-coding process. However, central bankers make speeches in various contexts and may talk about reforms which are not related to the euro debt crisis, but to different circumstances. As an illustration, Luc Coene, the Belgian central banker since 2011, is member of the advisory board of the think tank "Itinera Institute"³. He may then make propositions that fall within its scope of actions in his speeches. Therefore, it is necessary to contextualize the reform proposals central bankers make in their speeches. Such contextualization requires the technique of cognitive mapping.

Cognitive mapping is a method commonly used in the fields of political science, social psychology and organizational studies. It enables a systematic analysis of leaders' policy beliefs embedded in public assertions, and allows to make qualitative and/or quantitative comparisons of these beliefs⁴. It offers ways to qualitatively and quantitatively analyze both the content and structure of belief-systems. While most of the studies using the cognitive mapping focused on foreign policy beliefs (with an emphasis on U.S. presidents), as we will show, this technique also applies to different topics, delivering

³Source: <http://www.itinerainstitute.org/en/about-itinera/advisory-board> [Accessed 22 September, 2014].

⁴See Axelrod (1976), Bougon et al. (1977) for seminal papers and Young and Schafer (1998), Eden and Ackermann (1998), Curseu et al. (2010), and Van Esch (2012) for more recent uses.

interesting insights.

Wrightson (1976, pp. 291-332) described the process of coding cognitive maps from texts as a “sophisticated” content analysis. This technique involves creating cognitive maps through a hand-coding textual analysis of public speeches. The coder looks for “cause concept -linkage- effect concept” relationships. This involves identifying concepts and the relationships between those concepts. The term “concept” refers in this context to the mental representation a central banker has when talking about macroeconomic variables (inflation, deficit...), economic instruments (tax, capital requirements...), or economic reforms (banking union, supervisory mechanisms...). A cognitive map thus gives a structured overview of a policy-maker’s position on certain issues related to the euro debt crisis, and shows how its outlined concepts are linked, and indicates which ones are positively or negatively related. Policy-makers’ preferences and causal reasoning may be determined from the maps. In contrast to basic content analysis, which is essentially a counting procedure, the analysis in a cognitive map is based on the causal relationship between concepts, not on the concepts themselves. Then, cognitive maps allow to distinguish the reforms European central bankers made in the context of the euro debt crisis from the reforms made during other events/crisis⁵. Hence, it is the most adequate textual analysis method to extract and conceptualize the reforms central bankers propose to counteract the negative effects induced by the euro debt crisis.

Given that private documents are inaccessible to the general public, the empirical studies in politics and psychology have mainly used public sources to assess decision makers’ views (Van Esch, 2007). One might argue that asserting decision makers’ beliefs from public sources may be biased given that they are written by speech writers, and thus do not reflect their personal views about the necessary reforms. However, Renshon (2009) shows that analyzing public sources leads to the same outcomes as private sources, providing confirmation of the validity of using public speeches to assess leaders’ beliefs. Moreover, de Jong and Van Esch (2013) argue that an additional advantage of using public speeches is that they reflect the person’s opinion in its official role, which may be the exact reason why she can be influential. For the present study, public speeches by central bank officials are written by a department in the national central banks, and can be subject to review by the Board. Thus, there might be a degree of censorship or restraint and we cannot control for that. However, in our view this makes our results even stronger since central bankers’ speeches might reveal more subtler perspectives on

⁵Like, e.g., the subprime mortgage crisis.

their personal views on reforms despite the potential censorship. Moreover, if the empirical analysis reveals the importance of some traits, it can only be biased towards the null hypothesis of no-influence.

To determine European central bankers' views on the euro debt crisis and their respective reform proposals, a cognitive map is created for each of them based on all their public speeches⁶ from October 2009⁷ until July 2013 (see Appendix B.1), in front of national and international audiences. We ignore Executive Board members given that the analysis of their speeches has shown that they are primarily ECB's policy representatives.

Cognitive maps are created as follows: the causal relations between concepts revealed through the textual analysis are transformed into graphic maps in which the concepts are depicted as points and the relations between these concepts as arrows. A concept at the tail of an arrow is taken to cause, or influence, the concept at the arrowhead. When an arrowhead is shown with a positive sign (+) attached, then the first pole of the tail concept implies the second pole of the head concept. We thus distinguish in the maps the reforms they advocate (cause concepts), and their positive/negative impact (linkage) on some economic aggregates (effect concepts), such as economic growth, the level of unemployment or the government budget balance. Given the research question raised by this present study, cause concepts serve as an indicator, first to reveal the differences between European central bankers' reform proposals, and second to assess the influence of their educational and professional background on their respective propositions.

As an example of this technique, Figure 3.1 represents an excerpt of the cognitive map of Erkki Liikanen (2004 -...), the governor of the Bank of Finland, when he talks about the euro debt crisis.

⁶Public speeches of central bankers are available in the Bank of International Settlements database (www.bis.org/list/cbspeeches/from_01011999/index.htm).

⁷In October 2009, the new Greek government revealed that previous Greek governments had been underreporting the budget deficit. From this period onward, similar concerns arose in Ireland, Portugal, Spain and Italy, amplifying notably the risk of contagion of rising spreads on sovereign bonds. This rapidly led to tensions in the euro sovereign debt market.

- Federally oriented reforms
- Liberalization market reforms
- Unconventional monetary easing.

3.3 Data and Methodology

To assess the influence of the biographical features on the reform proposals derived from the cognitive maps of each European central banker, we estimate a Tobit regression model, which is the most adequate given the nature of our data.

The Tobit model describes the relationship between a non-negative dependent variable y_i and an independent variable x_i , which can be described in terms of a latent variable y_i^* . If we consider that y_i^* is observed if $y_i^* > 0$ and is not observed if $y_i^* = 0$, then, the observed y_i is defined as :

$$y_i = \begin{cases} y_i^* = \beta x_i + u_i & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* = 0 \end{cases}$$

The Tobit model is convenient for the censored regression model, because some observations on y_i^* (those for which $y_i^* = 0$) are censored. In other words, the latent variable y_i is only observed if $y_i^* > 0$. The actual dependent variable is : $y_i = \max(0, y_i^*)$. As Wooldridge (2002) suggests⁹, a censored regression model applies when there is a variable with quantitative meaning, y^* , which is censored from below or above, i.e., it is not observed for some part of the population.

In our case, we face a censored regression model given that 12 out of 17 central bankers (70%) left or took their position during the period of analysis (2009-2013) (see Table 3.3 in appendix B.1). Therefore, some dependent variables may not be observable for some central bankers. For instance, some reforms have been applied before the appointment of some central bankers¹⁰, thus, these reforms are absent in their respective proposals, and not because they did explicitly choose not to mention them. We estimate then a

⁹“the censored regression model arises due to data censoring. In particular, the underlying dependent variable is roughly continuous but it is censored below or above a certain value due to the way we collect the data or to institutional constraints. In a sense, the problem solved by censored regression is a missing data problem, but we have useful information on the nature of the missing data” (p. 551).

¹⁰The Basel 3 accord was agreed in December 2010. Therefore, it is obvious that a central banker such as Ignazio Visco, who was appointed on November 2011 as a governor of the Bank of Italy, will not talk about it as a crucial reform to adopt.

linear relationship between variables with a left censoring in the dependent variable¹¹. We check whether any of the assumptions of the censored normal regression model is violated, in particular if there is heteroscedasticity or non-normality, and find that the results are consistent¹².

Our sample covers the period running from October 2009 until July 2013, and includes all EMU central bankers who have made public speeches¹³. The estimated equation takes the following form:

$$reform_{x,i} = \alpha + \beta_1 prof_i + \beta_2 educ_i + \beta_3 appoint_{polit_i} + \gamma X_i \quad (3.1)$$

where $reform_{x,i}$ is the ratio of reform x proposed by central banker i to the total number of all reforms stated in his speeches¹⁴ (and derived from his cognitive map) during the covered period, i.e., it reflects the relative importance he grants to the reform x in his speeches¹⁵. The form of the dependent variable (ratio) impedes the use of a Count data model, given that it does not comply with one of the fundamental conditions of the Poisson distribution, i.e., the use of an integer as a dependent variable.

$prof_i$ is the profession of central banker i , $educ_i$ represents his education and $appoint_{polit_i}$ the political affiliation of the government that appointed the central banker i . We consider eight different background indicators, of which four are dummy variables for working experience, two dummies for education background and two additional dummies for political affiliation. Finally, given that in the euro area central bankers are appointed by different countries with different and sometimes antagonist interests, we introduce a set of control variables X_i to control for this potential heterogeneity. X_i includes the growth of GDP, the growth of the unemployment rate, the growth of the debt level, and the inflation rate of the country of central banker i during his tenure for the covered period.

With regard to education, we distinguish holders of a Ph.D and holders of a MSc. As for occupational background, (private) bankers, economic scholars, central bank staff and civil servants are distinguished. We follow Göhlmann and Vaubel (2007) and consider that if a central banker has worked in more than one profession, we take into

¹¹Censoring from the left takes place when cases with a value that fall at a threshold (0) are censored.

¹²Test results available upon request.

¹³Except for Vitor Constancio, given that he was appointed vice-president of the ECB on May 2010.

¹⁴We consider a ratio given that central bankers talk with different frequencies, as shown in Table 3.3 of Appendix B.1.

¹⁵Due to space constraints, statistics about the left-hand side variables are available upon request.

account his entire background. For instance, if a central bank governor has experience in academia and in the banking sector, both background indicator variables take the value 1¹⁶. Finally, given that the governor of the central bank is usually appointed by the government or by parliament, that a political party tends to nominate committee members with similar preferences (Havrilesky and Gildea, 1992; Chappell et al., 1993; Vaubel, 1997; Berger and Woitek, 1997; Ennser-Jedenastik, 2014), and that partisan ideologies appear to play an important role in the monetary policy committee's voting calculus (McGregor, 1996; Neuenkirch and Neumeier, 2013), we consider that the political affiliation of the government that has appointed central banker i may have an impact on the reform proposals. We thus distinguish the central bankers appointed by right wing governments from the central bankers appointed by left wing governments. We use the correlation matrix to check for multicollinearity between the dependent variables, and find that the null hypothesis of no collinearity cannot be rejected.

It is worth noting that introducing a time dimension such as time fixed-effects in this estimation is pointless given that central bankers deliver speeches when they are invited for conferences or seminars. Then, the distribution of speeches, and thus, of their reform proposals, is random throughout the period analyzed.

Figure 3.2 below summarizes the educational and occupational background of the European central bankers.

¹⁶This is particularly relevant for the European central bankers, given that most of them have cumulated a position in the university and in the public, the private or the central banking sector.

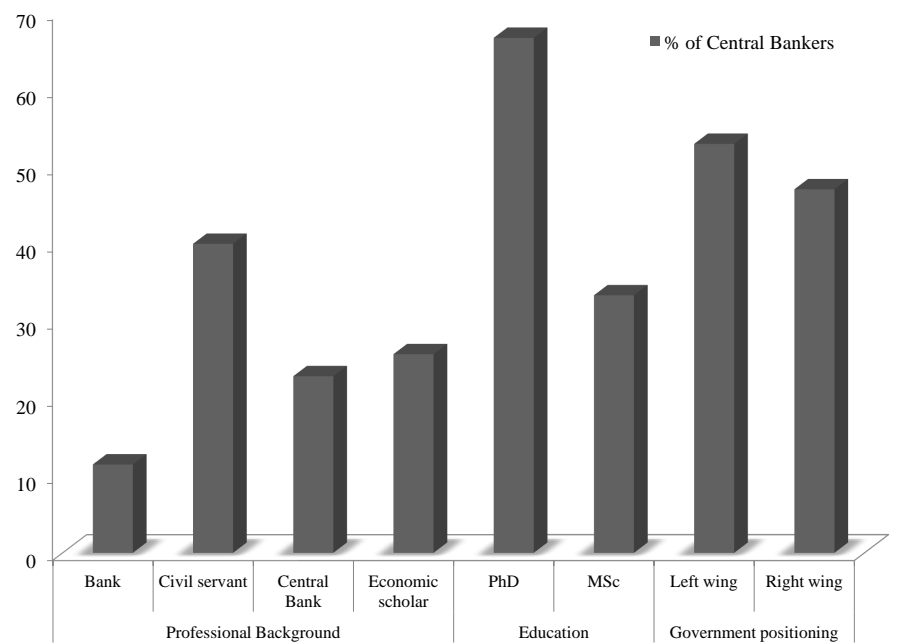


FIGURE 3.2: The educational and occupational background of the European central bankers.

Figure 3.2 shows that most of the central bankers in the EMU have a background in the public sector, followed by those with a previous experience in the academic and in the central bank sector. Those having an experience in the private sector, e.g., the banking sector, represents a minority in the Governing Council. Concerning the educational background of central bank governors, holders of a Ph.D represent a majority in the committee (65%). Finally, given the political diversity of parties leading the EMU countries during that period, the number of central bankers appointed by left wing governments is approximately the same than the number of central bankers appointed by right wing governments in the Governing Council.

3.4 Results

Table 3.1 below details the results of the regressions. The central banker i who has worked as an economic scholar¹⁷, holds a MSc, and who has been appointed by a right wing party is used as a reference in the estimations.

¹⁷Given that being an economic scholar is the norm among the European central bankers, i.e., all central bankers who have an experience in the academic sector have also an experience in one of the three other sectors, we consider it as the reference type. This allows to unveil the specificities of the other occupational categories of central bankers, i.e., the banking, the central banking, and the public sectors.

TABLE 3.1: Economic reforms

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.14* (0.08)	-0.01 (0.71)	-0.11*** (0.005)	0.007 (0.90)	-0.31*** (0.002)	-0.23 (0.17)
Occupational Background						
Banker	-0.05 (0.37)	0.01 (0.69)	0.01 (0.70)	-0.03 (0.42)	-0.008 (0.89)	-0.63** (0.01)
Civil servant	-0.04 (0.39)	0.04* (0.09)	0.04* (0.06)	-0.05** (0.04)	0.06 (0.11)	-0.008 (0.89)
Central Bank	0.05 (0.24)	0.02 (0.54)	0.012 (0.52)	-0.02 (0.60)	0.05 (0.32)	0.03 (0.61)
Academic	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Education						
Ph.D	-0.0009 (0.98)	-0.02 (0.31)	0.03 (0.11)	0.013 (0.67)	0.06 (0.30)	0.10 (0.11)
MSc	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Political Appointment						
Left wing	0.07* (0.07)	-0.01 (0.47)	0.02** (0.03)	-0.03 (0.32)	0.06* (0.08)	-0.08 (0.26)
Right wing	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Control variables						
GDP growth	0.004 (0.30)	0.001 (0.65)	0.003*** (0.008)	-0.003 (0.31)	0.005 (0.14)	-0.005 (0.29)
Unemployment	0.002 (0.70)	-0.002 (0.64)	0.005* (0.08)	-0.005 (0.38)	0.005 (0.39)	-0.0004 (0.97)
Debt	0.0005 (0.43)	-0.0001 (0.82)	0.0006* (0.09)	0.0004 (0.41)	0.002** (0.03)	0.001 (0.21)
Inflation	0.001 (0.89)	-0.001 (0.70)	-0.004 (0.13)	0.007 (0.21)	0.006 (0.12)	0.02 (0.20)
Number of observations	136	119	102	85	34	

(1): Banking and Finance industry reforms. (2): Basel 3 implementation. (3): Consolidation measures. (4): Federally oriented reforms. (5): Market Liberalizing reforms. (6): Unconventional monetary easing.

*significant at 10%, **significant at 5%, ***significant at 1%, p-value in parentheses.

It has to be remembered that each reform category¹⁸ regroups a set of economic reforms that are detailed in the results' comments below (cf. Table 3.4 of Appendix B.3).

A first interesting observation concerns the central bankers with an experience in the public sector: on average, they are more likely to call for the implementation of economic reforms in their speeches than their colleagues from the banking and the central banking sectors. In particular, they advocate the need for adopting consolidation measures, which consist on correcting the public finance imbalances, by reducing governments' expenditures and restructuring the public debt. They highlight notably the fact that governments (especially from Southern Europe) need to recover stability in public finances to ensure a sustainable economic growth, and to make more effective the impact of the ECB's non-standard monetary measures. They are also more likely to encourage the implementation of the norms contained in Basel 3, compared to the central bankers from the other sectors¹⁹, like the introduction of the countercyclical capital buffer and the increase of capital requirements. These reforms are supposed to strengthen bank capital requirements by increasing bank liquidity and decreasing bank leverage. Therefore, central bankers from the public sector emphasize the need for stricter policy rules to put a ceiling on government's expenses and on banks' investments.

An additional observation from Table 3.1 shows that central bankers from the public sector do not highlight the need for federally oriented reforms in their speeches compared to the *reference group*, the academic sector (column 3). It is worth noting that when we consider other reference categories than the academic sector (see Table 3.5 in Appendix B.4), we observe that central bankers from the banking and the central banking sectors are more prone to insist on the need of a better coordination policy in the eurozone, like a political or a banking union, as well as a common supervision at the supranational (European) level. Central bankers who advocate the need for these reforms argue that a political and a banking union would ensure the common implementation of rules in the eurozone, and that these common rules will help to prevent bank crisis, and facilitate fiscal transfers between member countries. These reforms aim then to complete the EMU, and allow for centralized application of EU-wide rules in the euro area. Therefore, the peculiarity of the central bankers having an experience in the banking and the central

¹⁸i.e., reforms of the banking and finance industry, Basel 3 implementation, Consolidation measures, Federally oriented reforms, Liberalization market reforms, and Unconventional monetary easing.

¹⁹For example, George Provopoulos, the central bank governor of Greece since June 2008, has a 15 year-experience in the banking sector, and has emphasized that "*a new code of conduct in 2015 will lower capital requirements to release funds for a new growth model in the Greek economy*" in an interview with the Athens news agency on February 2014.

banking sectors is that they do not insist on country-specific reforms to correct for potential national imbalances, but rather seem to call for common measures that should be implemented by supranational institutions, and that all member countries should follow to enhance the resilience of the EMU.

As regards the unconventional monetary easing instruments, central bankers from the banking sector seem to be reluctant to explicitly advocate in their speeches the adoption of non standard measures to help sustain the public finances of some EMU member countries, like the introduction of the Long term refinancing operations (LTRO) or the purchase of government bonds, compared to the reference category (column 6). The aim of these non-standard measures is to support the effective transmission of monetary policy to the economy, by enhancing the provision of credit to the private sector, and keeping contagion in financial markets contained.

Concerning the impact of the political affiliation of the governments that appointed central bankers, we notice that the ones who have been appointed by a left wing government or parliament focus in their speeches on the necessity of liberalizing the markets on the one hand (column 5), by asking for labor market reforms, privatization measures, and the removal of competition barriers. These central bankers thus highlight the need for some countries (Greece, Spain, and Portugal) to increase competitiveness and to lower production costs, in order to build foundation for GDP growth and to decrease the unemployment rate.

On the other hand, estimation result in column (1) reveals that these central bankers also tend to insist on the reforms of the banking and finance industry that member countries should implement to reclaim their financial sector, and to establish a safe and growth enhancing financial sector in Europe. Thus, these central bankers assert the importance of improving the regulatory framework in their speeches, by separating and restructuring banks' activities, establishing a resolution regime, increasing the macroprudential instruments and the level of transparency of financial firms *inter alia*. The aim of these reforms is to strengthen regulation and supervision of the financial sector to provide an effective response to the financial crisis, and to ensure that it can put the euro area back on the path of a sustainable and inclusive growth.

Finally, the results reveal that central bankers with a PhD are more likely to talk about specific reforms to stimulate the economic recovery than those with a MSc., as they call for the adoption of consolidation measures, such as the enforcement of the Stability and the Growth pact or the adoption of a budget adjustment program (column 2). This

confirms the argument proposed by Rajan (2004), that central bankers with a better qualification are more prone to propose specific and detailed economic measures than their colleagues, as they may feel more confident about their potential benefits.

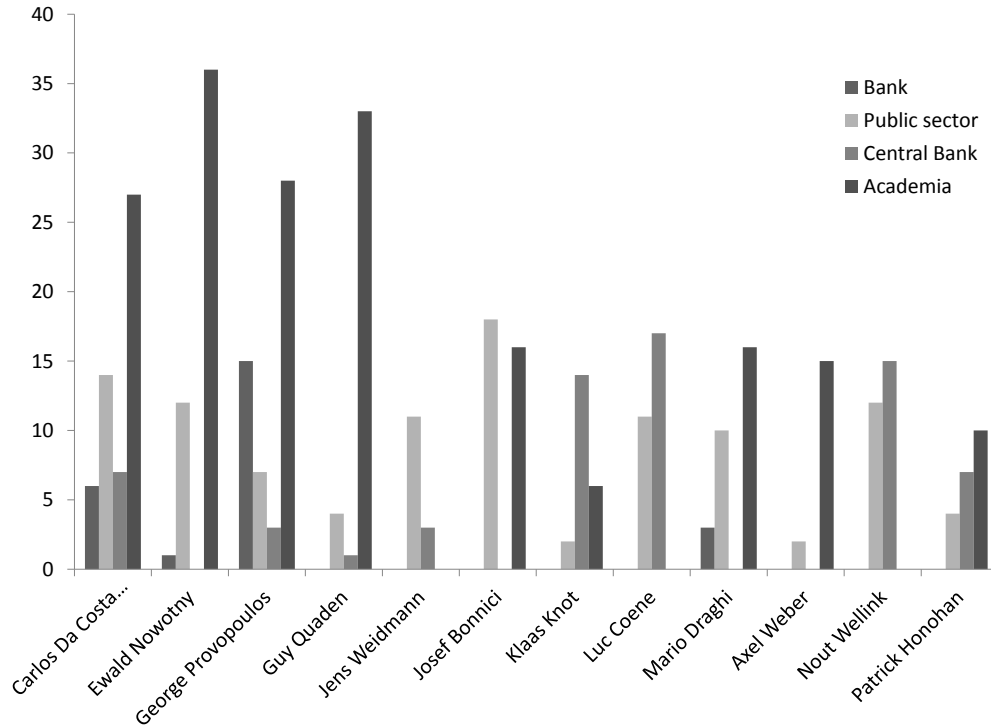
In the context of the euro debt crisis, the findings reveal that central bankers with a background in the public sector tend to promote national reforms, so as to enhance countries' capacities to withstand the economic slowdown, and to render their economic growth's framework more sustainable. They thus have primarily a national perspective when they consider the reforms that should be adopted as a way out of the euro debt crisis. Meanwhile, central bankers with a background in the banking and central banking sectors rather ask for reforms that aim to consolidate the economic integration process of the EMU. The peculiarity of their reforms is that they have a supranational character, while the reforms of central bankers from the public sector has a national one.

Hence, the results of this paper empirically confirm the relevance of the theoretical literature about the professional and the educational indoctrination process, i.e., it appears that this indoctrination is a source of variation in the attitude of economic policy makers such as the European central bankers vis-à-vis the euro debt crisis. The results show that in the context of the EMU, some central bankers have particular preferences when considering the structural and the stabilization reforms that should be adopted to face the euro debt crisis, and that these preferences are related (at least in part) to their biographical background.

3.5 Extensions and robustness tests

As Figure 3.3 below shows, central bankers had diverse professional experiences with different magnitudes. Thus, a natural question is to check whether this diversity and the different years in office have an impact on the results, given that the indoctrination process has a crucial role in shaping individuals' beliefs. We propose two extensions in what follows: (i) a finer professional distinction among central bankers, (ii) a consideration of the years in office European central bankers spent in their past professional positions (see Table 3.6 of Appendix B.5).

FIGURE 3.3: The occupational background of the European central bankers.



3.5.1 A finer professional distinction

In the Governing Council of the ECB, there is a predominance of central bankers with a position both in the academic sector and in another sector. Hence, we propose additional dummy variables with interaction terms related to the professional background. The aim is to show the specific impact of having an experience in the academic sector on the economic reform proposals of European central bankers. The regression has the same components as equation (1), except that the independent variable $prof_i$ comprises now the following professional categories with interaction terms:

- academic*central bank*
- academic*civil servant*
- academic*banker*
- central banker*
- civil servant*
- banker*.

The reference dummy variable corresponds to the category *academic*civil servant*. Table 3.2 details below the results of the estimations.

TABLE 3.2: Economic reforms

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.24** (0.04)	0.008 (0.87)	-0.17** (0.0006)	-0.27*** (0.002)	-0.11 (0.23)	-0.21 (0.18)
Occupational Background						
Banker	-0.05 (0.59)	0.13** (0.01)	-0.03 (0.38)	-0.17*** (0.004)	-0.01 (0.88)	-0.41** (0.03)
Civil servant	0.03 (0.66)	0.16*** (0.002)	0.02 (0.51)	-0.11** (0.02)	-0.01 (0.87)	0.04 (0.62)
Central bank	0.04 (0.51)	-0.07** (0.01)	0.03 (0.15)	0.11*** (0.008)	0.01 (0.68)	0.0006 (0.9)
Acad.*banker	-0.12 (0.55)	-0.18* (0.07)	-0.04 (0.46)	-0.32*** (0.009)	0.27 (0.12)	-0.65** (0.02)
Acad.*central banker	-0.04 (0.69)	-0.17*** (0.002)	-0.23** (0.04)	-0.0001 (0.99)	0.15 (0.10)	0.0003 (0.9)
Acad.*civil servant	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Education						
Ph.D	0.07 (0.27)	0.019 (0.58)	0.09*** (0.003)	0.12*** (0.004)	-0.03 (0.61)	0.11 (0.13)
MSc	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>		
Political Appointment						
Left wing	0.05 (0.21)	-0.008 (0.71)	0.007 (0.65)	-0.08** (0.03)	0.09** (0.02)	-0.08 (0.32)
Right wing	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>		
Control variables						
GDP growth	0.004 (0.22)	0.001 (0.61)	0.002* (0.08)	-0.002 (0.45)	0.003 (0.29)	-0.004 (0.37)
Unemployment	0.004 (0.76)	0.012 (0.12)	-0.003 (0.59)	-0.005 (0.54)	-0.003 (0.79)	0.005 (0.37)
Debt	0.001 (0.31)	-0.0007 (0.43)	0.003** (0.02)	0.003*** (0.0016)	-0.002 (0.90)	0.006 (0.73)
Inflation	0.001 (0.92)	-0.017** (0.03)	0.001 (0.74)	0.03*** (0.002)	0.0009 (0.30)	0.01
Number of observations	136	119	102	85	68	34

(1): Banking and Finance industry reforms. (2): Basel 3 implementation. (3): Consolidation measures. (4): Federally oriented reforms. (5): Market Liberalizing reforms. (6): Unconventional monetary easing.
 significant at 10%, **significant at 5%, ***significant at 1%, p-value in parentheses.

The results delivered in Table 3.2 show that, when introducing the interaction terms to reveal the specific effect of having an additional experience in the academic sector on the reform proposals, the results are still broadly in line with those without interaction terms, and that they are even more significant for certain reform categories such as “Basel 3 implementation” (column 2), and the “Federally oriented reforms” (column 4). First, and as shown in column (3), central bankers from the academic and the public sector are more prone to have a “nationalistic” view by promoting and advocating consolidation reforms that have primarily a national trait than those coming from the academic and the central banking sector. An interesting insight is that an additional experience in the academic sector tends to prevent even more central bankers from the central banking sector to promote measures for correcting public finance imbalances. Second, we obtain very similar results for the reforms referring to Basel 3 implementation (column 2), that is, central bankers from the public sector call for the increase of capital requirements in their speeches. Again, it appears that having an experience in the academic sector is determinant for central bankers from the banking and central banking sectors for being less likely to propose measures related to capital and liquidity requirements than the reference group, as shown by their negative and significant coefficients. Third, central bankers appointed by left wing parties are the only ones who advocate the need to implement market liberalizing reforms (column 5). However, the estimation that considers the reforms related to the banking and finance industry (column 5) is close of being significant for these central bankers (0.20). Fourth, regarding the federally oriented reforms, the central bankers coming from the central banking sector insist on the need of coordinating macroeconomic policies between member states. They thus call for a banking and a political union in their speeches. This is in accordance with the finding of the previous section.

Finally, the reforms akin to the non standard measures confirm the relevance of the previous results, i.e., central bankers from the banking sector are less likely to call for the launch of the LTRO or the government bond purchases than those coming from the academic and the public sector. Hence, even though the results are in accordance with the previous findings (cf. section 3.4), they suggest that taking into account the diverse professional experiences of central bankers (in the form of interaction terms) allows showing their respective influence on central bankers’ reform proposals.

3.5.2 Years in office

When we consider the years in office spent in each professional category in the right-hand side variables instead of dummies, we obtain similar findings as in the previous regressions, although with a lesser significance for “Basel 3 implementation” and “Federally oriented reforms”, but still with similar signs. This result seems intuitive as the distinction between European central bankers is more blurry and hard to capture when we consider in details the time they spent in each professional category. Nevertheless, the same conclusions can still be drawn: European central bankers’ reform proposals are influenced by the indoctrination process they went through during their educational and professional experience.

TABLE 3.3: Economic reforms

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.16* (0.06)	-0.01 (0.84)	-0.07*** (0.005)	-0.14** (0.01)	-0.14 (0.15)	-0.37*** (0.001)
Occupational Background						
Banker	-0.008 (0.48)	0.002 (0.77)	0.05 (0.29)	0.02 (0.78)	-0.001 (0.89)	-0.24 (0.5)
Civil servant	0.008 (0.77)	0.001 (0.26)	0.01 (0.19)	0.001 (0.34)	-0.001 (0.74)	0.007 (0.44)
Central Bank	0.002 (0.91)	0.001 (0.13)	0.001 (0.88)	0.002** (0.02)	-0.001 (0.56)	0.007 (0.25)
Academic	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Education						
Ph.D	0.04 (0.43)	-0.02 (0.7)	0.03 (0.15)	0.03 (0.09)	0.06 (0.64)	0.17*** (0.006)
MSc	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Political Appointment						
Left wing	0.04* (0.09)	-0.01 (0.43)	0.02* (0.05)	-0.01 (0.53)	0.04 (0.26)	-0.15 (0.2)
Right wing	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>	<i>Reference group</i>
Control variables						
GDP growth	0.004 (0.27)	-0.001 (0.5)	0.001 (0.17)	-0.001 (0.63)	0.003 (0.24)	-0.03 (0.55)
Unemployment	0.009 (0.42)	-0.007 (0.32)	0.001 (0.74)	-0.008 (0.26)	0.01 (0.3)	-0.06 (0.51)
Debt	0.0007 (0.33)	-0.0002 (0.56)	0.001 (0.53)	0.001** (0.03)	0.001 (0.22)	0.003 (0.23)
Inflation	-0.004 (0.59)	-0.005 (0.9)	-0.006** (0.02)	0.004 (0.43)	0.003 (0.65)	0.04 (0.2)
Number of observations	136	119	102	85	34	

(1): Banking and Finance industry reforms. (2): Basel 3 implementation. (3): Consolidation measures. (4): Federally oriented reforms. (5): Market Liberalizing reforms. (6): Unconventional monetary easing.

*significant at 10%, **significant at 5%, ***significant at 1%, p-value in parentheses.

3.6 Conclusion

In this chapter, we extract the economic reforms European central bankers proposed since the start of the euro debt crisis, using the methodology of cognitive mapping. In a next step, we check whether these reform proposals depend on their respective educational and occupational background. We find that the differences between the reforms proposed by the central bankers occur because of their different professional experiences, those coming from the public sector favor national measures, while central bankers with a banking and central banking background tend to promote measures that have to be adopted at the supranational level. The political affiliation of the governments that have appointed central bankers plays also a key role, i.e., those appointed by left wing governments support structural and financial reforms. Overall, our analysis confirms that the indoctrination process European central bankers experienced is crucial for the type of policy reforms they would like to see implemented.

The policy implication of this study is that political leaders might actually appoint some central bankers with a specific background to promote the adoption of measures that they wish to implement, not only inside the Governing council of the ECB, but also towards the general public through the media channel and the speeches. Again, this raises the question of whether European central bankers are independent vis-à-vis the government of their respective countries, not only with respect to monetary policy decisions, but also to the non standard measures that the ECB might implement.

As an obvious extension, the focus of the analysis might be broadened to the speeches of political leaders, to check whether they are promoting the same type of policy reforms than their respective national central bankers. This might be a good proxy to assess the (true) degree of (in)dependence of European Central Bankers.

Chapter 4

FOMC Members' Incentives to Disagree: Regional Motives and Background Incentives¹

4.1 Introduction

As the attention was devoted to the ECB in the two previous chapters, we now turn to another central bank that has attracted a lot of attention in many empirical studies, the Federal Reserve. This chapter aims at bringing a new contribution in the literature of the Federal Open Market Committee decision-making process.

Although, according to Google Trends, their names do not figure among the most searched for on the Internet, the members of the Federal Open Market Committee (FOMC)² probably have a larger impact on the real life than most stars, real or virtual. This justifies, if needed, that many studies have focused on determinants of their behavior. Even if the final decision is made collectively by the FOMC, its members enter the decision-making process with their own, personal, policy preferences, themselves

¹This chapter is based on a joint work with Etienne Farvaque and Piotr Stanek.

²The FOMC is composed of 12 voting members, of which 7 are the members of the Federal Reserve Board (hereafter designed as Governors) including the Chairperson. The remaining 5 are the Presidents of the 12 regional Federal Reserve Banks (hereafter designed as Presidents), who vote on a rotating basis. The President of the Federal Reserve Bank of New York has a permanent voting right (and serves as a vice-chairperson) and the remaining 11 Presidents vote according to a rotation scheme. They may, however, participate in discussions during all the FOMC meetings.

being shaped by their past (education and professional backgrounds) and their aspirations (e.g., future job opportunities). As a consequence, they may process the common information differently, and/or may take into account data that are not available to, or would be considered as irrelevant by, other members. This may explain why interest rate decisions by the FOMC are not always made unanimously (with 5% of officially recorded dissents; see Horvath et al., 2014). Moreover, even if the degree of disagreement does not show up in an officially expressed dissenting vote, several studies have now proven that FOMC members cast their votes about monetary policy while having different considerations from each other.

A driving force for such different perceptions can be the policymakers' personal backgrounds, and notably their education. This has been highlighted as exerting a strong influence, for the long-run growth of countries, as argued by e.g., Besley et al. (2011) and Jones and Olken (2005), as well as for monetary policy performance (Farvaque et al., 2014). In the specific context of the monetary policy decision within the Fed, studies by Gildea (1990), Havrilesky and Schweitzer (1990), Havrilesky and Gildea (1991) and Chappell et al. (1995) also reveal that experiences in the government, academia or inside the Federal Reserve Board tend to induce different degrees of "hawkishness". More recently, Eichler and Lähner (2013) have shown that experiences within the financial sector tend to induce a FOMC member to dissent on the tightening side while an NGO career is associated with somewhat more frequent "loosing" dissents. Political connections also are to be considered, as FOMC members appointed by a Democratic president seem to be more "dovish", according to studies by, e.g., Havrilesky and Gildea (1991, 1995), Chappell et al. (1993, 1995), Tootell (1996), Chang (2003) or Meade and Sheets (2005).³

The obvious difficulty is that, if such a background influence exists, it has to be disentangled from other sources of disagreement or heterogeneity that may hamper the FOMC's decisions. The most notable source of heterogeneity mentioned in the literature is the presence of a bias related to the regional origin. This comes from the fact that, as several FOMC members are representatives from different economic regions which may, at each point in time, be located at different positions of the business cycle, their favored policy decision may be influenced by the situation in their home district. This assumption has

³Needless to say, preference heterogeneity is not a distinctive feature of the FOMC, and characterizes any monetary policy committee. See, e.g., Riboni and Ruge-Murcia (2008) or Bhattacharjee and Holly (2014) for the Bank of England and Horvath et al. (2014) who also consider the Czech Republic, Hungary and Sweden.

been proven relevant by the literature: Belden (1989), Gildea (1992), Meade and Sheets (2005), Chappell et al. (2008) and Eichler and Lähler (2014), notably, have shown that, among other factors, the regional unemployment rate impacts on the Presidents' decisions. Moreover, regional considerations are also noticeable in Presidents' public speeches (Hayo and Neuenkirch, 2013), a result that confirms the more general case of regional favoritism made by Hodler and Raschky (2014). Thus, it seems interesting to identify also the strength of regional influences on the members of Board of Governors. In this paper, we thus investigate the regional and background determinants of the FOMC members' propensity to disagree. So doing, we face, however, a number of difficulties. First, as the Reserve Banks' regions do not coincide with the ones of the American States, nor with the Census' regions, some data are not available at the adequate level (i.e., the one of the Reserve Banks' districts). As this may have blurred the previous analyses, the first contribution of this paper is to build this data, and to improve the consistency of the analysis. A further potentially strong impediment is the revelation of the preferences of the FOMC Members. One could use the voting records (as in Chappell and McGregor, 2000, for instance) but, as stated by Jung (2013), there may be more shortcomings than gains to use them to derive the members' preferences. This is notably the case if members vote strategically (as evidenced by, e.g., Havrilesky and Gildea 1991, Johnson et al., 2012 or Ellis and Liu, 2013), if only because they do not want to appear on the losing side of a vote, which they can guess from the meetings' inner workings or from before-meetings discussions (Axilrod, 2009).⁴ This may, however, not forbid them to express their real views during the meetings, in which case the transcripts are a better source of information. Thus, we assume the rates favored by the members in transcripts to be closer to their true preferences. A drawback is that coding the transcript to get the preference of a member is a sometimes relatively subjective process, when members do not state explicitly their favorite option. Another limitation is that they are released with a lag, which explains why they have not so often been used, despite their richness (see Chappell et al., 2005, Meade, 2005, 2010, Jung, 2013, and El-Shagi and Jung, 2013). Transcripts may seem to have a further advantage, which is to be available from voting members as well as from the non-voting ones. This is not as advantageous as it first may appear, if non-voting members attempt to influence their voting colleagues (and this clearly seems to happen, according to the results by

⁴This behavior is also indirectly confirmed by higher preferred policy rates at the end of the tenure of Presidents (both voting and non-voting), when the incentives for consensuality tend to fade and, thus, the temptation to reveal the true preferences is less constrained (Johnson et al., 2012).

Meade, 2006, and Tillmann, 2011). The bottom line is thus that it is safer to err on the conservative side and to consider only preferences expressed by the voting members.⁵⁶ Hence, we proceed in four steps. First, we build a dataset of economic aggregates coinciding with each Reserve Bank's area for the period 1994-2008. Second, we use the transcripts to derive the preferences of each voting member of the FOMC. Third, we compute Taylor rules-based desired rates for each member. Fourth, we estimate the impact of the FOMC members' background on their preferences, to assess how backgrounds shape preferences.

Our study thus adds at least two contributions to the field. The first is by using consistent region-level aggregates when estimating the regional bias of the FOMC members. The second is an addition to the literature testing for education and career effects on the behavior of FOMC members. Differently from other existing studies that have used the transcripts, however, in the present paper the background effect is thus used to explain the gap between each FOMC member's preferred rate and the actual policy. Hence, we offer a way to disentangle two effects which were generally confused in the literature, either because the authors searched for regional economic influences without considering background effects or, on the opposite, were looking for background effects without controlling for regional developments. More precisely, this paper first studies the influence of FOMC members' local areas key economic variables on their preferred monetary policy. Standardly assuming that FOMC members (at least implicitly) follow a Taylor-like reaction function when deciding on the interest rate, we expect different evolutions of the local economic indicators - i.e., inflation and output - to induce different policy preferences. Second, we are able to point out which personal characteristics of the FOMC members tend to increase the degree of disagreement inside the Committee. The remainder of the paper is structured as follows. We first expose the methodology we have used, before analyzing the results of our empirical estimates, while the concluding section summarizes the results.

⁵⁶The minutes of the FOMC meetings are not a useful source of information here, due to their brevity and absence of attribution of the elements of discussions whereas, as stated by Meade (2010): "the published transcripts provide a relatively complete account of FOMC meetings. The transcripts are, for the most part, verbatim, although they have been lightly edited to provide clarification (when necessary) and to excise discussion of specific sources (when release of this information could undermine the FOMCs access to information)" [provided by foreign central banks and governments].

⁶As a consequence, and to avoid confusion with the literature that studies dissent in voting, we will use the "disagreement" lexicon in what follows.

4.2 Data and methodology

4.2.1 Justifying Taylor-rule based individual reaction functions

It has been shown that the reaction function of the Fed by itself can be described by a Taylor rule, at least since 1979. For example, Blinder and Reis (2005, p. 14) point out that “monetary policy decisions of the Greenspan era are well described by a Taylor rule”. Moreover, Judd and Rudebusch (1998, p. 3) find that a Taylor-rule framework “is a useful way to summarize key elements of monetary policy” in the US during the Burns, Volcker and, for what concerns us (i.e., the 1994-2008 period), the Greenspan periods. More recently, Mehra and Sawhney (2010) find that this has not changed during the early Bernanke years and that deviations from the Taylor rule between 2002 and 2006, and even during the financial crisis, were much smaller than generally believed.

Finally, it is also quite standard to augment the traditional Taylor rule with a “smoothing” parameter to make it correspond even more to the observed pattern of interest rates (Woodford, 2003). Hence, in the following empirical investigation, we could suppose that desired interest rates of individual decision-makers belonging to the FOMC follow an analogical pattern. However, not only it has been demonstrated by Farvaque et al. (2009) that (at least part of) the smoothing behavior is a product of the nature of monetary policy making by committee itself, but it also appears that individuals may have less incentives than institutions to smooth their behavior. As a consequence, it makes sense to assume that individual decision makers do not smooth their desired interest rates.⁷

4.2.2 Data issues

During the Greenspan era, the discussion on interest rates at FOMC meetings occurred in two rounds. The first round served mainly to exchange views between members on the economic situation. The second round was devoted to the discussion of policy options. This was the occasion for Chairman Greenspan to provide his views and policy recommendations, followed by the rest of the members. Several empirical studies (e.g., Meade, 2005) use policy-makers' interest rate preferences revealed in the policy round

⁷Sirchenko (2013) analyzes the behavior of the Polish central bankers in a framework that acknowledges that policy decisions by individual members are potentially unrelated from one meeting to another.

when considering preference heterogeneity in the FOMC. We follow this literature and use the FOMC transcripts to obtain information about FOMC members' interest rate preferences.⁸ The transcripts contain information on whether a FOMC participant expressed agreement, argued for a higher or a lower federal funds rate with respect to Greenspan's proposal. The data set we build contains the expressed monetary policy preferences of governors and voting regional bank presidents who attended FOMC meeting between February 1994 and December 2008⁹. This corresponds to 121 meetings and 1449 individual statements of preferences, and to the chairmanship of Alan Greenspan (1994-2006) and to the beginning of the one of Ben Bernanke (2006-2008).

While the Federal Reserve publishes what belongs to the widest possible range of data across central banks, strong data limitations remain for the scope of the present analysis. First, individual forecasts of FOMC members are only available for the sub-sample ranging from 1992 to the end of 2002 and cover exclusively nationwide data (see Romer, 2010). However, as stated above, it is doubtful whether FOMC members focus solely on national interests. As an illustration of this, Gildea (1992) provides evidence that presidents are more concerned about developments in the districts they represent than with the nation as a whole, while Meade and Sheets (2005) find that regional unemployment rates influence the interest rate setting behavior (showing that any FOMC member representing a district in which unemployment is 1% point above the national average will oppose tighter policy 2.4% points more frequently than a FOMC member from a district in which unemployment is at the national average). Chappell et al. (2008) empirically confirm that regional conditions affect the policy preferences of Fed presidents, and Hayo and Neuenkirch (2013) present additional clues of why they react to regional developments.

We follow this literature and consider that FOMC members may react to changes in the inflation rate, the industrial production index, and the unemployment rate of their respective districts. The real issue however lies in computing data consistent with the districts monitored by the Federal Reserve Banks. Concerning output developments, we make use of the Coincident index (based on employment, housing, production, and financial data), published by the Federal Reserve Bank of Philadelphia. However, this indicator is only available at the state level. Hence, to create a Coincident Index at

⁸Renshon (2009) provides a further argument of the validity of using public speeches for assessing leaders' beliefs, showing that the analysis of public sources lead to the same outcomes as private sources.

⁹As the Fed itself acknowledges, before 1994, the Transcripts are not real transcripts, which limits the information they convey.

each of the Fed's districts level, we aggregate the Coincident Indexes of the states that stand inside a district's borders, considering that they have a similar weight within the district¹⁰. As an illustration, we aggregate the Coincident Indexes of the states corresponding to Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont, for the Boston's Fed district. Nevertheless, other districts comprise a unique state, such as the New York district (state of New York) and the Cleveland district (state of Ohio). See Appendix C.1 for the list of states comprised in the Fed districts. Concerning price developments, there is no state or district-wide consumer price index (CPI) measure available. Only CPI data for metropolitan areas are available from the Bureau of Labor Statistics (BLS), and some districts contain more than one metropolitan area. As Hayo and Neuenkirch (2013) indicate, there is no straightforward way of creating district CPI figures. Therefore, we are forced to rely on aggregating metropolitan CPI data to compute the ones of the districts. For the unemployment rate, data at the district level are provided by the Federal Reserve Bank of St. Louis. Finally, the preferred policy rate of the FOMC members are estimated from the available Transcripts of the FOMC.

4.2.3 Estimating Taylor-rule reaction functions using regional data

The dependent variable we consider is the preferred policy rate of the central banker when he/she votes during the period 1994-2008, i_t^p , while the independent variables include the consumer price index, a measure of the relative regional economic position (corresponding to the difference between the regional Coincident index and the national one, which we hereafter call for expositional simplicity the regional output gap), and the unemployment rate in his/her district. The assumption underlying this procedure is that FOMC members have regional considerations when expressing their preferred policy rate.

We check whether there is correlation between the CPI, the regional output gap, and the unemployment rate, and find that the null hypothesis of no correlation cannot be rejected. We use the heteroskedasticity-consistent estimator (HCE) to control for potential heteroskedasticity, as in Jung (2013). We present the results of the estimated reaction functions for the Federal Reserve Districts in the form of individual Taylor-type

¹⁰Considering demographic or GDP weights would not change the essence of the results presented below. Alternative estimates are available from the authors.

rules estimated separately for each member, using the frequency of the FOMC meetings (8 regular meetings per year) covering the period 1994-2008 :

$$i_t^p = c + \beta\pi_t + \gamma y_t + \delta u_t + \varepsilon_t \quad (4.1)$$

where π_t is the (district-based) measure of inflation in the observed district, and y_t and u_t are, respectively, the (district-based) measure of output gap and unemployment in the same district. Note also that the time index, t designates the voting period of each central banker. Then, t will cover all the meetings during which a FOMC member has voted, like, e.g., 1997, 2000, 2003 and 2006 for Jack Guynn. Additionally, the available macroeconomic data are averaged to correspond to the frequency of the meetings (i.e., 8 per year): e.g., for the third meeting in 2003, if the data are available at a monthly frequency, we average the monthly macroeconomic records between the second and the fourth meeting. We obtain a set of estimated parameters $(c, \beta, \gamma, \delta)$ for each central banker, which reflect the reaction of each FOMC member when there is a move of the inflation rate, the industrial index and the unemployment rate of his/her district during his/her voting period. Table 4.1 presents the results of the estimates of equation (1) for each FOMC member.

TABLE 4.1: Individual Taylor-rule reactions functions

	Position	FED district	Constant	CPI (β)	Output (γ)	Unemp. (δ)	No. Of Obs.
Jack Guynn	President	Atlanta	11.7***	0.15	2.07***	-1.70***	30
Cathy Minehan	President	Boston	4.6***	-0.1	1.22***	-0.19	36
Michael H. Moskow	President	Chicago	9.8***	0.39**	0.45	-1.22***	53
Jerry Jordan	President	Cleveland	10.4***	0.48	0.19**	-1.18***	39
Richard W. Fisher	President	Dallas	1.72***	0.03	8.12***	-0.07	14
Robert D. McTeer	President	Dallas	11.7***	-0.21	-0.44	-1.36***	24
Thomas Hoenig	President	Kansas City	10.8***	0.37	-0.1	-1.69***	41
Gary H. Stern	President	Minneapolis	9.3***	1.15**	-3.29***	-1.39***	32
Timothy Geithner	President	New York	13.6***	0.16	-0.42	-2.05***	41
William J. McDonough	President	New York	7.5***	-0.14	1.31***	-0.49***	74
Anthony M. Santomero	President	Philadelphia	9.8***	0.14	1.78**	-1.45***	16
Alfred Broaddus	President	Richmond	14.2***	0.21	0.46	-2.3***	24
Robert Parry	President	San Francisco	13.5***	0.93***	-3***	-1.45***	32
William Poole	President	St. Louis	13.6***	0.33	0.03	-1.9***	31
Roger Ferguson	Governor	Boston	9.7***	-0.02	0.73	-1.48***	67
Susan Bies	Governor	Chicago	12.4***	0.12	0.09	-1.68***	42
Susan M. Phillips	Governor	Chicago	7.2***	-0.02	0.48	-0.43***	35
Edward W. Kelley	Governor	Dallas	6.7***	0.16	0.78**	-0.32**	63
Donald Kohn	Governor	Kansas City	9.83***	0.28	1.67***	-1.58***	52
Mark W. Olson	Governor	Minneapolis	4.5***	0.03	0.85	-0.57**	36
Kevin M. Warsh	Governor	New York	14.4***	0.16	-1.27**	-2.12***	23
Alice M. Rivlin	Governor	Philadelphia	4.2***	0.06	0.02	0.20*	24
Randall S. Kroszner	Governor	Richmond	12.6***	-0.38	-1.27**	-1.76***	23
Janet Yellen	Governor	San Francisco	5.1***	-0.25***	0.11***	0.07***	24
Laurence Meyer	Governor	St. Louis	7***	0.31**	-0.1	-0.4***	45

Several results are worth highlighting here. First, there does not seem to be strong behavioral differences between Presidents and Governors. President Gary Stern is a case in point, here, as all the (district-based) variables are strongly significant in his case while, on average, the district-based CPI measure does not seem to influence the FOMC members. Second, in the case of output, our regional measure seems to influence both the Presidents and the Governors, confirming the relevance of considering both types of policymakers. Third, when significant, the unemployment variable has the expected sign: an increase in the unemployment rate is related to a decrease in the preferred rate. All in all, then, the estimates in Table 4.1 support the contention of a regional bias of FOMC members. Although this result is a rejoinder to the literature, it is here built on consistent data. Moreover, if comparing the results (by the size of the coefficients, say) with the previous results is not obvious (given the sample and data building differences), our results deliver a ranking - in terms of degree of relative hawkishness - of the districts that is quite close to the one that can be derived from Jung (2013, Table 3). Both types of support thus allow us to pursue our investigation.

In a second step, we use the estimated parameters $(c, \beta, \gamma, \delta)$, along with ex-post regional data, to derive the “desired” interest rate for each FOMC member j , $\widehat{i}_{j,t}$ for the full period for which Transcripts are available (i.e., 1994-2008):

$$\widehat{i}_{j,t} = c_t + \beta\pi_t + \gamma y_t + \delta u_t \quad (4.2)$$

where $t = 1994\text{Meet}1-2008\text{Meet}8$.

We then derive the difference between the desired interest rate, $\widehat{i}_{j,t}$, and the Fed's actually decided interest rate, i_t , for the period 1994-2008. This difference, $PD_{j,t}$, is thus a measure of the “policy differential” between what the situation of his/her district would have induced a FOMC member j to aim at and the policy implemented during the FOMC meeting. Table C.2 in the Appendix C.2 delivers the descriptive statistics of the desired interest rate and of the “policy differential” for the FOMC members during the period under review.

4.3 Measuring personal backgrounds' influence

In the final step, we assess how much the “policy differential” is related to the biographical data of FOMC members. As explained above, the aim is to assess the influence of the personal characteristics of FOMC members on their respective desired interest rate with respect to the actual one, having purged for any regional bias they are also displaying.

The use of the difference $PD_{j,t}$ allows to reveal the impact of FOMC members' biographical features on their propensity of being more hawkish (if on average $PD_{j,t} > 0$), or more dovish (if $PD_{j,t} < 0$) than the rest of the committee members.¹¹

We use the Least Squares Dummy Variables model (LSDV), which allows to bring the unobserved effects explicitly into the model. The unobserved effects are being treated as the coefficients of the dummy variables, i.e., the $\alpha Prof_j$ term represents a fixed effect on the dependent variable $PD_{j,t}$ for the profession of central banker j . Having specified the model in this way, it can be fitted using OLS with robust standard errors. Given the limited number of central bankers (N=25), using the LSDV method is a practical proposition. Finally, we control for the influence of the national macroeconomic variables (CPI, output and unemployment, from the BLS):

$$PD_{j,t} = c_0 + \alpha Prof_j + \lambda Educ_j + \rho Woman_j + \phi Member_j + vBernanke_t + \tau X_t + D_{j,t} + \mu_{j,t} \quad (4.3)$$

where $t = 1994\text{Meet1}-2008\text{Meet8}$, c_0 is a constant, $Prof_j$ and $Educ_j$ indicate, respectively, the career and the educational background of the FOMC member, while $Member_j$ is a dummy variable indicating whether the voting member is a Board member or a Bank president, also controlling for the fact that a member has been appointed by a Democrat or Republican administration. The meaning of the dummy $Woman_j$ is self-explaining, as well as the one of the $Bernanke_t$ one, which identifies the period when Ben Bernanke has been chairing the FOMC. Finally, X_t is the vector of national macroeconomic variables, and $D_{j,t}$ is a dummy variable that takes the value 1 if the regional unemployment rate is higher than the national one, and 0 otherwise.

¹¹Additionally, this can disclose the determinants for their influence on the decision-making process of the FOMC: given that this influence may have an impact on the value of $PD_{j,t}$, then, the more influential a FOMC member is, the more $PD_{j,t}$ should be close to 0. However, as other factors may influence the value of $PD_{j,t}$, such as the regional business cycle positioning with respect to the national one, we do not pursue this avenue further.

We consider four indicators (dummy variables) for the professional experience: financial sector (positions at banks or other financial institutions), economic scholars (positions at universities or colleges), central bank staff (positions at a regional Federal Reserve Bank, except for president), and civil servants (positions in government sector, except for positions at the Federal Reserve System) are distinguished. We classify educational background in five categories: Professors, holders of a Ph.D, an MBA, an MSc., or a Bachelor. Note that, if a central banker has worked in more than one profession, we consider all of his/her backgrounds. For instance, if a central bank governor has experience in academia and in the banking sector, both background indicator variables take the value 1. As reference for the dummy variables, we consider the variables which appear with the highest frequency. The FOMC member who holds a Ph.D, has previously worked in the financial sector, is male and Bank President thus serves as the reference for the estimations provided in the following tables.

The first regression in Table 4.2 includes all the variables, while the two following ones intend to check for potential multicollinearity between the biographical data (notably between some educational and professional background indicators). The dependent variable is the policy differential variable, PD , in the first three estimates displayed in Table 4.2, while the last two ones present estimates for the positive (resp., negative) values of the policy differential. So doing should allow differentiating the influence different types of backgrounds have on a (relative) tendency to disagree on the policy decisions and the incentive to disagree when the difference between the desired interest rate and the actual one is positive - which would then signal a degree of hawkishness - or negative - instead signalling dovishness.

As can be seen from Table 4.2¹², for example, it appears that a background as Professor tends to be associated with a propensity to disagree, as the policy differential is significantly related to this category (column (1)). Even more interestingly, as can be seen from column (4), the propensity to disagree is more significant in case of a negative differential than in case of a positive one (where the coefficient is insignificant). Hence, this signals a greater dovishness from Professors (relatively to the reference category). Another interesting result holds for MBA holders, who would tend to be more hawkish when the differential is positive, and more dovish when the differential is negative, which

¹²Given the low of number of observations for some central bankers in the first step (i.e., the estimation of the individual reaction functions), like, e.g., for Richard Fisher, we have re-estimated eq. (3) using only the desired interest rates of central bankers with a number of observations superior to the median. This delivers results qualitatively similar as the ones displayed in Table 4.2 (results available upon request).

would reveal an even higher degree of dovishness than for Professors. This could mean, as is often stated, that a degree of heterogeneity may be desirable in a committee, a contention which our results would support.

Members of the FOMC with experiences in the private or the public sector appear to have a reduced propensity to disagree (with regard to the reference category, i.e., members coming from the financial sector), as their background is negatively related to the policy differential, whatever the sign of this differential.¹³ The inverse stands for female members of the FOMC, for whom the same pattern is observed, but with the opposite sign for the coefficients. This is in line with previous results on a larger degree of hawkishness from women. This is explained by the fact that women tend, on average, to be more conservative in their monetary policy preferences - possibly in order to establish a reputation -, as exposed in Farvaque et al. (2011, 2014). Members of the Board appointed by a Republican administration tend to disagree less (as a negative sign of the coefficient is associated with the policy differential). Interestingly, the results also show that this tendency is even lower when the differential is positive, thus signalling a reduced degree of hawkishness (compared to the reference category - here, being a District President). On this point at least, our results contrast with the general finding of the literature (from at least Havrilesky and Gildea, 1991, to Meade, 2005 or Eichler and Löhner, 2013). This apparent disparity confirms that an incentive to disagree does not always translate in a dissenting vote, especially if members act strategically (as shown by, e.g., Tillmann, 2011).

Finally, the period associated with the chairmanship of Ben Bernanke is associated with reduced disagreement, which could mean that the FOMC, under his chairmanship, has become more consensual, and less “individualistic” (see Meade, 2005, or Blinder, 2007). This also lies in conformity with what is generally said about his personality (Axilrod, 2009).

All in all, then, our results clearly reveal that there are some influences from the FOMC members' backgrounds on their distance between the policy they would favor as representative of their district and the policy implemented by the Federal Reserve. It is also worth noting that the macroeconomic variables are strongly significant, in the three

¹³Relating this result to the one by Eichler and Löhner (2013) is not immediate, though, as they focus on dissent while we identify a propensity to disagree. Nevertheless, as they show that FOMC members with longer careers in the public sector are more focused on output stabilization, which can be considered as a sign of dovishness, our results refine and complement their previous one.

regressions (although the coefficient on national inflation is insignificant in the last regression, i.e., in cases of negative differentials). Interestingly, the national inflation has the expected influence over the preferences of the FOMC members (a higher CPI leads to higher interest rates, which is also consistent with the insignificance of the regional inflation for most of the individual Taylor rules reported in Table 4.1). Finally, the estimated coefficients for national unemployment and national growth rate reveal that a higher national growth rate (resp. or a lower national unemployment rate) forces a member to become a “relative dove” - relative in the sense that the interpretation of the related coefficients has to be related to their regional equivalent, which are strongly significant for most of the members, as reported in Table 4.1. Hence, and inversely, a lower national growth rate (resp., a higher unemployment) would incentivise a member to become a “relative hawk” (assuming the given regional values of these variables). The only exception is the “dovish” situation (of a negative PD) where a higher national unemployment reinforces the preference for a lower policy rate.

TABLE 4.2: FOMC members' backgrounds influence on the policy differential

	(1)		(2)		(3)		(4)		(5)	
	Policy differential (PD)						Positive PD		Negative PD	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Constant	-0.18	0.21	-0.50**	0.04	-0.46*	0.09	-1.70***	<0.00001	1.42***	<0.00001
Professor	-0.32***	0.001	-0.0009	0.6			-0.13	0.4	-0.20***	0.002
MBA	-0.37***	<0.00001	-0.3***	0.005			0.23**	0.02	-0.47***	<0.00001
Master	-0.65***	<0.00001	-0.78***	<0.00001			-0.25***	0.003	-0.46***	0.0002
Bachelor	-0.59***	<0.00001	-0.45***	0.0021			0.07	0.58	-0.47***	<0.00001
PhD	Ref									
Academic	0.15	0.3			0.08	0.43	0.14	0.45	0.01	0.29
Central Bank	-0.29***	0.001			-0.09	0.21	-0.48***	<0.00001	0.15***	0.006
Private sector	-0.91***	<0.00001			-0.69***	<0.00001	-0.42***	<0.00001	-0.36***	<0.00001
Public sector	-0.92***	0.0002			-1.39***	<0.00001	-0.72***	<0.00001	-0.50***	0.006
Financial Sector	Ref									
Woman	0.8***	<0.00001	0.82***	<0.00001	0.79***	<0.00001	0.24***	0.0007	0.79***	<0.00001
Man	Ref									
Board Rep.	-0.31***	0.0015	-0.12*	0.08	-0.35***	<0.00001	-0.35***	<0.00001	-0.23***	0.005
Board Dem.	0.39**	0.0017	0.34***	0.002	0.46***	0.0007	0.22**	0.04	0.11	0.54
President	Ref									
Bernanke	-0.41***	<0.00001	-0.43***	<0.00001	-0.42***	<0.00001	-0.25***	0.004	0.06	0.34
CPI (National)	0.26***	<0.00001	0.26***	<0.00001	0.26***	<0.00001	0.16***	<0.00001	-0.002	0.94
Output (National)	-2.65***	<0.00001	-2.6***	<0.00001	-2.62***	<0.00001	-0.31**	0.04	-1.05***	0.0004
Unemp. (National)	0.35***	<0.00001	0.35	<0.00001	0.34***	<0.00001	0.68***	<0.00001	-0.37***	<0.00001
Dummy Unemp.	-0.37***	<0.00001	-0.27***	<0.00001	-0.37***	<0.00001	0.04	0.47	-0.33***	<0.00001
Observations	2950						1378		1532	

4.4 Robustness checks

4.4.1 Simultaneous inclusion of the regional and background effects

To test whether our results are sensitive to the step corresponding to the computation of the desired interest rates for FOMC members, we skip the estimation of eq. (2), and consider in a simultaneous regression eqs. (1) and (3).

Hence, we regress the monetary policy preferences of FOMC members directly on their regional and biographical data, to check whether we obtain results consistent with those reported in Table 4.2. If, by definition, this procedure does not allow to estimate the variation in individual reaction functions among FOMC member as shown in Table 4.1, it nevertheless permits checking the influence of the regional economic conditions when one wishes to reveal the background effect on FOMC members' preferred policy rates. We thus run the following panel regression:

$$i_{j,t}^p = c_1 + \beta\pi_{j,t} + \gamma y_{j,t} + \delta u_{j,t} + \eta_j + \alpha Prof_j + \lambda Educ_j + \rho Woman_j + \phi Member_j + v Bernanke_t + \tau X_t + \mu_{j,t} \quad (4.4)$$

On the left hand side, $i_{j,t}^p$ represents the preferred policy rate of central banker j during his/her voting period. The right hand-side variables have similar meanings as in the previous regressions (see equations 1 and 3). Table 4.3 displays the results of the estimation. As shown in Table 4.3, and consistently with detailed individual results presented in Table 4.1, regional growth rate and regional unemployment exert a significant (and expected) influence on the preferred policy rates of the FOMC members. Analogically with the results provided above, they also collectively care about the national inflation rate but not about the district differences with respect to this variable. Moreover, the other national variables (growth and unemployment rates) have also statistically significant influence. These results are thus consistent with our interpretation of “relative hawks and doves” (if national output grows- or unemployment falls -, for given respective regional values, the policy maker becomes dovish, *ceteris paribus*).

The results for educational categories are globally consistent with our main empirical strategy: Professors, Masters and Bachelors are more dovish than the reference category of PhD holders. The only different result is for the category of MBA holders: here they appear to be more hawkish than the reference category, whereas the global result

TABLE 4.3: FOMC members' regional and backgrounds influence on the preferred policy rates

	Preferred policy rate ($i_{i,t}^p$)	
	Coefficient	p-value
Constant	10.9***	<0.00001
CPI (β)	-0.01	0.27
Output (γ)	0.20***	0.0006
Unemp. (δ)	0.22***	<0.00001
Professor	-1.25**	0.01
MBA	0.09	0.5
Master	-0.55***	0.008
Bachelor	-0.38***	0.004
PhD	Ref.	
Academic	0.62**	0.02
Central Bank	-0.44***	<0.00001
Private Sector	-0.97***	<0.00001
Public Sector	-0.88***	<0.00001
Financial Sector	Ref.	
Woman	0.53***	<0.00001
Man	Ref.	
Board Rep.	-0.43***	<0.00001
Board Dem.	0.29***	0.002
President	Ref.	
Bernanke	1**	0.017
CPI (National)	-0.34***	<0.00001
Var. Coincident Index (National)	3.17***	<0.00001
Unemp. (National)	-1.62***	<0.00001
Observations	922	

reported in column (1) of Table 4.2 suggests a higher propensity to be consensual. However, already in column (4) of Table 4.2 (regression run on positive policy differentials), they were preferring even higher policy rates. This drop of ambiguity might suggest that the propensity of MBA holders to disagree is especially visible if they are on the hawkish side of the committee.

The robustness check for professional categories confirms the dovish character of central bankers as well as private and public sector representants as compared to the reference category (of decision-makers issued from the financial sector). The only tiny difference is related to the fact that the results reported in Table 4.2 suggested a (weakly significant) hawkishness of the members from the academia, whereas the robustness check (similarly to the results of regressions (3), (4) and (5) reported in Table 4.2) does not reveal any significant difference between the reference category and them.

However, the robustness check suggests higher rather than lower policy differentials under the Chairman Bernanke. This reveals the interest of our policy differential measure,

which delivers finer insights into the dynamics at play inside the FOMC.¹⁴ Nevertheless, qualitative results for the Board members nominated by the Republican and Democratic Presidents, and for the women, are consistent with those reported above and even more pronounced (both in terms of value and significance).

4.4.2 Using votes instead of monetary policy preferences

As emphasized in section 2.2., FOMC transcripts are supposed to reveal the policy preferences of FOMC members. Thus, one might expect different results in Table 4.2 if we use votes rather than expressed policy rates, i.e., a different influence of FOMC members' background characteristics on their policy differential. To show whether this is the case, we re-estimate equation (1) using votes rather than expressed policy preferences as dependent variables, to check if our results are driven by our interpretation of the Transcripts, or whether we obtain similar results when using the votes cast by FOMC members.

The results of the individual reaction functions show that the determinants of preferred policy rates as revealed by votes are similar quantitatively (i.e., same value), qualitatively (i.e., same sign), and with the same significance as for the preferences revealed by transcripts¹⁵.

In the second step, we use the estimated parameters to re-estimate equation 2 and 3 using similar right hand-side variable, the only difference being the value of the new coefficients that are used to compute the desired interest rates. Given that we use votes instead of the stated preferences, we also add a dummy variable that takes the value 1 if there was a dissent vote in the policy meeting, and 0 otherwise.

Table 4.4 displays the results of estimation (3) with votes as the dependent variables, instead of the preferred policy rates from FOMC transcripts. A first remarkable difference concerns a stronger significance (and higher value) of the constant in the robustness check, which arguably means that our main method of investigation is better able to dismantle the “constant” value into the true preferences and their regional determinant. Otherwise, similarly to the results of the first robustness check, academic members of the FOMC are not significantly different from the reference category. Overall, the significance and the value of the coefficients are stronger when we use the policy preferences

¹⁴This may also capture the trend of increased dissent across time, as documented in Thornton and Wheelock (2014).

¹⁵Test results available upon request.

revealed by the transcripts than preferences revealed by votes. This is notably reflected on the degree of hawkishness of MBA holders in case of a positive differential, and on members of central bank staff and woman in case of a negative policy differential. Republican governors seem to behave more dovishly when expressing their policy preferences than when voting, in case of a negative differential. Finally, the coefficients attached to the dissent dummy lie in conformity with the analysis of Thornton and Wheelock (2014), that dissents are not necessarily correlated with macroeconomic variables, but with fundamental disagreement about the policy stance.

Therefore, it must be underlined that using the preferences decoded from the transcripts provide better, and more sincere, results for showing FOMC members' background influence on their policy preferences.

TABLE 4.4: FOMC members' backgrounds influence on the policy differential as estimated based on votes

	(1)		(2)		(3)		(4)		(5)	
	Policy differential (PD)						Positive PD		Negative PD	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Constant	-0.59**	0.02	-1***	<0.00001	-0.89***	<0.00001	-1.56***	<0.00001	1.15***	<0.00001
Professor	-0.25**	0.01	0.05	0.6			-0.16	0.21	-0.17	0.1
MBA	-0.20***	<0.00001	-0.12	0.19			0.05	0.42	-0.3***	<0.00001
Master	-0.81***	<0.00001	-0.87***	<0.00001			-0.51***	0.003	-0.57***	0.0002
Bachelor	-0.64***	<0.00001	-0.45***	0.0021			0.01	0.91	-0.69***	<0.00001
PhD	Ref									
Academic	0.06	0.3			0.06	0.32	0.09	0.61	-0.07	0.86
Central Bank	-0.38***	0.001			-0.15**	0.03	-0.46***	<0.00001	0.03***	0.006
Private sector	-1.07***	<0.00001			-0.81***	<0.00001	-0.53***	<0.00001	-0.55***	<0.00001
Public sector	-0.88***	0.0002			-1.5***	<0.00001	-0.39***	<0.00001	-0.55***	0.006
Financial Sector	Ref									
Woman	0.7***	<0.00001	0.74***	<0.00001	0.75***	<0.00001	0.3***	0.0007	0.58***	<0.00001
Man	Ref									
Board Rep.	-0.33***	0.0015	-0.12*	0.08	-0.38***	<0.00001	-0.35***	<0.00001	-0.16**	0.015
Board Dem.	0.32**	0.0017	0.22**	0.002	0.35***	0.0007	0.27**	0.017	0.13	0.35
President	Ref									
Bernanke	-0.41***	<0.00001	-0.43***	<0.00001	-0.42***	<0.00001	-0.17***	0.004	-0.03	0.34
CPI (National)	0.26***	<0.00001	0.25***	<0.00001	0.26***	<0.00001	0.15***	<0.00001	0.02	0.74
Output (National)	-2.63***	<0.00001	-2.6***	<0.00001	-2.6***	<0.00001	-0.36**	0.04	-1.19***	0.0004
Unemp. (National)	0.31***	<0.00001	0.31***	<0.00001	0.3***	<0.00001	0.6***	<0.00001	-0.36***	<0.00001
Dummy Unemp.	-0.23***	<0.00001	-0.09	0.11	-0.2***	<0.00001	0.05	0.32	-0.25***	<0.00001
Dummy Dissent	-0.12**	0.03	-0.12**	0.04	-0.13**	0.03	-0.13**	0.04	0.14***	<0.00001
Observations	2950						1378		1589	

4.5 Conclusion

This paper uses the FOMC transcripts over the largest period for which they are available (1994 - 2008) and a consistent set of regional (i.e., central bank districts) price and output variables to disentangle the regional and biographical influences on the behavior of its members. The results show that, under the chairmanship of Bernanke, the incentives to disagree seem to have declined for all types of members. This may compensate the propensity to disagree that arises from regional developments, as well as from the idiosyncrasies of the previous experiences (professional and educational) members of the FOMC carry when seating in the meetings. This delivers new insights on the inside of the FOMC in both the Greenspan and Bernanke years and notably confirms the interest of using Transcripts instead of expressed votes to study policy preferences.

General Conclusion

This thesis has addressed some important issues related to the link between central banks communication and their decision-making processes. In the first chapter, we modeled the heterogeneity of the audiences central banks face, and analyzed its impact on the importance of central banks' public signals. We concluded that central banks that have an heterogeneous audience tend to adapt the consistency of their communication policy to the constraints it raises. In the second chapter, we derived the concerns expressed by the national media in the EMU, and thus, the concerns of the national publics. Using monetary policy rules -à la Taylor -, we show that the GC of the ECB tend to better accommodate the concerns of Germany and a group of Northern countries in its decision-making process. Chapter three has pursued the analysis by evaluating the influence of the educational and occupational background of European central bankers on their respective reform proposals. We find that European central bankers who have an experience in the public sector argue for national reforms, while central bankers from the banking and central banking sectors promote supranational reforms. In chapter four, we use the FOMC transcripts to detect the regional and biographical influences on the preferred policy rate of its members. The results show that during the chairmanship of Bernanke, there was a decrease in the propensity to disagree, and that various professional and educational experiences appear to be a source of different policy preferences. The results and findings of the above chapters could be extended in many directions. A future research for the first chapter could consider the boundaries that central banks face in the the context of the economic and financial crisis, such as the Zero Lower Bound, and check how it affects the strategy and the consistency of their communication policy. For the second chapter, we can extend the textual analysis to national newspapers with different political sensitivities, to verify if the results are still robust when we control for this supply-side media bias. A further extension for chapter 3 would be to derive

the cognitive maps of political leaders of the EMU, to check to what extent their reform proposals are (dis)similar from the ones European central bankers promote. This could be a good proxy of the independence of the European central bankers. Finally, for the last chapter, an upcoming research could compare the determinants of FOMC members dissent with respect to the determinants of FOMC members disagreement, to check which individuals characteristics are (truly) crucial for dissenting behaviors.

Appendix A

Textual Analysis

A.1 A sample article

IRISH TIMES

Bank Bailout-Extra funds for Irish Nationwide and Anglo lost money.

CHARLIE TAYLOR

1 October 2010

CENTRAL BANK governor Prof Patrick Honohan said additional funding for Anglo Irish Bank and Irish Nationwide was “essentially lost money”.

He also expressed regret that the Central Bank had not taken a more pessimistic view of how much the bank bailout would cost the taxpayer.

Speaking on RTÉ radio at lunchtime yesterday, Prof Honohan admitted that the extra funding for Anglo and Irish Nationwide was “essentially lost money”, but said the investment into AIB “should yield returns over time”.

He said the announcement “gave as much certainty as could be reasonably expected” at this time.

Admitting that the sums invested in propping up Anglo in particular were “colossal”, the governor said the bailout of the banks could be managed without needing to seek emergency financial aid from the EU and the International Monetary Fund.

“It is not painless by any means. It is going to be a severe pain, as will the adjustment of the overall fiscal deficit which emerged on normal tax and receipts as part of the boom that we got caught up in,” he said.

“I think by the time we’re through this in 2014, the banking contribution to our debt will be about a third of the increase,” Prof Honohan added.

The governor rejected suggestions that Nama had paid too much for the first two tranches of loans transferred to the agency.

He also denied claims that the Central Bank had been involved in a cover-up over the total cost of the bailout.

Prof Honohan said the policies now being pursued by the Government were correct, adding that he was sorry the Central Bank had not been more pessimistic in estimating the total cost of the bank bailout.

A.2 National newspapers selected

TABLE A.1: National newspapers selected

National newspaper	Country of origin	Daily circulation	Rank
De Telegraaf	Netherlands	529000	1
Le Monde	France	340000	3
Corriere della Serra	Italy	700000	3
El país	Spanish	432000	1
Süddeutsche Zeitung	Germany	560000	2
Diário de Notícia-Jornal de Notícias	Portugal	115000	2
Suomen Tietotoimisto	Finland	n/a	n/a
Der Standard	Austria	80000	n/a
De Standaard	Belgium	100000	3
Athens news*	Greece	n/a	n/a
The Irish Times	Ireland	80000	2
Postimees	Estonia	60000	1
Cyprus mail	Cyprus	10 000	n/a
Luxemburger Wort	Luxembourg	90000	1
Times of Malta	Malta	40000	1
Slovenka tiskovna agencija	Slovenia	n/a	n/a
SITA Slovenska Tlacova Agentura	Slovakia	n/a	n/a

*Closed in November 2012.

A.3 Result of the HDC process

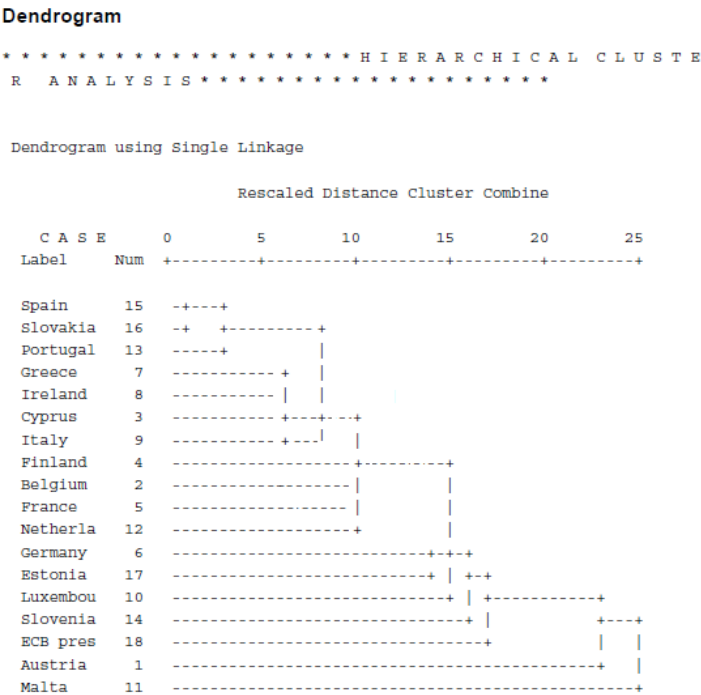
FIGURE A.1: Result of the Hierarchical Decreasing Classification for the Irish central bankers for the period 1999-2011



As shown in Figure 9 above, Class 2 is related to the Political system (*Pol. Sys.*, with words such as: minister, tanaiste (i.e. Irish prime minister), McCreevy (Irish politician). Class 4 refers to national issues (*National*), given that it contains words like tax, evasion, commission. Class 3 focuses on economic and financial news (*Econ. News*) with words like growth, price, inflation, competitiveness; while Class 6 contains words that suggest monetary policy actions (*Monet. Pol.*): rates, cut, reduction, lower. Finally, Class 5 clearly refers to the euro debt crisis (*Crisis*): mortgage, borrow, stress, debt; and Class 1 does not belong to any category, given that its words do not have an economic meaning : artist, patient, alzheimer.

A.4 Result of the cluster analysis

FIGURE A.2: Cluster analysis for the period 1999-2011



This figure displays the dendrogram which visually shows a cluster configuration. The horizontal axis of the dendrogram represents the distance or dissimilarity between clusters. The vertical axis represents the objects and clusters. Rows that are close together (have small dissimilarity) will be linked near the left side of the plot. For example, we notice that Spain, Slovakia and Portugal are very similar. Rows that link up near the right side are very different. For example, the Maltese newspaper appears to be very different from the other newspapers.

The number and the composition of clusters that will be formed at a particular Cluster Cutoff value may be quickly determined from this plot, by drawing a vertical line at that value and counting the number of clusters that the vertical line contains. For instance, if we draw a vertical line at the value 10, 3 clusters will result. One cluster will contain three newspapers, and the two other ones will contain 4 newspapers.

A.5 Detailed results of the cluster analysis

TABLE A.2: Detailed results of cluster analysis

	1999-2011	1999-2007	2008-2011
Northern European group	FI-BE-FR-NL	BE-FI-AT-NL	SI-AT-NL-FI-SK-BE
Peripheral European group	GR-IE-CY-IT	FR-GR-IT-IE	
Southern European group	ES-SK-PT	PT-ES	CY-IE-PT-ES-IT-EE-GR
Fourth group of newspapers	DE-EE-LU-SI		
Isolated newspapers	AT-MT	LU-DE	DE-FR-MT

A.6 Euribor and ECB Main Refinancing rate

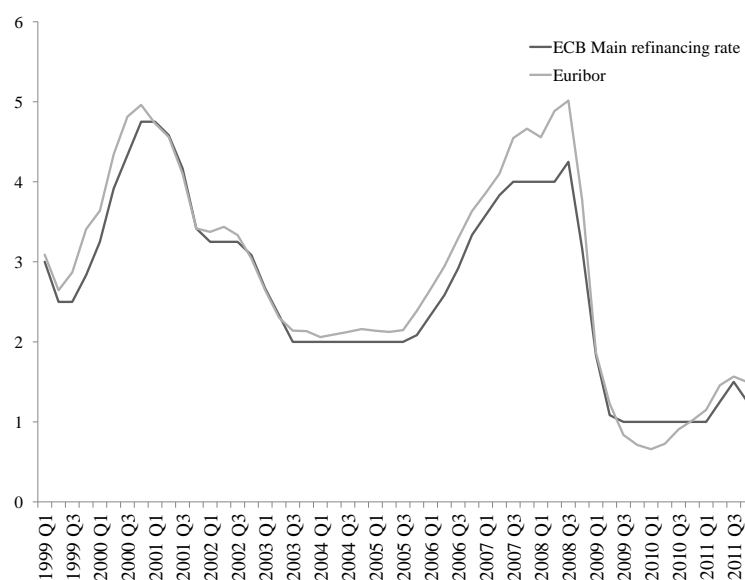


FIGURE A.3: ECB Main refinancing rate, Euribor.

Appendix B

Cognitive Mapping

B.1 Speeches and tenure of European Central Bankers

TABLE B.1: Speeches and tenure of European Central Bankers

Central Banker	Number of speeches analyzed*	2009	2010	2011	2012	2013
Axel Weber	18	1	1	0	0	0
Carlos Costa	5	0	1	1	1	1
Christian Noyer	27	1	1	1	1	1
Erkki Liikanen	16	1	1	1	1	1
Ewald Nowotny	9	1	1	1	1	1
George Provopoulos	7	1	1	1	1	1
Guy Quaden	5	1	1	0	0	0
Ignazio Visco	6	0	0	0	1	1
Jens Weidmann	19	0	0	1	1	1
Josef Bonnici	4	0	0	1	1	1
Klaas Knot	5	0	0	1	1	1
Luc Coene	2	0	0	1	1	1
Mario Draghi	10	1	1	1	0	0
Miguel Ordóñez	13	1	1	1	1	0
Nout Wellink	11	1	1	1	0	0
Patrick Honohan	34	1	1	1	1	1
Yves Mersch	14	1	1	1	1	0

*All central bankers' public speeches referenced in the BIS database were analyzed, except newspaper interviews.

B.2 A cognitive map excerpt

Patrick Honohan: Two-way interdependence between the banking system and the State.

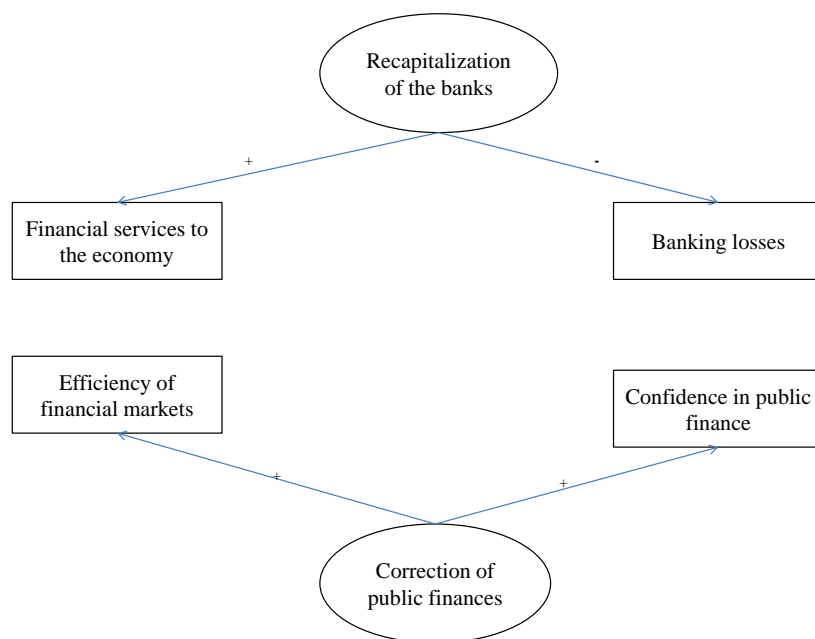
Address by Mr Patrick Honohan, Governor of the Central Bank & Financial Services

Authority of Ireland, to the Small Firms Association, Dublin, 11 May 2010.

“...The recapitalization of the banks, which we announced at the end of March, is key to dispelling the cloud of ill defined banking losses that has been hanging over the public finances for many months...The experience has shown how crucial it is to stay on a disciplined course to correction of the public finances right across the euro area. This is essential if the financial markets are to work more effectively and in particular resume their key function of helping to finance the recovery including through lending to small firms...

The recapitalization and restructuring of the banks will be accomplished by end year. They will be stable and secure, capable of resuming their role in providing financial services to the economy...Staying on course to reduce this underlying deficit is absolutely crucial to ensuring that confidence in the public finances can be maintained and strengthened...”

FIGURE B.1: Honohan’s cognitive map deduced from an excerpt of his speech “Two-way interdependence between the banking system and the State”



B.3 European central bankers reform proposals

TABLE B.2: Reform proposals

Category	Reforms
Reforms of the banking and finance industry	Advocacy for financial reforms Increase of transparency Increase of macroprudential instruments Asset restriction Separation of Bank activities Restructuring of Banks Resolution regime
Basel 3 implementation	Advocacy for Basel 3 Reduction of the leverage ratio Introduction of the countercyclical capital buffer Increase of liquidity standards Increase of capital requirements Additional capital buffer Improve Bank capital
Consolidation measures	Advocacy for consolidation Reduction of government expenditures Correction of public imbalances Restructuring of public debt Enforcement of the Stability and Growth Pact Budget adjustment program
Federally oriented reforms	Banking union Common supervision Political Union Coordination of macroeconomic policies Introduction of the Eurobonds
Liberalization market reforms	Structural reforms Privatization measures Labor market reforms Remove of competition barriers
Unconventional monetary easing	Support of government bond purchases Support for LTRO

B.4 Federally oriented reforms

TABLE B.3: Federally oriented reforms

Variable	(1)	(2)
Constant	0.02 (0.63)	-0.004 (0.93)
Occupational Background		
Banker	<i>Reference group</i>	0.01 (0.85)
Civil servant	-0.05** (0.03)	-0.05* (0.07)
Central Bank	-0.03 (0.28)	<i>Reference group</i>
Economic Scholar	-0.04 (0.15)	-0.03 (0.5)
Education		
Ph.D	0.03 (0.39)	0.01 (0.64)
MSc	<i>Reference group</i>	<i>Reference group</i>
Political affiliation		
Left wing	-0.02 (0.45)	-0.01 (0.69)
Right wing	<i>Reference group</i>	<i>Reference group</i>
Control variables		
GDP growth	-0.002 (0.45)	-0.001 (0.53)
Unemployment	-0.005 (0.39)	-0.005 (0.33)
Debt	0.0008 (0.21)	0.0008 (0.27)
Inflation	0.003 (0.44)	0.004 (0.56)
Number of observations	85	85

*significant at 10%, **significant at 5%, ***significant at 1%, p-value in parentheses.

B.5 Years in Office

TABLE B.4: Years in office (until July 2013)

	Years in office			
Central Banker	Banking sector	Public sector	Central Bank sector	Academia sector
Carlos Da Costa Silva	6	14	7	27
Christian Noyer		38		
Erkki Liikanen		42		
Ewald Nowotny	1	12		36
George Provopoulos	15	7	3	28
Guy Quaden		4	1	33
Ignazio Visco			42	
Jens Weidmann		11	3	
Josef Bonnici		18		16
Klaas Knot		2	14	6
Luc Coene		11	17	
Mario Draghi	3	10		16
Axel Weber		2		15
Miguel Fernandez		32		
Nout Wellink		12	15	
Patrick Honohan		4	7	10
Yves Mersch		40		

Appendix C

FOMC Members' Incentives to Disagree

C.1 States comprised in the Fed districts

TABLE C.1: U.S. States comprised in the Fed districts

Fed district	States within a district	Fed district	States within a district
Atlanta	Florida Alabama Georgia Tennessee Louisiana	Chicago	Illinois Indiana Michigan Wisconsin Iowa
Cleveland	Ohio	New York	New York
Richmond	Columbia Maryland Virginia North Carolina South Carolina West Virginia	Boston	Connecticut Massachusetts Maine Vermont New Hampshire Rhode Island
Minneapolis	Minnesota Montana North Dakota South Dakota	St. Louis	Arkansas Kentucky Missouri Mississippi
Dallas Philadelphia	Texas New Mexico New Jersey Delaware Philadelphia	Kansas City	Wyoming Colorado Kansas Nebraska Oklahoma
San Francisco	Alaska Arizona Hawaii California Idaho Nevada Oregon Utah		

C.2 Descriptive statistics

TABLE C.2: Descriptive statistics

			Desired interest rate			Desired differential		
	Position	FED district	Average	Median	Standard deviation	Average	Median	Standard deviation
Jack Guynn	President	Atlanta	3,78	3,82	1,56	-0,26	-0,13	1,53
Cathy Minehan	President	Boston	4,00	3,97	0,50	-0,04	-0,60	1,51
Michael H. Moskow	President	Chicago	4,00	3,95	1,41	-0,04	-0,02	1,08
Jerry Jordan	President	Cleveland	4,44	4,31	1,22	0,40	0,30	1,35
Richard W. Fisher	President	Dallas	3,06	3,13	0,70	-0,98	-1,32	1,40
Robert D. McTeer	President	Dallas	4,00	4,25	1,42	-0,04	-0,13	1,35
Thomas Hoenig	President	Kansas City	3,78	3,96	1,13	-0,26	-0,42	1,08
Gary H. Stern	President	Minneapolis	3,93	3,88	0,95	-0,11	-0,42	1,51
Timothy Geithner	President	New York	2,42	2,51	1,85	-1,62	-0,92	2,18
William J. McDonough	President	New York	4,79	4,81	0,59	0,75	0,28	1,62
Anthony M. Santomero	President	Philadelphia	2,65	2,87	0,98	-1,39	-1,54	1,55
Alfred Broadus	President	Richmond	3,72	3,68	1,74	-0,04	-0,04	0,95
Robert Parry	President	San Francisco	5,06	5,32	1,91	1,02	1,06	2,09
William Poole	President	St. Louis	3,95	3,91	1,72	-0,09	-0,23	1,69
Roger Ferguson	Governor	Boston	2,89	2,72	1,68	-1,15	-0,98	1,58
Susan Bies	Governor	Chicago	4,15	4,09	1,80	0,10	0,06	1,14
Susan M. Phillips	Governor	Chicago	4,98	4,93	0,56	0,94	0,49	1,40
Edward W. Kelley	Governor	Dallas	5,00	5,08	0,48	0,96	0,54	1,51
Donald Kohn	Governor	Kansas City	3,38	3,66	1,39	-0,66	-0,78	0,91
Mark W. Olson	Governor	Minneapolis	2,14	2,26	0,58	-1,90	-2,38	1,50
Kevin M. Warsh	Governor	New York	2,96	2,99	1,53	-1,09	-0,68	1,87
Alice M. Rivlin	Governor	Philadelphia	5,28	5,27	0,15	1,23	0,34	1,84
Randall S. Kroszner	Governor	Richmond	4,35	4,33	1,53	0,60	0,47	0,98
Janet Yellen	Governor	San Francisco	5,34	5,30	0,27	1,30	0,37	1,91
Laurence Meyer	Governor	St. Louis	4,87	4,85	0,98	0,83	0,43	1,73

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