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INSTITUTIONAL SETUPS OF MONETARY POLICY AND BANKING REGULATION AND SUPERVISION – A SURVEY

By

Diana Lima
(Bank of Portugal)

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School of Economics
University of Surrey
Guildford
Surrey GU2 7XH, UK
Telephone +44 (0)1483 689380
Facsimile +44 (0)1483 689548
Web https://www.surrey.ac.uk/school-economics
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Institutional setups of monetary policy and banking regulation and supervision - a survey

D. Lima*

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Abstract

Worldwide reforms to the institutional setup of banking supervision in the aftermath of the global financial crisis aimed not only at revising improving the of banking supervision, but also at introducing a macroprudential oversight of the financial system, empowering central banks with new financial stability objectives and instruments. This survey investigates the interaction of monetary policy and banking regulation and supervision in the light of these new developments and what it may imply for the design of their institutional setup. The survey finds a consensus around an institutional framework where central banks are entrusted with financial stability and macroprudential policy mandate, since this setup would take the most of the similarities between macroprudential and monetary policies. In such an institutional set up, the microprudential dimension of banking regulation and supervision should be assigned to an independent authority. Finally, the literature review highlights the need for empirical evidence and theoretical analysis, regarding the impact of different financial supervisory architectures on social welfare, specifically the assessment of the benefits and costs associated to each type of institutional arrangement.

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*Bank of Portugal, Financial Stability Department, Rua Castilho, 24 -2., 1269-179, Lisbon, Portugal. Phone: +351 211 597 057 , E-Mail: dlima@bportugal.pt. Supported by FCT - Fundação para a Ciência e a Tecnologia, SFRH/BD/69139/2010.

1 Introduction

The recent financial crisis raised the debate regarding the institutional arrangements of monetary policy and banking regulation and supervision.[1]

Historically, as pointed out by Haubrich (1996), the institutional arrangements of monetary policy and banking regulation were mainly influenced by two distinct traditions: the English tradition and the German influence. For example, the United States, the United Kingdom, Australia and Hong Kong used to follow the English tradition, combining the monetary policy and supervision under the central bank premises. On the other hand, Germany, Austria, Denmark, and Switzerland used to follow the German tradition of separation of functions. According to Haubrich (1996), the origin of these different traditions is related to the evolution of the payment system. Countries that adopted the English tradition experienced a rapid expansion of credit through the introduction of alternative forms of money, where the central banks naturally became the guarantors of the smooth functioning of the payment system and the regulators in these market-based financial systems. In contrast, countries that experienced a slow expansion of credit developed a bank-based financial system of well-capitalised banks that were regulated by an independent authority following the German tradition.

In the late 90's there was a tendency for the separation of both functions (Docherty (2008)), following the German approach. This has occurred in the European Monetary Union, when the European Central Bank was assigned the responsibility for the conduct of monetary policy and the national authorities became in charge of the banking regulation and supervision (Goodhart & Schoenmaker (1995)). Likewise, United Kingdom and Australia have opted for the separation of these functions. DiNoia & DiGiorgio (1999) states that only a few industrialised countries have assigned to a single agency (i.e. the central bank) both tasks. The degree of unification between financial regulators seemed to be inversely related to the central bank role in the banking regulation and supervision (also known as central bank fragmentation effect) (Masciandaro (2004)). Nonetheless, there are still differences among countries in what regards the institutional arrangements of banking regulation and supervision.

Notwithstanding the institutional mandates trends around the world in the period preceding the financial crisis, in academic literature it remained an open-ended question.

[1] The concepts of banking regulation and banking supervision are distinct. The former relates to the definition of legal rules which the banks have to comply with; the latter respects to the surveillance of the compliance of those rules by banks. These are two different tasks, but usually they are conducted by the same authority. In this survey, since these responsibilities are intertwined, they will be studied en bloc.

The arguments for and against separation are strong and therefore it is not an easy task to find a theoretical solution to the issue of what would be the most efficient institutional mandate from a social welfare point of view. From an empirical standpoint, it seems to exist in the literature a relative consensus around the thesis of the 'conflict of interests effect', but not in what concerns the 'information effect', which are two of the inevitable arguments of this discussion, as it will be explained in the next sections.

Recently, the 2008 financial crisis questioned this apparent consensus towards the separation of functions, and many countries, as the United Kingdom, Germany, United States of America, Ireland and even the European Union, implemented major reforms regarding the role of the central bank in banking supervision mandates.In particular, these reforms encompassed the introduction of a macroprudential view of the financial system as a complement of the microprudential approach already in place. This was due to costs triggered by the financial crisis and the inability of banking supervisors to prevent it strongly emphasized the need for more policies and instruments targeting macro-financial stability. As defined by Borio (2003), *the objective of a macroprudential approach is to limit the risk of episodes of financial distress with significant losses in terms of the real output for the economy as a whole*, in which it differs from the objective of the microprudential approach, that aims *to limit the risk of episodes of financial distress at individual institutions, regardless of their impact on the overall economy.*

The discussion concerning the role of macroprudential policy in financial stability regulatory frameworks introduced new questions into the governance debate. In fact, there is now a clearer distinction between microprudential and macroprudential policies, which may change the way governance issues regarding monetary policy and banking regulation and supervision have been addressed in the past. For instance, macroprudential policies might be more connected to monetary policy than microprudential policies, namely in what regards informational synergies, since macroprudential and monetary policies are more macro-oriented. As a consequence, the discussion at the current juncture has to include a new variable into the institutional framework equation, that is macroprudential policy.

This paper aims at surveying the arguments in favour and against the different options for institutional arrangements, taking also into account the new role of banking regulation and supervision and how it should interact with monetary policy. We identify key issues in the literature that need to be further explored. On the one hand, there is a need for analytical frameworks in order to study the interactions between monetary policy and banking regulation and supervision. In particular, the impacts of the implementation of macroprudential policy on the transmission mechanism of monetary policy

in different macroeconomic models, in the form of cooperative and non-cooperative interactions. On the other hand, the empirical evidence is scarce and not fully conclusive in what the advantages and disadvantages of specific institutional designs are concerned. Empirical research should be expanded not only on the grounds of the work done so far, by including a larger number of countries, time horizon, explanatory variables and the use of different estimation techniques, but also by identifying the economic situations in which the interplay of monetary policy and prudential policies is likely to produce conflicting outcomes.

The survey is organised as follows. Acknowledging that the effectiveness of monetary policy decisions depends on the smooth operation of the banking system, but the soundness and stability of the banking sector also rely on price and macroeconomic stability, an overview of the interactions of monetary policy and banking regulation is thereby crucial to understand the issues related to the design of the institutional mandates of these policies. Section 2 of the survey explains how these interactions may occur. Section 3 analyses the most important arguments in favour and against the separation of policies, by surveying the relevant empirical literature and Section 4 covers theoretical insights regarding these issues.

The second part of the survey is focused on the post global financial crisis period, in which reforms in banking regulatory mandates were implemented to introduce a macroprudential policy oversight of the financial systems. We discuss the implications of these reforms for the monetary policy mandate and how it reconciles with the pre-crisis debate in Section 5. Section 6 concludes.

2 The Interactions of Banking Regulation and Monetary Policy

Banking regulation and monetary policy are completely distinct functions, not only in terms of the objectives pursued, but also in terms of the nature and frequency of their decisions and qualification of staff. Nonetheless, both are intertwined in several ways. On the one hand, the effectiveness of monetary policy depends on the smooth functioning of the banking system, which is promoted by sound banking regulation and supervision practices. On the other hand, the monetary policy stance may also pose risks to financial stability, justifying that monetary policy decisions should be under the watchful eye of the banking supervisors.

Although there are several channels of monetary policy transmission,we focus our

analysis on those that work through financial imperfections, and are more likely to impact on bank stability and ultimately on the stability of the financial system.[2] From this perspective, there are three main channels of monetary policy propagation: i) the credit channel, which comprises the bank lending and the borrowers' balance-sheet channels, ii) the bank capital channel and iii) the risk-taking channel.[3]

Through the credit channel, monetary policy shocks have an impact not only on the level of interest rates, but also on the size of the external financial premium (i.e. the difference between the cost of funds raised externally and the opportunity cost of internal funds) (Bernanke & Gertler (1995)). The bank lending and the borrowers' balance-sheet channels illustrate the link between monetary policy decisions and the external finance premium. The borrowers' balance-sheet channel is based on the assumption that the external finance premium is directly related to the borrower's financial condition, which, in turn, is positively determined by the net worth the borrower owns (addressed as the sum of the liquid assets and the market value of collaterals). A stronger financial condition (or a greater net worth) of a borrower is thereby associated to a lower external finance premium. The lower external finance premium results from the borrower capacity to internally finance a higher share of his or her investments and / or to offer more collateral to the lender. Given that the borrowers' financial situation affects the external finance premium, thus determining the general credit conditions available to them, variations in the quality of borrowers' balance-sheets should likewise impact on credit terms they face and, consequently, on their investment and spending decisions.

The balance-sheet transmission mechanism of monetary policy arises from the impact of changes in interest rates on the borrowers' net worth, at least in two ways. Directly, by increasing the cost of liabilities (such as outstanding short-term or floating-rate debt), in the case of rising interest rates, which reduces cash flows and deteriorates the borrower's financial position. Or even by decreasing the price of assets that can be used as collateral, deteriorating in this way the borrower's financial position. Indirectly, a rise in interest rates may also reduce demand for a certain product, also affecting firms' net cash flows and collateral values. In both situations, a tightening in monetary policy interest rates increases the external finance premium, negatively impacting the borrowers' ability to take loans out (i.e. it reduces credit demand in general).

The bank lending channel of monetary policy, on the other hand, operates through the banks' balance-sheet. In particular, monetary policy may affect the external finance premium by changing the financial intermediaries' supply of funds, which, in turn, affects

[2]See European Central Bank 2011 for more on the transmission channels of monetary policy.

[3]In this section we address only the transmission channels of conventional monetary policy.

credit supply. A reduction in the supply of funds can, in principle, be achieved by an increase in reserve requirements (directly reducing the share of liabilities used for granting credit), a policy measure that is not so common nowadays, or by a rise in interest rates (raising the relative cost of funds faced by banks). In the case of a decline in credit supply, the most bank-dependent borrowers, although they may not be completely excluded from credit, they may have to face costs associated with finding a new lender, for instance. The higher costs are likely to increase, by this manner, their external finance premium and reduce real activity (Bernanke & Gertler (1995)).

The bank capital channel thesis highlights the role of bank capital requirements, for market or regulatory reasons, in influencing the banks' business choices. It is argued that the bank capital requirements are likely to amplify the effects of monetary policy shocks. According to Borio & Zhu (2012), changes in interest rates can affect bank capital in diverse ways. They may have a direct impact, by affecting cash flows, net interest margins, profits and the valuation of assets. Changes in interest rates may also indirectly generate changes in bank capital, through its impact on non-bank balance-sheets and the macroeconomy, which can have an effect on asset quality and the adequacy of the bank capital cushion in turn. Overall, when the banks' cost of funds increase, as a result of the decrease of the value of the bank capital or the increase of its issuance cost, it is likely to induce higher funding costs to firms when borrowing from banks. Higher lending costs may lead to lower borrowing and, thereby, a decrease in firms investment and output. This propagation effect typically comes from imperfections in the markets for bank capital, which dictate changes in the value of bank capital - see Drumond (2009) for a review on the theoretical reasons.

The risk-taking channel, as first argued by Borio & Zhu (2012), is also considered an important way through which monetary policy could impact on banking stability. It is argued that low interest rates boost assets and collateral prices and if the market believes that this is a sustainable rise, it prompts banks and borrowers to accept higher risks. Then, a softening of credit standards can follow, which may lead to an excessive increase in loan supply. At the same time, low interest rates make riskier assets more attractive given the demand for higher yields ('search for yield' effect) as an alternative to less profitable investments. By the means of the risk-taking monetary policy channel, low interest rates reduce risk perceptions and/or improve risk tolerance, thereby encouraging risk taking behaviour.

The close link between monetary policy and the banking system implied by these transmission channels makes the stability of the banking sector not only a concern but a crucial matter for monetary policy effectiveness. Otherwise, an unstable banking sys-

tem can pose significant threats to the desired smooth functioning of these transmission mechanisms and to the expected and desirable effects of monetary policy decisions. Against this background, regulation and supervision of the banking system, as a necessary condition to promote banking and financial stability, is thereby a requirement to obtain stability of prices.

On the other hand, it is reasonable to argue that banking regulators should also be interested in the stability of prices (Tuya & Zamalloa (1994)). Price stability is a source of macroeconomic stability and banks prefer to operate in an environment with low degree of uncertainty. As explained by the authors, *high and volatile inflation may provide wrong market signals, causing miss-allocation of resources and thus endangering the credit decisions of bankers*, increasing the probability of bank failures.

The effects of banking regulation and supervision tools in monetary conditions should thereby be object of concern for monetary policymakers. The instruments used by banking regulators to minimize moral hazard problems and promote the safety, soundness and competition of the banking system (for instance, capital adequacy requirements, asset classification and liquidity requirements) can have undesirable effects in monetary aggregates and interest rates. Banking regulations, such as Basel I and Basel II systems of risk-based capital requirements, may change the monetary transmission mechanism, by affecting balance-sheet responses of the banking system and limiting credit and other assets growth. As Hanson et al. (2010) describe, when a troubled bank is asked to increase its capital to total assets ratio, for instance, *the regulator does not care whether the bank adjusts via the numerator or via the denominator - that is, by raising new capital or by shrinking assets*, because in both cases this ratio is strengthened to the level required by the banking authority. However, if the bank chooses to decrease its assets instead of raising capital, that might represent a reduction on lending and, as a result, it might affect the transmission mechanism of monetary policy.

In addition, it is argued that the introduction of capital requirements or its reinforcement can have a procyclical effect in the economy. In a crisis, a negative shock to the capital positions of banks, which are highly leveraged and regulated institutions, requires them to shrink assets to comply with the minimum regulatory capital requirements, amplifying the negative impact of economic shocks.

The implications of banking regulation on the monetary policy effectiveness are largely studied. VanHoose (2008) and Drumond (2009) provide surveys on theoretical predictions and empirical evidence, mainly focusing on the amplification effects of the Basel I and Basel II accords through the bank capital channel. The survey by VanHoose (2008) shows that the effects of monetary policy through the banking system are asym-

metric, depending on the levels of capitalization of the banks. The survey shows that banks which are well capitalized are less constrained in their reactions to contractionary monetary policy shocks than banks with relatively lower levels of capitalization. When there is a monetary policy easing the capital unconstrained banks tend to be less reactive. Drumond (2009) concludes that the theoretical models focusing on the bank capital channel under the Basel II accord generally support the procyclicality hypothesis and that the magnitude of the procyclical effects depends on, among other determinants, the composition of banks' asset portfolios, the approach adopted by banks to compute their minimum capital requirements, and the capital buffers over the regulatory minimum held by the banking institutions.

The introduction of a macroprudential oversight of the financial system, as already established by the Basel III regulatory framework, brings new challenges for the interaction between monetary policy and banking regulation, which need to be thoroughly investigated. Among other aspects, the interactions may result from the fact that some of the instruments used by monetary policy and macroprudential regulation are similar. This is the case of changes in haircuts for central bank operations or changes in reserve requirements, which can be considered substitutes of macroprudential instruments such as liquidity requirements and regulation of margin requirements (Smets 2014). The sharing of transmission channels and the use of similar instruments calls for the design of institutional arrangements in which strong coordination mechanisms are embedded. Section 5 presents preliminary findings in this regard.

Having in mind the ways through which monetary policy and banking regulation may be interlinked, the next section reviews the rationale behind the different designs of the institutional framework of monetary policy and banking regulation around the world, covering, in particular, the main arguments for and against a certain type of institutional arrangement.

3 Institutional arrangements of monetary policy and banking regulation

Worldwide, according to the World Bank database, there is still a preference for assigning banking supervision responsibilities to central banks, given that only 39 economies out of 98 favoured an institutional mandate in which banking supervision is assigned to an independent authority.[4] Moreover, the allocation of banking supervision powers to

[4]The database covers the financial sector supervision institutional structures for 98 countries from 1999 to 2010 and distinguishes between high, upper-middle and lower-middle income economies.

central banks has not changed significantly after the beginning of the 2007 and 2008 financial crisis, as shown in Table In 2007, the prudential supervision of the banking sector was conducted by the central bank in 60 countries, comparing to 59 economies in 2010.

Nonetheless, developed economies (40 countries in 2010) show a more balanced distribution of banking supervision responsibilities, since, based on the 2010 figures, 50% assigned this regulatory and supervisory role to the central bank. On the other hand, upper-middle and lower-middle income countries still reveal a tendency to assign the banking supervision power to the central bank.

With the purpose of clarifying the different political options for the design of the monetary policy and banking regulation and supervision institutional arrangements, in the next subsections we start by reviewing the arguments supporting the choice of a combined institutional mandate, in which the central bank is the banking supervisory authority, and then we survey the arguments for a separate institutional mandate, where banking regulation and supervision are assigned to an independent authority of the main arguments).

For this literature review, we limit the scope of our analysis to these two types of institutional mandates of banking regulation and supervision (i.e. we only assess whether the banking regulatory and supervisory powers are within the central bank or outside the central bank), deliberately omitting other types of financial supervisory architectures.

3.1 Arguments against a separate mandate between monetary policy and banking regulation

There is a large number of arguments in the literature regarding the defense of a unified mandate of monetary policy and banking regulation. As referred by Haubrich (1996), *the economics of combination is the economics of information and incentives.* The arguments are listed in three categories: 'informational gains', and 'qualified staff' and 'independence and funding'.

3.1.1 'Information Gains' arguments

There are informational advantages resulting from the participation of the monetary policy authority in bank regulation and supervision. The 'information gains' result from having direct access to confidential information concerning banks' financial conditions. The literature points out three types of advantages from having access to confidential information regarding the safety and soundness of the banks: its usefulness to decide

whether to provide the lender of last resort (LOLR) support by central banks, as a source of information about the state of the economy and it improves the accuracy of economic forecasting.[5]

One important advantage is intimately closed to the LOLR role of central banks, that makes them concerned about the systemic stability of the banking and financial systems ((Tuya & Zamalloa 1994) and (Goodhart & Schoenmaker 1995)). Given this role, the central bank needs to be aware of the economic and financial conditions of the bank institutions to distinguish between illiquid banks that can be solvent or insolvent, in order to provide the LOLR support (which should be put in action in situations where the bank is illiquid, but solvent) and reduce moral hazard. If the central bank participates in the supervisory process of the banking system, it will have direct access to the banking supervision data and, under these circumstances, it would be more straightforward to judge about the solvency of the troubled banks and decide whether to provide or not the LOLR assistance.[6] More specifically, Repullo (2000) states that in order for the LOLR to provide liquidity to banks, it can require to lend on good collaterals, as banking securities. To distinguish between good and bad collaterals, Repullo (2000) argues that an obvious source of information is bank supervision, because it can have access to private information on the financial condition of the illiquid bank. Therefore, the decision to implement the lending of last resort assistance should rely on this supervisory information. Since the central bank can be seen as the *ultimate guarantor of financial stability*, as argued by Eichengreen & Dincer (2011), the type of information it needs to be a competent guarantor can only be obtained when it has regulatory and supervisory responsibilities.

The combination of policies becomes even more relevant during periods of financial crises, when only direct supervision can provide timely and relevant information about banking conditions (Haubrich 1996). DeGrauwe (2007) expands this argument further, stating that if the balance sheets of central banks are affected by a bubble crash, they should be also concerned about movements in the assets markets, in order to prevent the bubbles to form and eventually burst. Therefore, the author concludes that central banks should expand their responsibilities to the supervision of all institutions that generate credit and liquidity (and not only to banks).

[5] As highlighted in Fahr et al. (2011), in the limit the central bank could replace the interbank market entirely, working as a market maker of last resort, in contrast to a loan provider to a single bank. The 'information gains' argument is valid, regardless of the role of a central bank (as a lender or as a market maker of last resort).

[6] Nevertheless, Goodhart and Schoenmaker (1993, 1995) argue that the preferences of the central banks, regarding bank rescues, are focused on the risk of a contagion effect, instead of being concentrated in the banks' solvency.

Banking supervision data is important not only to guide decisions related with the role of the LOLR, but also to improve the accuracy of economic forecasting so as to conduct monetary policy in a more effective way, as argued by Peek et al. (1999). Accordingly, problems in the banking sector can be used as an early indicator of the deterioration of the macroeconomic conditions. Another aspect worth mentioning is that banking supervisory information is also relevant to understand how banks might respond to changes in interest rates ((Peek et al. 1999) and (Goodhart 2000)). As already referred, monetary policy affects inflation through a transmission mechanism in which the intermediation by the banking system is essential.[7] Therefore, in order to assure the effectiveness of monetary policy, it is necessary to understand how banks might react in their decisions on lending and credit creation to changes in the monetary policy instruments, i.e. interest rates.

There are also other arguments related to operational issues, but not as relevant as the ones described before. For instance, Tuya & Zamalloa (1994) argue that the design of monetary policy and bank supervision is heavily dependent on information collected from banks. Therefore, the two policies should be conducted by the same agency to guarantee the time availability of this type of information and avoid a unnecessary reporting burden on banks. Another argument by Tuya & Zamalloa (1994) is that central bankers have international contacts with their counterparts that are very useful for banking supervision. In their regular meetings, they discuss policy coordination and timely analyse economic developments that can affect international banks. Being a separate agency, banking supervision would not be able to have access to this information.

Although this is a major argument to join both functions, there is not a general consensus regarding the view that monetary policy authorities should have access to banking information by undertaking supervisory responsibilities ((Peek et al. 1999) and (Goodhart 2000)). First, LOLR facility is not an exclusive mission of central banks, as argued by Goodhart (2000): *"(...) crisis management, at least in most countries, has already gone beyond the capacity of the Central Bank to handle on its own. (...) So crisis management already involves joint co-operation, assessment and agreement between Central Banks and Ministries of Finance*", and the use of taxpayers' funds to resolve the banking system crisis. Khan & Santos (2005) also point out that the LOLR may be unable to distinguish between insolvent and illiquid banks, due to information asymmetry problems, even in the cases central banks have supervisory responsibilities.

In addition, in the absence of direct supervisory responsibilities, the central bank could simply request the supervisory information from the bank regulator. Peek et al.

[7] See Bernanke & Gertler (1995) for a description of the transmission mechanisms of monetary policy.

(1999) point out some hurdles that, in practice, could hamper these efforts. For example, the monetary authority should have ready access to all supervisory data in order to be able to ascertain which data are important for the conduct of monetary policy. Thus, central banks must have access to timely and reliable supervisory data. More important is that the assessment of a bank's health and the information used to make that assessment might depend on the objective function of the banking supervisor, which would limit the ability of the central bank to interpret the supervisory information. For instance, the different objectives could originate the collection of and emphasis on different bank information or affect the way CAMEL ratings are assigned.[8] In addition, Goodhart (2000) points out that, once the banking supervision has been removed from the central bank, it can lose the ability to interpret supervisory information properly. Ferguson (1999) agrees with this view, referring that "*in the last analysis, there simply is no substitute for understanding the links among supervision, regulation, market behaviour, risk taking, prudential standards, and [...] macro stability*".

Finally, based on the adversarial legal system theory, Haubrich (1996) claims that the separation of functions would produce the most information. In other words, each separate authority with different objectives will obtain evidence that confirms their own view, whereas combined authorities may not be interested to find information that contradicts their preferred policy.

With regard to the argument that underlines the importance of banking supervision data to improve the accuracy of economic forecasting, the empirical evidence is weak. In the literature, there are two papers about this issue, but they show contradictory results. Peek et al. (1999) analyse whether the banking supervisory functions enhances the conduct of monetary policy by the central banks, by investigating whether the supervisory information is used by the Federal Reserve in the conduct of monetary policy to improve macroeconomic forecasts. They conclude that supervisory confidential information about banks' health is not used by the Federal Reserve staff to improve their forecasts of inflation and unemployment rates in a way that is different from forecasters that do not have access to this information. However, they show that confidential supervisory information is useful to predict inflation and unemployment.

Using a different methodology, Feldman et al. (2003) contradicts this last result, by comparing the performance of two forecasting models, one including supervisory information and one without it, in order to understand whether adding these confidential

[8]CAMEL rating is a United States supervisory rating, that is based on the banks' overall conditions. The financial conditions of the banks are assessed by the following components: Capital Adequacy (C), Asset Quality (A), Management (M), Earnings (E) and Liquidity (L).

data to the model improves forecasting accuracy for unemployment and inflation or not. Results show that the forecast errors are virtually the same as in both models specifications. Therefore, in out-of-sample exercises, this paper does not find evidence from any methodology applied that supervisory information would improve forecasts of inflation, contradicting the empirical results by Peek et al. (1999).

3.1.2 'Qualified Staff' argument

Another group of arguments is related with the expertise of human capital employed by central banks and banking supervisors. It is argued that both banking supervision and monetary policy could benefit from being allocated to the central bank. There are some advantages for banking regulators. First, the knowledge and skills originated by the management of systemic risk, which has traditionally been associated with the conduct of monetary policy, may improve the conduct of prudential supervision due to the closed relationship between this task and monetary policy Docherty (2008). In addition, the prestige and independence of central banks improve their ability to enforce actions, as well to recruit and retain the most skilled professional staff. Therefore, the banking regulator would naturally benefit from these abilities, being able to recruit the most skilled staff and take advantage of the credibility of the central bank when enforcing their actions to bank institutions Garicano & Lastra (2010). This argument is specially relevant in countries where the level of human capital with this expertise is scarce Abrams & Taylor (2000).

By the same token, the development of expertise about the way the financial system operates is of critical importance to monetary policy making, as argued by Ferguson (1999). In his view, *"there is no substitute [...] for the understanding of the institutions and the workings of the markets that comes with the hands-on experience derived from actual supervisory responsibility*". Ferguson (1999) claims central banks should have supervisory roles, in order to develop the knowledge and experience that would be crucial to manage a financial crisis.

The only empirical evidence related to the staff argument is given by Goodhart et al. (2002). Based on a sample of 91 banks across 57 countries, they conclude that the main determinant for the employment of experts with different skills (economists or lawyers) is whether the supervisory authority is the central bank or not.[9] More precisely, central banks hire economists and finance experts, but few lawyers in their supervisory and financial stability department. By contrast, non-central bank agencies

[9] As stressed by the authors, the results should be interpreted carefully, because they are influenced by the different ways in which supervisory institutions answered the questionnaire.

employ more lawyers than economists. Considering this empirical evidence together with economists ability to analyse the impact of macroeconomic trends on the banking system, the authors conclude that "*an institutional setting with involvement of the central bank is more likely to produce such a macro-approach than a setting without central bank involvement*".

Therefore, they propose an institutional arrangement where the central bank and the banking regulator and supervisor are physically together, but with separate boards. This empirical result sheds some light into the argument that the expertise of central banking staff would contribute to the effectiveness of banking supervision. However, it would be necessary to explore whether these differences of expertise enhance the effectiveness of banking regulation and supervision.

3.1.3 'Independence and Funding' argument

In what regards to funding, a unified mandate ensures independence of banking supervision from fiscal budget pressure ((Tuya & Zamalloa 1994), (Abrams & Taylor 2000), among others). In the same way as monetary policy, banking regulation and supervision policy requires independence from political pressure to adequately perform its function. Central banks are generally self-funded and usually profitable and these features would provide banking regulation with independence from budget pressures and its supervisory actions would not be influenced by political decisions.

Currently, this argument is overpast in the sense that banking regulators and supervisors are now mainly funded by the central banks and by the supervised financial institutions, insulating them from political pressures. Based on information concerning funding of supervisory agencies for 143 countries provided by the World Bank (Banking Regulation Survey, June 2008), we ascertain that in 28% of the countries, those agencies are funded by the Central Bank, in 21% they are funded by supervised financial institutions and in only 3% supervisory agencies rely on government funding.[10]

Garicano & Lastra (2010) argue that *"the wider is the role of the central bank, the more subject it could become to political pressures, thus threatening its independence*". In particular, that may happen when a large failure requires government intervention and funding, letting the central bank politically subservient in a supervisory role (Goodhart 1996).

[10]Note: This information was not available for 33% of the countries .

3.2 Arguments for a separate mandate of monetary policy and banking regulation

As Goodhart (1996) pointed out, "*there is a growing list of arguments for separation*". These arguments can be grouped in three categories, namely 'conflict of interests', 'reputation risk', 'organizational costs' and 'balance of powers'. The empirical evidence is also surveyed.

3.2.1 'Conflict of Interests' argument

An important argument for separation is that a conflict of objectives between the monetary authority and the regulatory and supervisory authority may arise, due to the impact of changes in interest rates (Goodhart and Schoenmaker (1993, 1995) in banking stability. The argument goes as follows. Under certain circumstances, the monetary authority may be interested in raising interest rates to control inflation, but the banking regulator may try to avoid the adverse effect of high interest rates on the soundness and profitability of the banking sector. Therefore, when both functions are ruled by the same agency, i.e. the central bank, monetary policy stance might become more flexible if the central bank fears that tight monetary conditions may cause bank distress and ultimately bank failures. In cases like this, it is likely that the flexibility in guiding monetary policy will lead to an inflation bias, since, as Haubrich (1996) explains, "*the central bank might view its primary function as protecting banks, not the public interest*".

Tuya & Zamalloa (1994) explore the effects of monetary policy in the banking sector. They conclude that, under certain circumstances, monetary policy conflicts with the objective of preserving the soundness of the banking system. The contraction of the monetary policy instrument, i.e. a rise in interest rates, is likely to increase the risk of loan default and, consequently, deteriorate the soundness of the banking system.

On the other hand, Goodhart and Schoenmaker (1993, 1995) discuss what would be the negative impact of high short-term interest rates to the banking system. They argue that the impact depends not only on the period of time in which high interest rates are likely to last, but also on the structure of the banking system's balance sheets. For instance, banking systems which are mainly financed by a retail deposit base, whose interest rates are unlikely to change following changes in money market wholesale rates, would have better conditions to deal with contractionary monetary policies. Or, another example, bank institutions that have bank loans and mortgages contracts defined in terms of a fixed interest rate are also less prone to temporary periods of high interest rates. Therefore, they conclude that the structure of the banking and financial systems

influence the degree of the 'conflict of interests effect' and that these conflicts increase proportionally to the financial intermediation and competitiveness of the banking system.

So far, we have described the sources of the conflict of interest in the case of a tightening of monetary policy. Nonetheless, as Blinder (2010) explains, this problem can also arise when monetary policy is expansionary. Suppose the banks are in trouble and the macroeconomic environment is weak. The banking supervisor should enforce banking discipline and the monetary policymaker should decrease interest rates to stimulate the economy. However, if the central bank has supervisory powers the policies will conflict, because the increase of discipline in banks will have the effect of reducing bank lending, while the decrease of interest rates will have the opposite result. In a context of a financially distressed banking system, Blinder (2010) argues that the consequence may be regulatory and supervisory forbearance.

In sum, the discussion about conflict of interest implies that, in a unified institutional regime, when there are inflationary pressures and monetary policy should be tightened, there is the risk that a lax monetary policy policy may be implemented, to safeguard the banks, sacrificing the inflation target; when there are deflationary pressures and monetary policy should be expanded, there is the risk that a lax banking supervision will be pursued, to avoid the adverse impact in bank lending. Underpinned on this arguments, banking regulation policies should be assigned to separate and independent authorities.

In a critical perspective, Goodhart and Schoenmaker (1993, 1995) defend that, in an environment characterized by open, competitive, and market-driven banking system, the conflict of interest should be incorporated into a single agency in order to achieve a more efficient resolution of bank distress. In face of a potential bank failure, the monetary policy authority, as it is also responsible for systemic stability, will prefer to rescue the bank, whereas the banking regulator will tend to close it in order to avoid moral hazard. In addition, Blinder (2010) considers that separation of policies may not maximise the society outcome, because the banking supervisor would be unlikely to take into account macroeconomic concerns when disciplining the banks. Thus, the supervisor might be strict with banks and, consequently, reduce bank lending, even when it is necessary to provide more credit to the economy.

The empirical evidence seems to support the argument that 'conflicts of interests' may arise, suggesting that the central banks should only focus on monetary policy. This conclusion is confirmed by the empirical results of DiNoia & DiGiorgio (1999), Copelovitch & Singer (2008) and Ioannidou (2005). DiNoia & DiGiorgio (1999) focus on 25 developed countries and classify them in two groups, monopolistic and non-monopolistic countries.

Monopolistic countries includes the ones in which the central bank is in charge of the monetary policy and acts as a monopolist in banking supervision. The estimation results show that monopolist central banks are less effective in controlling inflation.[11] Nevertheless, as the authors pointed out, the sample dimension is small, so the differences found in the average level of inflation could be due to other common features shared by the group of countries that composes the sample.[12]

Based on the same set of countries, Copelovitch & Singer (2008) extend this study to test the following hypothesis: institutional mandates of central bankers have an important influence on inflation outcomes; the effect of a central bank's mandate on inflation is conditional on the government's choice of exchange rate regime, and the effect of the central bank's regulatory mandate is conditional upon the size of the domestic banking sector. Though their econometric approach incorporates additional explanatory variables, their findings agree with those of DiNoia & DiGiorgio (1999). However, they also show that the impact on inflation rates of having a separate banking regulator is conditional on the choice of exchange regime and the size of the domestic banking sector. In particular, the separation mandate has a significant negative effect on inflation under floating rates, but this effect is only observed at middle to high levels of banking sector size.

An additional empirical contribution by Ioannidou (2005) about the 'conflict of interests effect' uses data from one country only, the United States of America, avoiding the criticism of cross-sectional studies. The study focuses on the particular banking system regulatory architecture of United States, in which three authorities, the Federal Reserve System (Fed), the Office of the Comptroller of the Currency (OCC) and the Federal Deposit Insurance Corporation (FDIC), share the supervisory powers, but the Fed is the only authority with monetary policy responsibilities. In this study, the behaviour of the Fed as a bank supervisor is compared with the supervisory behaviour of the other two agencies. In particular, it is analysed the effect of the monetary policy on the probability of a bank getting a formal action (dependent variable). Data covers the period 1990-1998. Results suggest monetary policy influences the supervisory actions of

[11] Using inflation rates data for the 1960-1996 period, they perform an econometric analysis where the dependent variable in the regression, average inflation rate, is explained by the country's institutional mandate (dummy variable, that takes 1 when the central bank is monopolistic and 0 otherwise) and by the degree of independence of the central bank from the government, measured by the index of Grilli et al. (1991).

[12] This study presents an additional empirical contribution to this literature, by analysing the bank's pricing behaviour and performance in monopolistic and non-monopolistic countries. They suggest that the different institutional arrangements may influence the competition model of the banking system. In particular, they argue that "the banking sectors in 'monopolistic' countries are more protected and somehow less developed and efficient than those in 'non-monopolistic' countries".

the Fed, but does not affect the actions of the other supervisory agencies. When the Fed rises the funds rate, the probability of getting a formal action decreases, which means that the Fed turns out to be more flexible in its bank supervisory role when it tightens its monetary policy stance.

More recently, Lima et al. (2016) examine the macroeconomic outcomes of economies characterised by different monetary and financial supervisory architectures. In particular, the paper evaluates the existence of an inflation bias, acknowledging that central banks in charge of banking regulation may be less aggressive in their inflation mandate. The paper empirically assesses whether central banks' combined mandates lead to an inflation bias problem using panel data for 25 industrialised countries from 1975 to 2012, adopting both static and dynamic panel data models. Findings suggest that, once the authors control for relevant policy and institutional factors, the separation of banking supervision and monetary policy does not have a significant negative effect on inflation outcomes, i.e., there is no evidence of an inflationary bias arising from institutional frameworks in which central banks have banking supervisory mandates. Results show that there are other institutional pillars of the monetary and financial supervisory architecture, such as deposit insurance schemes and inflation targeting mandates of central banks, that contribute in a significant manner to keeping inflation rates low.

Overall, the empirical results support for the "conflict of interest" effect, although recent research challenge this apparent consensus and underlines the role of other institutional factors in contributing to keep inflation rates at low levels.

3.2.2 'Reputation Risk' argument

An additional relevant argument is that the reputation of the central bank is more likely to suffer, than to benefit, from banking regulation and supervision, specially in periods of banking distress ((Goodhart & Schoenmaker 1995) and (Ferguson 1999)). If bank failures occur, public perception of central bank credibility in conducting monetary policy can be negatively affected by its role as banking regulator and supervisor. In this situation, the reputation costs could be very high for the central banks in charge of both monetary policy and banking regulation. Hence, the monetary policy authority may not be interested in damaging its credibility by being responsible for both powers. As Goodhart (1996) clearly explains, *"external regulation is only desirable to the point where the marginal benefits exceed the marginal costs*". Thus, it is reasonable to expect that *"an optimal regulator will be a regulator who fails from time to time in the exercise of her duty, because the alternative is too expensive*". However, a failure of the banking

regulator is generally visible by the public and it weakens credibility of the banking regulator and supervisor, because it is not interpreted as a possible outcome of an optimal policy.

Haubrich (1996) offers a critical view about this argument. Allowing a bank failure might mean not only that the central bank is incompetent and, consequently, flexible on inflation, but also that it is strict in both functions. According to the author, each interpretation is valid, depending on the circumstances. Hawkseby (2001), in turn, perceives the reputation risk as a consequence of the potential conflict of interest that may occur once the central bank is in charge of both policies. He argues that the central bank may have the motivation to be more lax in its monetary policy function to avoid the failure of a bank or group of banks, which would hurt its credibility as a prudential supervisor.

3.2.3 'Organizational Costs' argument

The existence of 'organizational costs' as an argument against a unified institutional arrangement is claimed by Vickers (2002) and Garicano & Lastra (2010) among others. Vickers (2002) analyses the operational differences between monetary policy (the 'hedgehog') and competition policy (the 'foxes') in the United Kingdom.[13] Banking regulation is considered a competition policy, according to his definition. Vickers (2002) argues that monetary policymakers and competition authorities are very distinctive institutions, in what concerns four organizational aspects: simplicity of tasks, repetition of decisions, confidentiality and transparency, and interested parties.

Table 1 summarizes the main differences between the two kind of policymakers, based on the organizational categories suggested by Vickers (2002):

Vickers (2002) argues that monetary policymakers tasks are simple, in the sense that they typically deal with one goal only (price stability) and use one instrument (interest rates) to achieve their objective. Therefore, the assessment of its success in controlling inflation rates should be straightforward. The simplicity of tasks by the central bank contrasts with the variety of competition policy issues, which sometimes are difficult to solve. Focusing on banking regulation and supervision, Garicano & Lastra (2010) defend that, as a rule, this activity is multitasking, because it deals with multiple goals (financial stability, investor/consumer protection, conduct of business, among others), and deploys a wide range of tools (licensing requirements, macro and micro prudential supervision,

[13] Competition policy comprises a variety of industries and markets, such as "banks, beer, broadcasting and buses" and also different issues, for instance "mergers, collusion, vertical relationships, pricing behaviour, and so on" (Vickers 2002).

financial stability reviews, lender of last resort operations and crisis management and resolution).

Another attribute distinguishing both functions is related to the frequency of decisions. The decision monetary policy authorities have to make - to increase, maintain or decrease the interest rate, given economic conditions - is the same every month, whereas competition regulators usually do not repeat decisions, due to the singular nature of competition cases. Furthermore, competition cases deal with confidential information and, as a consequence, competition policymakers must be extremely cautious in what regards the public release of information. Conversely, monetary policy handles with public information and public models. Transparency is also difficult to deal with in competition policy, even though it has become more transparent in recent years.

Lastly but rather important, generally the decisions about interest rates undertaken by monetary policy affects everyone to some degree, but the impact of decisions of competition regulators affects mostly producers and their representatives, making this functions more vulnerable to lobbying by interested parties. As argued by Haubrich (1996), "*the banking industry, which is better organised and affected than the public, could "capture" the central bank and gain undue influence*".[14]

3.2.4 'The Balance of Power' argument

Ferguson (1999), Haubrich (1996) and Goodhart (1996, 2000) introduce another argument for the separation of functions, that is the concentration of powers in a single institution. A central bank that is responsible for both monetary policy and banking regulation and supervision is a very powerful institution and it should be monitored closely by the citizens and their elected representatives. A related argument by Ferguson (1999) is that banking regulation and supervision, considering its importance for the economy, should be allocated to elected authorities, so as to be collectively evaluated in its performance.

The concerns about the concentration of powers in a single institution are raised when the central bank is independent from the government. In a democracy, this means that important powers are delegated to an authority that is not democratically elected. Goodhart & Schoenmaker (1993) and Goodhart (2000) state that the tendency towards the independence of the central bank from the government occurred simultaneously with the trend towards the removal of banking regulation and supervision from the

[14]This argument is associated to the 'organizational costs' argument, that states that competition regulators are more vulnerable to lobbying by interest parties, as banking industry, than monetary policymakers (Vickers 2002).

central bank. Some explanations for this occurrence are addressed by Goodhart (2000). One explanation is that democratically elected governments are unlikely to delegate important powers to an independent agency. Alternatively, the separation of functions could have been the acceptance that there are 'conflicts of interest' between the two functions.

Another argument related to the 'balance of powers' is associated to the development of the financial system that calls for a unified regulator for the banks, insurance companies and securities markets, as stated by Goodhart (2000) and Ferguson (1999). According to Ferguson (1999), "[...] *coupling it with the Central Bank would create too much power in one entity and place the Central Bank beyond its expertise*". However, a single supervisory authority for all financial institutions would pose some concerns, in the sense that it would be focused on its broad mission and neglect the consequences of its actions in the economy.

A theoretical approach in which the benefits and costs of different institutional arrangements are balanced does not offer a clear-cut answer for what would be the optimal supervision architecture, since we may invoke either arguments against or in favour, depending on our preferences about it. In fact, the design (or reform) of the financial supervisory architecture is an outcome of a political decision, often preceded by an intense debate that usually aims at gathering the public and stakeholders' points of view. The 'balance of powers' argument may be indeed a concern for politicians when designing banking supervision institutional setups.

A political-economy approach of the institutional arrangements of monetary policy and banking regulation and supervision is therefore necessary since, in the real world, these arrangements are ultimately the outcome of a political process (Masciandaro et al. (2008)). Furthermore, the political choices are a consequence of policymakers's preferences, which are under-studied in the related literature. In particular, the policymakers'objective function in what concerns financial supervisory design is scarcely studied in the economic literature (Masciandaro (2007)).

Along this political-economy view, there is an emerging strand of the literature that aims at identifying the main factors determining the differences in the banking supervision regimes from country to country and, particularly, how political preferences may impact on the design of the financial supervision architecture. The literature review shows that the current institutional arrangements influence the policymakers choices when defining the financial supervision structure. Masciandaro (2004), Masciandaro (2007) and Dalla Pellegrina et al. (2013) investigate what features of the present financial supervision institutional regimes are more likely to affect the policymakers' decisions.

On the other hand, Masciandaro et al. (2008), Masciandaro (2009) and Franck & Krausz (2008) analyse the most important political characteristics explaining the financial supervision architectures.

Masciandaro (2004) highlights the heterogeneity between banking supervisory regimes. By building up indices of the degree of unification in financial sector supervision and the central bank's involvement in financial supervision, based on institutional arrangements from 69 countries, the author concludes that the degree of unification of supervisory powers in developed countries is increasing, particularly in European Union states.[15] In addition, the study identifies two distinct institutional arrangements, that are more common across the world: a model with high level of unification of supervisory powers and a weak central bank's involvement, opposed to a model characterised by low levels of unification of powers and strong central bank's participation. Given these results, it is argued that a trade-off arises between the degree of financial sector unification and the role of the central bank. There are some possible explanations for this central bank fragmentation effect. The author argues that the trade-off can emerge due to the blurring hazard effect, which argues that policymakers worry that the central bank role as lender of last resort of the banking system might be extended to other financial sectors, such as insurance and securities industries. On the other hand, the trade-off can be explained from a political economic point of view, in the sense that in a country where the central bank is strongly involved in financial supervision, the government may fear an "overly powerful bureaucratic agency" and it will promote a less consolidated supervisory regime. This interpretation is related to the 'balance of powers' argument, as discussed in this section.

Masciandaro (2007) investigates the central bank fragmentation effect using econometric techniques as a complement to the previous descriptive analysis in Masciandaro (2004). The paper argues that the policymakers' decision on supervision unification level will depend on the role the central bank plays in banking supervision.[16] Based on the same indices constructed in Masciandaro (2004) an econometric study is performed, where the central bank fragmentation effect is tested.[17] In other words, it is empiri-

[15] In order to build this index, Masciandaro (2004) considers three possible financial sectors: banking, securities and insurance.

[16] For clarification, unification refers to single financial authorities regimes, in which banking, securities and insurance supervision are ruled by a same agency.

[17] The econometric models adopted are an ordered Logit model and an ordered Probit model. The dependent variable is the Financial Authority Index, as described in Masciandaro (2004). The key independent variable is the Central Bank Financial Authority Index, that indicates the involvement of the central bank in supervision. The control variables are index for the private governance factor, market capitalization over GDP, quality of public sector governance, GDP, binary variables for OECD

cally assessed whether the involvement of central banks in financial supervision is an important factor in defining the degree of supervisory unification. The author expects a negative signal between the central bank participation in financial supervision and the degree of financial supervision consolidation. The results confirm the descriptive trade-off between the participation of the central bank in financial supervision and the degree of supervision unification: "*the more the central bank is involved in financial supervisory powers, the lower the degree of concentration of those powers is likely to be*".

The empirical study by Dalla Pellegrina et al. (2013) focus specifically on the effect of central bank independence and monetary policy settings on the probability of allocating banking supervision to central banks. The dataset comprises 88 countries at different stages of economic development. Findings suggest that higher central bank operational independence is associated with a reduced degree of supervisory powers and tighter monetary policy goals are related to higher central bank involvement in supervision.

Franck & Krausz (2008) present a political-economy explanation to the selection of one of the two possible institutional frameworks. Using the contract theory framework, they analyse whether the separation between monetary policy and banking regulation is influenced by the political preferences on inflation of Conservative and Liberal parties. They assume that the Conservative party is more favourable to a price stability environment and, in opposition, the Liberal party prefers inflation and lower unemployment. Results show that separation between those tasks better serves the interests of the Conservative party, that aims for low-inflation policies and banking stability, once the banking system is considered solid and the probability of banking failures is low. The main conclusion is that different political objectives regarding inflation have an impact on the choice of the monetary policy and banking regulation's institutional regimes.

The review of the still recent political-economy view on this subject supports, to a large extent, the balance of powers argument. These studies suggest that political preferences regarding inflation or the degree of financial sector unification, may have implications to the design of institutional setups of monetary policy and banking supervision.

3.2.5 Discussion on Section 3

The literature review referring to the advantages and disadvantages of a combined institutional mandate for monetary policy and banking supervision indicates that there is a trade-off between expected benefits (sharing of information and expertise) and expected

and European countries, binary variables for the law factor and latitude, for the endowment view.

costs ('conflict of interests', 'reputation risks', 'organizational costs' and 'balance of powers') of central bank involvement in banking regulation and supervision (Dalla Pellegrina et al. 2013).

Hence, as Tuya & Zamalloa (1994) point out, the decision of placing banking regulation and supervision in the central bank should be taken on a case-by-case basis. For example, banking regulation and supervision powers should be assigned to the central bank in economies in transition, characterised by institutions and legal systems under a development process, scarcity of human capital and a lack of coordination between institutions. Moreover, in countries where there is no statutory guarantee to ensure an independent banking supervision agency the central bank should also be in charge of banking supervision. On the other hand, countries with high developed financial systems operating internationally, the argument that a central bank should have regulatory and supervisory powers for all banking institutions loses strength, due to the complexity of supervising all the financial intermediaries that are affected by its decisions.

Another critique comes from Beck & Gros (2012), which advocate that most of this literature focuses on normal times rather than a crisis situation, although theory and practice may show that "*the nature of the relationship between supervision and monetary policy might differ fundamentally between crisis and normal times*".

Goodhart & Schoenmaker (1995) also conclude that "*the question of the appropriate design of regulatory system may need to be answered against the particular financial / banking structure of each country, rather than being capable of resolution as an abstract generality*". Furthermore, the reasoning concerning the advantages and disadvantages of separate institutional arrangements is conditioned by the type of institution - the central bank or the banking regulator - that is being under analysis. Haubrich (1996) argues that "*as technology, finance, and the global economy change, so too may the shape of the world's central banks. [...] This should serve as a reminder that the regulatory structure keeps evolving and needs continuous reappraisal*". In sum, there is not a "one size fits all" solution, which means that the design of institutional mandates must undertake a careful and balanced analysis of the arguments, taking into account the specificities of each country, in terms of political system, financial sector development and current architecture of financial regulation and supervision.

There are important conclusions from the empirical review. First of all, there is little empirical analysis on the advantages and disadvantages of different institutional mandates of monetary policy and banking regulation and supervision. The empirical studies focus essentially in analysing the arguments related with the 'information gains', 'staff and funding' and 'conflict of interests'. Furthermore, empirical evidence seems to

support the option for an institutional framework where the central bank does not have regulatory and supervisory responsibilities. In particular, the empirical evidence seems to confirm that the conflict of interests effect may occur, suggesting that central banks should only focus in monetary policy. However, the samples in which the authors based their analysis are small in terms of time horizon considered (only 24 years). Moreover, the econometric methods employed are not the most appropriate to analyse panel data.

In contrast, the 'informational gains' advantage does not gather the same consensus in the empirical literature. Nevertheless, only a few papers investigate this effect. This effect is particularly relevant having in mind that, according to Garicano & Lastra (2010), the apparent consensus towards a separate regime was affected by the recent financial crisis and, more precisely, by the Northern Rock failure, which "*caught the Bank of England completely unprepared*".

Regarding the staff expertise argument, it was empirically found that the central banks with supervisory powers employ more economists than banking regulators and supervisors, which hire comparatively more lawyers. Although it sheds some light into the differences in expertise among supervisory institutions, it is not sufficient to confirm the argument that the unique expertise of central banking staff would improve the effectiveness of banking regulation and supervision. Lastly, it is not easy to assess the pertinence of 'reputation and organizational costs' arguments, which may explain the of empirical papers approaching these issues.

In conclusion, it is necessary to undertake more empirical research, in order to understand the real relevance of the arguments discussed above. Otherwise, as pointed out by Hawkseby (2001), political factors end up having a key role in the choice of supervisory structure, given the high degree of uncertainty about the economic costs and benefits of supervisory structures.

The recent financial crisis highlighted the importance of developing a macroprudential approach to regulatory policy, which may introduce a different perspective to the traditional debate about governance of banking regulation and supervision (microprudential policy focus) and monetary policy. Garicano & Lastra (2010) suggest an intermediate solution, that is that the function of macroprudential policy should be conducted by the central bank, whilst the microprudential policy should be allocated to a separate institution.

4 Banking Regulation and Monetary Policy - Theoretical Approach

The connections between monetary policy and banking regulation are poorly addressed in the theoretical literature. However, there is an interesting and fruitful strand studying the optimal institutional allocation of regulatory functions, such as lender of last resort (LOLR), deposit insurance and banking supervision, with microeconomic frameworks (Repullo (2000), Khan & Santos (2005) and Ponce (2010)). It is interesting in the sense that it focus on one of the major arguments for allocating banking supervision powers at the central bank: its role as LOLR. This argument, as explained above, claims that the LOLR should have access to supervisory information in order to distinguish between insolvent and illiquid banks. By addressing the issue of which institution should play the lender of last resort role and of whether it should accumulate this function with supervisory powers, this literature provides useful insights to this debate.

While the abovementioned studies are based on microeconomic models, there are others approaching the interconnections between monetary policy and banking regulation and supervision from a macroeconomic point of view ((Seater 2000), (Cecchetti & Li 2008), (Walque et al. 2010), (Angeloni & Faia 2013) and (Cecchetti & Kohler 2012)). In this section, we will first survey the microeconomic approaches, and then we will cover the macroeconomic models.

Repullo (2000) is one of the first attempts to explore the interactions between central banks and regulators, by studying the optimal allocation of the lending of last resort function. Based on an incomplete contract framework, Repullo (2000) develops a banking model with liquidity shocks, in order to analyse which agency, the central bank or the deposit insurer, should perform the lender of last resort function. The model assumes that the agency to which is given the lender of last resort role shall also be the supervisory authority, so as to have access to supervisory information. Supervisory information is key for a LOLR entity to correctly evaluate the true value of the assets that will be used as collateral in the liquidity loan. The central bank and the deposit insurer maximise their own objective functions.[18] The central bank is concerned about the impact of a bank failure on the stability of the banking system, while the deposit insurer is worried about the risk of having to reimburse depositors after a bank failure. Results show that the central bank should provide the LOLR assistance for small liquidity shocks, whilst

[18]Repullo (2000) follows a political economy approach, in the sense that the two agencies are not maximising social welfare. Otherwise, there would be no issue, since either of them would act optimally as LOLR.

the deposit insurer should have this role for large liquidity shocks. Therefore, assuming that small liquidity shocks are more frequent than large ones, conclusions suggest that the LOLR function should be allocated to central banks, and consequently, the banking supervision too, in order to avoid duplication of monitoring costs. In face of large liquidity shocks, the central bank shall delegate this role to the deposit insurer.

Khan & Santos (2005) extend the Repullo (2000) framework to investigate whether the deposit insurer and the lender of last resort should be separate or unified agencies and whether one of these regulators should be responsible for banking supervision. However, they introduce new features. They explicitly model banking regulation and supervision[19], which corresponds to the power of closing a bank, and they also allow for a distinction between insolvent and illiquid banks. In addition, by assuming that information is asymmetric, they assess the impact of the institutional allocation of banking regulation and supervision on regulator's incentive to obtain and share confidential information on banks' financial conditions with the other regulators.

The study considers different types of institutional arrangements: i) a single-regulator arrangement without supervisory powers, where the LOLR and the DI functions are performed by a single regulator, but banking supervision (i.e. the closure authority) is allocated to a distinct agency; ii) a single-regulator arrangement, with banking supervisory powers; iii) a multi-regulator, characterised by three independent institutions, a central bank that is in charge of the LOLR function, a deposit insurer that cannot withdraw DI coverage and a banking supervisor; and finally iv) a multi-regulator, where the deposit insurer has supervisory powers. The main conclusions are that the best institutional arrangement seems to be the one described in iv), where the central bank is only responsible for the LOLR assistance and the deposit insurer has the power to close banks. This institutional arrangement is not a common allocation of functions, since deposit insurers usually are not assigned supervisory responsibilities. However, it assures that banks invest efficiently in loans (as opposite to choosing an excessive level of reserves) and reduces excessive forbearance (i.e., regulators' reluctance to close the banks), that arises in institutional frameworks such as i) and iii). These results were obtained by assuming no informational frictions in the model. When informational asymmetry is incorporated in the model by assuming that the profitability signal is observed costlessly only by banks, so that monitoring the banks is now a costly activity for regulators, it is shown that, first the regulator's incentives to obtain information depend on their responsibilities. Second, it is shown that regulators may prefer not to share information

[19]The authors consider the term "banking regulation" in a broad sense, since it includes not only formal rules, but also supervision, deposit insurance and lending of last resort.

that they obtain in an individual basis with other regulators.

Based on these studies, Ponce (2010) presents a formal model to derive the optimal LOLR policy to manage liquidity shortages in individual banks.[20] This model extends the previous models in several aspects, but the most important innovation relates to a first attempt to model reputation risk and its implications for the optimal allocation of banking supervision, by assuming that all bank regulators (central bank, deposit insurer and bank supervisor) incur in political costs. These are of different magnitude regarding the type of regulator and are incorporated in the utility function of each regulator.

Under the assumption that information is symmetric (i.e. both the liquidity shortfall and the solvency signal are verifiable), the main finding is that, for small liquidity shortfalls, the central bank should be the lender of last resort (as in Repullo (2000)), whereas for large shortfalls the illiquid bank should always be supported. This leads to an optimal institutional arrangement of the regulatory system, in which the optimal lender of last resort policy can be implemented when a central bank that is responsible for the LOLR role, a deposit insurer that guarantees the central bank's last resort loans that exceed a certain solvency threshold, and a supervisory agency that implements corrective actions that are triggered by the provision of the last resort loans.[21] These results do not change even if the deposit insurance premium is positive or banks have capital different from zero.[22]

Under information asymmetry, results are largely the same as in Khan & Santos (2005). Assuming that the central bank is the LOLR and the depositor insurer is the bank supervisor (i.e. it gathers information about the bank's solvency), it is shown that for certain solvency levels the deposit insurer will prefer to omit such information to the central bank. In this situation, the central bank has to have supervisory powers in order to perform his role effectively.

In summary, the models present different conclusions regarding the optimal institutional regime. On the one hand, Repullo (2000) and Ponce (2010) suggest that the central bank shall have supervisory powers, since it performs the LOLR role more ef-

[20] Other innovations regarding the previous literature relates to i) the incentives of the bank supervisor, who prefer to financially assist illiquid banks in order to avert the political costs of bank failures; ii) the policy instruments of the bank supervisor, which are "a series of triggers to increase the efficiency of banking regulation", instead of the authority to close the bank; or iii) the role also played by bankers in determining the magnitude of their banks' liquidity problems, as opposite to the other papers, that assume that bankers are passive agents.

[21] According to the author, there are two reasons that justify the use of deposit insurers as guarantors: the money of taxpayers is not used and it increases transparency, since deposit insurance schemes are mainly funded by the banking sector.

[22] However, the results change slightly when it is assumed that corrective actions are costly. In this case, the results depend on the magnitude of the cost and liquidity shortages.

fectively when liquidity shocks are small. On the other hand, Khan & Santos (2005) argue that, under the hypothesis of information symmetry, the optimal institutional arrangement is one that assures deposit insurer should have supervisory responsibilities, whereas the central bank should perform the LOLR role. This type of institutional mandate would ensure, according to the model, an efficient allocation of bank resources and reduce excessive forbearance. By introducing information asymmetry in the model, Khan & Santos (2005) show as well that information sharing may depend on regulator's objectives and incentives. In particular, Ponce (2010) shows that, for certain solvency levels, the deposit insurer will prefer to omit such information to the central bank, justifying the allocation of supervisory functions at the central bank to be able to perform his role effectively.

Overall, results underscore that when it is assumed that regulators have distinct objective functions, the analysis of the incentives underlying their actions has to be carefully considered when designing an optimal institutional arrangement of banking regulation and supervision. This literature could be further extended to assess the implications for the optimal institutional arrangements of banking supervision of considering its interplay with the monetary policymaker.

In what regards the macroeconomic approach of the interplay between monetary policy and banking regulation and supervision, the study by Seater (2000) is one of the first to model this relationship and, particularly, the optimal structure of the institutional arrangement for both policies. Based on a IS-LM model with rational expectations, a financial service provided by the banking system is introduced, i.e. bank monitoring of its borrowers, and by affecting the productivity of the output sector of the economy, it provides a link between real economic activity and the financial sector. Another innovation is the introduction of a bank regulatory requirement, such as a reserve requirement or minimum bank capital ratio requirement, imposed by a banking regulator to the banking system. Results suggest that "*optimal regulatory and monetary policy should be simultaneously chosen, implying that the institutions responsible for them must at least coordinate their activities and perhaps even should be combined into one agency*".

Cecchetti & Li (2008) provide an insightful contribution to this literature, by developing a model through which the conflicts that arise from diverse policy objectives of monetary policymakers and banking regulators are analysed. The model extends the Blum and Hellwig (1995) banking sector framework to include a central bank and derive an optimal monetary policy rule, in which the potential procyclicality of capital requirements is incorporated. The central bank and the banking regulator are separate authorities and the game between the two is modelled by assuming that the central bank

moves first and it is followed by the banking regulator, since monetary policy is usually conducted on a daily basis, whereas banking regulation change slowly.

Results show that the central bank should respond to the banking system's balance sheet in order to neutralize the procyclical effect of prudential capital regulation. Thus, in a situation of financial distress and economic downturn, the optimal monetary policy stance should decrease interest rates more aggressively when the banking system is capital constrained, counteracting the procyclicality of capital regulation and, simultaneously, stabilising the aggregate economic activity.[23] In summary, the authors show that capital regulation requires adjustments by monetary authorities, but they are not an obstacle to the effective conduct of monetary policy. Hence, the conflict of interest between both policy's objectives can be overcome in a game where the central bank reaction depends on whether the banking system is capital constrained.

Cecchetti & Kohler (2012) extend the Cecchetti & Li (2008) methodology to assess the interaction of the monetary policy and banking regulation instruments - in particular, to investigate whether interest rates and capital requirements may be substitutes in stabilising the economy. They find that the instruments are full substitutes for achieving a standard monetary policy goal of output and price stability, due to their similarities regarding the transmission mechanism. The authors also show that introducing a financial stability goal impacts on the substitutability between interest rates and capital requirements. Coordination is, in this case, suggested to achieve full substitutability, but the type of coordination also matters. The authors refer to the situation in which partial coordination is assumed (where the authority in charge of financial stability moves first). In this case, the worse outcomes may be attained, given that the policymakers do not take each other's reactions into their optimisation problem.

Walque et al. (2010) develop a Real Business Cycle model with a heterogeneous banking sector (banks of two types: merchant and deposit banks) with endogenous default probabilities for both firms and banks and banking regulation and monetary policy.[24] Given the Real Business Cycle nature of the model, monetary policy is expressed in terms of liquidity injections into the interbank market, which are represented by a supply of commodities. The aim is to understand the interconnections between the banking sector and the rest of the economy, together with the role of supervisory and monetary authorities in restoring financial stability. In the optimal monetary policy exercise, the central bank follows two separate objectives, output stability and financial stability (by

[23] Cecchetti & Li (2008) show that, from 1989 to 2000, the Fed has optimally decreased the federal funds rate in response to a higher leverage ratio, that was embedded in its reaction function to capture greater banking system distress under capital regulation.

[24] The banking sector follows the model by Goodhart et al. (2006).

minimising bank default fluctuations), and it takes capital regulation as given. The banking sector is constrained by both Basel I and Basel II capital requirements. Results show that, under capital regulation, monetary policy increases the volatility of the financial sector. As explained by Walque et al. (2010), this occurs because liquidity injections "*imply an artificially low interbank rate and hence an artificially high bank repayment rate*".

Angeloni & Faia (2013) introduce banks in a standard DSGE model with nominal rigidities to "*analyse the role of banks in transmitting shocks to the economy, the effect of monetary policy when banks are fragile and the way monetary policy and bank capital regulation can be conducted as a coherent whole*".[25] In this model, the banking regulator aims at reducing banks' risk, considered high under a unregulated regime, by setting minimum capital requirements, imposed by a penalty on non-compliance. The minimum capital requirement is represented by a time-contingent ratio between the required banking capital and the total bank loan exposure, that, depending on some assumptions, mimics i) the fixed capital ratio under Basel I, ii) the minimum capital requirement implied by the internal ratings (IRB) approach of Basel II, and iii) the anti-cyclical capital requirements under Basel III.[26] Monetary policy is incorporated in the model through a Taylor Rule's objective function, that is extended by including two alternative terms representing a systematic reaction on financial market conditions, in the form of a response to asset prices or to changes in the deposit ratio. The interaction of monetary policy and banking regulation is performed under four capital regimes (the Basel I, Basel II and Basel III capital regimes, plus a free capital regime) and under six different combinations of monetary policy rules.[27]

Results suggest that an expansion of monetary policy increase bank leverage and risk. Secondly, pro-cyclical capital requirements, similar to those under Basel II, enlarge the reaction of output and inflation to other shocks, increasing the volatility of inflation and output and reducing welfare. In turn, anti-cyclical bank capital ratios (Basel III) have the opposite effect. Findings are thus indicative of, while Basel II procyclicality may lead to potential conflicting outcomes with monetary policy, the adoption of Basel III capital regime (in which macroprudential instruments are envisaged) may provide a hand to monetary policy. Moreover, in what regards the measurement of performance

[25] The banking sector is based on the Diamond and Rajan (2000, 2001) model.

[26] In case of non-compliance, the model assumes that "*the regulator adjusts the return to bank capitalists downward, to replicate the return to outside investors (depositors and capitalists) that, in an unregulated regime, would prevail under a bank run*".

[27] The performance of alternative policy combinations is assessed by three criteria, namely household welfare, output volatility and inflation volatility.

of alternative policies, the authors conclude that the optimal combination includes a mildly anti-cyclical capital requirement (Basel III) and a monetary policy that reacts aggressively to inflation and reacts systematically to asset prices or to bank leverage.

Overall, these papers show that capital regulation has an impact on the level of output and increase business cycle fluctuations. In addition, the capital requirements' procyclical effects in the economy are supported by this literature, mainly when the focus is on Basel II capital adequacy requirements. Lastly, capital regulation requires adjustments of the monetary policy, but there are circumstances where they are not an obstacle to the effective conduct of monetary policy. For example, as suggested by Angeloni & Faia (2013), an optimal policy could be one that combines the anti-cyclical capital requirement and a monetary policy that responds to inflation and financial imbalances.

5 Challenges posed by a macroprudential regulation approach to the institutional arrangements of monetary policy

The recent crisis not only has revived the debate with respect to the role of the central bank in banking supervision, but also highlighted the need for a macroeconomic dimension of traditional regulatory and prudential framework. As Blanchard et al. (2010) pointed out, financial regulation has played a key role in the crisis, by contributing to amplify the effects that converted the US housing bubble into a major world economic crisis. The financial regulation framework, by being characterised by a limited perimeter of action, encouraged banks to create off-balance-sheet entities to avoid some prudential rules and increase leverage ('shadow banking'). Moreover, mark-to-market rules, together with constant capital ratios, forced financial institutions to reduce their balance-sheets, aggravating asset fire sales, and deleveraging.

The crisis has also shown the lack of effective mechanisms to deal with systemic risk, stemming, for example, from systemically important institutions. The Fund (2011)) argues that this occurred because of an underlap issue in the financial supervisory architecture: neither macroeconomic policymakers nor prudential regulators were responsible for promoting the stability of the financial system as a whole. In particular, monetary policy was apparently insufficient to deal with credit and asset-price booms without inducing adverse collateral effects on economic activity Bean et al. (2010).

In the pre-crisis period, banking regulation and supervision was predominantly micro-

oriented, in the sense that aimed at *preventing the costly failure of individual financial institutions* Hanson et al. (2010), and was concerned with the protection of the consumers (depositors and investors). Macroprudential policy, on the other hand, is a regulatory approach that "*recognises the importance of general equilibrium effects, and seeks to safeguard the financial system as a whole*", as argued by Hanson et al. (2010).[28] In this crisis context, macroprudential policy has hence been highlighted as having a potentially significant role in addressing system-wide risks and promoting financial stability.[29]

In the aftermath of the crisis, a reform of the international regulatory framework is being implemented to encompass a macroprudential oversight of systemic risk, among other things. The ongoing debate among scholars and institutional authorities focuses on the role of macroprudential policy and how it should relate to other macroeconomic policies, particularly monetary policy and microprudential policy.[30]

Among other questions that are being discussed, the introduction of a macroprudential approach to the financial system brings new challenges for the financial supervisory architecture and, in particular, for the institutional mandates of monetary policy, including how policy coordination should be put in place.

5.1 Objectives and Instruments of Macroprudential Policy

Although macroprudential policy generic goal is to promote financial stability, there is not a single definition of financial stability, as Galati & Moessner (2012) argue.[31] In the literature, financial stability could be referred to as the robustness of the financial system

[28]There is an old debate on whether monetary policy should react to expected inflation only or to asset prices as well. For instance, Taylor (2010) considers that there is no need for "new policy instruments, such as discretionary countercyclical capital buffers, to ward off financial crises in the future". He argues that "the motivation for using such instruments is lacking. (...) If one believes that low policy rates were only a "modest" factor in the boom, then one is drawn to these alternatives".

[29]According to Galati & Moessner (2012), the term "macroprudential" firstly appeared in the late 1970's in unpublished documents prepared by the Cooke Committee, the precursor of the present Basel Committee on Banking Supervision, and in a document of the Bank of England.

[30]Bank of England, European Central Bank, International Monetary Fund, G-20, Bank for International Settlements, among others.

[31]In what regards macroprudential policy specific goals, the literature is fruitful in definitions as surveyed by Galati & Moessner (2012):

- Countervailing force to the natural decline in measured risks in a boom and the subsequent rise in measured risks in the subsequent bust;
- Avoiding bubbles;
- Limiting the risk of episodes of system-wide distress that have significant macroeconomic costs;
- Reducing systemic risk by explicitly addressing the interlinkages between, and common exposures of, all financial institutions, and the procyclicality of the financial system;
- To discourage individual bank strategies which cause systemic risk, a negative externality on the financial system;
- Controlling the social costs of a generalized reduction of assets in the financial system.

to external shocks or can be interpreted as the resilience to shocks originated within the financial system (endogenous nature of financial distress). Overall, macroprudential policy aims at limiting the risks and costs of systemic crises, thereby promoting financial stability. Macroprudential policy is, therefore, intimately related with the concept of systemic risk and its sources, but there is no consensus definition for systemic risk, as surveyed by Galati & Moessner (2012). Systemic risk can be defined as a risk of experiencing systemic events where institutions affected in the second stage or later fail as a consequence of the initial shock, even though they have been fundamentally solvent before the shock. In alternative, systemic risk is seen as propagation risk, when shocks disseminate beyond their direct economic impact, resulting in diffused distress and disruption of the real economy. The endogenous nature of systemic risk is also emphasized, by suggesting that systemic risk results from exposures to the evolution of systematic risk through time, which is intimately linked to the business cycle.

Since systemic risk has different sources, the literature offers a wide variety of potential instruments that can be used to mitigate systemic risk and prompt financial stability. The most popular is regulatory capital, such as capital surcharges for systemically important institutions, increasing regulatory capital requirements for particular exposure types or time-varying capital requirements. Funding liquidity requirements are also an alternative instrument, for instance, cyclically-dependent funding liquidity requirements or concentration limits, as well as collateral arrangements, such as time-varying loan-to-value (LTV) ratios. Risk concentration limits, quantitative limits to growth of individual types of exposures and profit distribution restrictions are other examples that could be included in the macroprudential toolkit.

As an example of how a macroprudential tool could work, let us describe time-varying capital requirements. This instrument requires banks to keep higher solvency ratios in the upswing of the business cycle (good times) than in the downturn (bad times), with the purpose of reducing balance-sheet shrinkage, due to credit crunches and fire-sales. Under such a rule, banks can release their capital buffers when an adverse shock hits the economy and, as a result, the pressure to reduce assets or increase capital would decrease in bad times. In bad times, the markets can be more demanding than regulators *vis-a-vis* bank capital ratios, given a rise in the assets risks. Thus, in good times, the time-varying capital requirements should be significantly above the market-imposed standards in bad times.

Financial stability is a primary goal of macroprudential policy, but it could also be fostered by alternative policies. In particular, monetary policy is also concerned with financial imbalances, due to the fact that financial stability is crucial to achieve stability

of prices. Therefore, monetary and macroprudential policies are interconnected, because they share the same concerns in what regards the stability of the financial system, but while for macroprudential policy it can be interpreted as an end in itself, for monetary policy it can be viewed as a mean to achieve price stability. Against this background, the advantages and disadvantages of combining monetary policy with macroprudential policy are surveyed in the next section.

5.2 Institutional arrangements of macroprudential and monetary policies

The mechanism of governance, accountability, transparency and coordination of macroprudential policy with other public policies that also aim at preserving financial stability are central features that should be addressed when designing the institutional architecture of macroprudential policy.

In this section, we focus our analysis on the interplay with monetary policy. Benes et al. (2014) enumerates some basic distinctions of macroprudential policy analysis and traditional monetary policy analysis. First, monetary policy is conducted over regular business cycles, whereas macroprudential policy functions with macro-financial cycles that are longer and more asymmetric. Second, monetary policy analysis is based on the assessment of risks, which generally follows a normal pattern. Macroprudential policy, in turn, deals with tail risks, i.e., plausible yet very unlikely scenarios. Third, monetary policy analysis is based on flow variables and prices, while macroprudential policy analysis is focused on balance sheets, stock-flow relationships and aggregate risk. Fourth, monetary policy in normal times can be modelled as a linear-quadratic optimal control problem. In turn, macroprudential policy should be addressed as a highly nonlinear robust control problem. Fifth, macroprudential policy deals with much more uncertain events than monetary policy, which is characterised by stable trade-offs that can be, most of the times, empirically quantifiable by the use of standard empirical methods. Hence, given the nonlinearities arising when the economy is subject to large distress, macroprudential policy analysis must rely much more on judgement and simulation-based validation than in empirical methods.

In practice, there are different macroprudential policy institutional models that can be grouped in the following types, according to the Fund (2011):[32] i) *a model where a specific institution is given a macroprudential mandate*; ii) *a model where a single institution is tasked with carrying out macroprudential policy (...), but the decisions are*

[32]Recent examples from a International Monetary Fund survey include European Union, Malaysia, Mexico, United Kingdom and United States.

taken by some attached policy committee; and *a model where an independent committee or council fulfills the role of macroprudential authority.*

Considering these challenges, the literature provides both arguments for and against a separate institutional regime, although they are not as systematised as the ones we find related to the traditional view of banking regulation and supervision (microprudential policy), due to the novelty of the topic. The arguments for and against a central bank role in macroprudential policy are organised using the same classification approach as for microprudential regulation.

5.2.1 Arguments against separation of macroprudential and monetary policies

- 'Information Gains' argument

There are informational advantages to both monetary and macroprudential policies, that arise from the complementarity of functions (price and financial stability, respectively) (Fund (2011)). Traditionally, central banks have been enrolled on surveillance of financial stability and in the analysis of systemic risks, given their role as LOLR, monetary authority and payment systems superintendence. On the one hand, the macroprudential policy may be interested in the financial stability risks associated with a given monetary policy mindset in formulating its polices. On the other hand, monetary policymakers may want to be informed of action or inaction of macroprudential authority when calibrating monetary policy. Moreover, Borio (2011) highlights that central banks have a comparative advantage due to their knowledge about the functioning of financial markets and the macro-economy, which justifies their leading role as macroprudential policymakers. In addition, Brunnermeier et al. (2009) acknowledge the critical importance for central banks of having information about large systemically important financial institutions.

- 'Qualified Staff' argument

The Fund (2011) particularly enhances the advantage related to the accumulated expertise of the central banks and argues that it could be used to ensure effectiveness of macroprudential policy. For instance, the central banks have expertise in the analysis of systemic risks and in monitoring financial markets and aggregate and sectoral developments, given his role in monetary policy and payment systems. In addition, expertise related to his role as a lender of last resort is also important for the definition of

macroprudential policy measures that aim to reduce the likelihood of individual failures. Another example concerns the analytical skills of central bank staff that can be used to clarify the benefits and costs of macroprudential policies.

Furthermore, the central bank has a strong interest in ensuring the effectiveness of macroprudential policy. Otherwise, the costs of a failure of macroprudential policy will be borne by the central bank, namely by leaning-against-the-wind operations, comprising the main goal of price stability, or by cleaning, providing liquidity ex post. For this reason, the central banking expertise should be seized to help the design of macroprudential policy, having in mind the ultimate goal of effectiveness.

- 'Independence and funding' argument

Taking into account that macroprudential policy measures may be unpopular mainly when adopted countercyclically, the operational independency of central banks may be a crucial factor in the design of this responsibility (McPhilemy (2016)). Countercyclical macroprudential policies have an impact on the capital and liquidity levels throughout the financial cycle, which may pose higher lending costs and thereby limit the access to credit by certain institutional sectors, that may lobby against those measures. The allocation of macroprudential policy to an independent authority is a way of mitigating the inaction bias issue.

5.2.2 Arguments for separation of macroprudential and monetary policies

- 'Conflict of Interest' argument

The price stability is the primary goal of monetary policy and financial stability objectives must have a secondary role. In other words, changes in monetary policy, such as changes in interest rates, should not be recommended by the macroprudential authority, because they can conflict with the principal monetary policy goal and jeopardize the monetary policy independence (Fund (2011)). Nonetheless, it is important to promote the mutual internalization of policy action in order to lead to an optimal policy mix.

Blanchard et al. (2010) also recognises that conflicts may occur, leading to a more flexible mandate on inflation, since increases in interest rates may have an adverse effect on bank balance sheets. However, these authors consider that this disadvantage can be overcome by reinforcing transparency.

Beau et al. (2014) consider that the conflict of interest outcome will depend on the type and dissemination of supply and demand imbalances across the financial system

Table 1: Conflicting outcomes of monetary and macroprudential policies

	Inflation above target	**Inflation close to target**	**Inflation below target**
Financial exuberance	Independent	Independent	Independent
Financial deflation	Conflicting	Independent	Complementary

Author's adaption from Beau et al. (2014).

and the real economy. They present the following example. Consider a situation characterised by an asset bubble and by downside risks to price stability. In this case, macroprudential policy would limit credit and liquidity growth, but such stance could have adverse effects in aggregate activity and could increase downside risks to price stability. If the prices fall as a consequence of macroprudential policy, than that may require the intervention of the central bank, by further lessening the monetary policy stance. Therefore, the necessary measures to control financial stability would have a negative impact on price stability, resulting in a conflicting outcome.

In turn, an expansionary monetary policy can also impact adversely on financial stability. Lower interest rates can create incentives for banks and other financial agents to take more risk, when they operate in an environment featuring asymmetric information and limited responsibility.

Under different economic circumstances the outcomes on financial and price stability of both policies could be complementary, independent or conflicting **?**. Table 1 presents the circumstances where the conflicts between both policies could arise:

Therefore, conflicting goals are likely to arise when the economic business cycle is characterised by financial deflation and inflation above the target or by financial exuberance and inflation below the target.

Ueda & Valencia (2014) argue that in the case central banks are in charge of both price and financial stability, a new time-inconsistency problem may arise. Monetary policy may be used to reduce the private sectors real debt burden after a financial shock materializes. The framework accounts for a macroprudential regulation that can only be used to affect flows and not to reduce the stock of debt (i.e. it can only be used preemptively to limit excessive leverage, but has a very limited role ex post to reduce the stock of debt), while monetary policy can be deployed ex ante and ex post, once a financial shock materializes. In this setup, they show that is optimal to separate price

and financial stability objectives, since the central bank, having committed ex ante with a level of inflation that corresponds to the socially optimum, ex post has the incentive to inflate away the economy to decrease the real value of private debt, leading to an inflationary bias.

Based on a simplified version of the model developed by Ueda and Valencia (2014), Smets (2014) demonstrates that an inflation bias arises not only in an institutional setup in which central banks are in charge of both price and financial stability, but also in an institutional framework in which central banks are responsible for leaning-against-the wind monetary policies and when is assumed that the macroprudential regulator moves first, taking monetary policy as given. In this context, the inflation bias is higher than the one resulting from time-inconsistency problems, as argued by Ueda and Valencia (2014).

- 'Reputation Risk' argument

A disadvantage that comes from a single authority for monetary and macroprudential policies is that the institutional regime would be more complex and, therefore, less accountable (Blanchard et al. (2010)) . In these circumstances, there is, again, a need for further transparency.

5.2.3 Discussion on Section 5.2

Despite the arguments in favour of a separate mandate, there is a convergent stance in the literature towards the a model in which central banks play a role in macroprudential policy or, at least, towards a regime that promotes close cooperation between the monetary and the macroprudential authorities.[33]

Blanchard et al. (2010) defend that the *macro institution will be the national central bank and the micro institutions(s) will be one, or more, Financial Services Supervisory institutions*. They enumerate three reasons by which the central bank must conduct macroprudential policy. Firstly, central banks monitor macroeconomic developments, so they can use this expertise to analyse financial trends. Moreover, the combination of both functions into a single agency would avoid problems of coordinating the actions of separate agencies during a crisis. Finally, monetary policy decisions have potential implications for leverage and risk taking, which are areas concerning macroprudential policy. Against this background, the authors consider that the decision for a unified,

[33]Brunnermeier et al. (2009), de Larosiere Group (2009), Blanchard et al. (2010), Garicano & Lastra (2010), and the Fund (2011).

single peak, approach in the United Kingdom was wrong and clearly recommend *a reversion to the prior twin-peaks approach, with one peak being the macro, systemic, economic Central Bank, and the other being the micro, individual prudential (...), legal and accounting FSA.*

Garicano & Lastra (2010) argue that macroprudential measures should be allocated to the central bank, because this institutional arrangement *makes it possible to capture the main synergies while avoiding most of the organizational costs.* In particular, the authors advocate that the multitasking, informational economies of scope and 'reputation risks' apply typically to microprudential policy, as well as the 'conflict of interests' arise from the connections of that function and monetary policy. In turn, the role of lender of last resort is a function that is more related with macroprudential supervision. For these reasons, the authors support an institutional regime featuring the combination of macroprudential supervision tasks with central banking, but leaving microprudential responsibilities outside the scope of central banks, since this framework seems to provide relevant benefits while avoiding the main 'organizational costs' associated to microprudential regulation.

Blinder (2010), in his analysis of the U.S. context, has the view that the macroprudential policy and the supervision of systemically important financial institutions should be assigned to the Fed, while the supervision and regulation of small institutions could be allocated to a separate institution, since it lacks economies of scope compared to the other functions. The reasons are: i) the separation of functions neglects the strong economies of scope between financial stability and monetary policy; ii) the role of lender of last resort is an important instrument to pursue financial stability, iii) a single agency responsible for financial stability is more accountable than a committee. Mishkin (2011) also agrees with the view that a systemic (macroprudential) regulator should exist and that it should be allocated to central banks, due to coordination advantages between monetary policy and macroprudential regulation. In particular, Mishkin (2011) considers that macroprudential policies are mainly useful to control the development of credit bubbles (and not asset price bubbles in general).

In turn, Fund (2011) concludes that there are advantages and disadvantages of specific institutional mandates for the macroprudential policymaking and, thus, these issues requires further analysis, particularly focusing on the interplay of macroprudential and monetary policies. The interlinkages between both policies are surveyed in the following section. Nevertheless, later in a policy paper of 2013, Fund (2013) suggests three institutional models for macroprudential policymaking and in all them central banks have the key role in designing and implementing macroprudential policy.

On the other hand, Smets (2014) propose an institutional setup that would provide for a clear separation of monetary and macroprudential objectives, instruments and communication strategy, with the aim of assuring the accountability of the policy maker in attaining each policy goal (and reducing contagion from failure from one policy dimension to the other), at the same time it benefits from the share of information and expertise. According to his view, this would be achieved with the combination of policies under the central bank, as along as financial stability remains a secondary objective of monetary policy and also a goal of macroprudential regulation.

5.3 The interactions of macroprudential and monetary policies

A main topic in the design of an effective institutional mandate for macroprudential policy is how it interacts with monetary policy, since both promote macroeconomic stability and affect real macroeconomic variables. The key questions we find in the literature are the following (Galati & Moessner (2012), Smets (2014) and of England (2015):

- How macroprudential policy tools should be set in conjunction with monetary policy?
- Should the same institution (i.e. the central bank) set the two policy instruments to achieve both price and financial stability?
- Or should each instrument be designed to deal with each policy objective?
- Are there any gains from coordinating monetary policy and macroprudential policy?
- Attending to the fact that both policies are likely to affect aggregate demand and supply and conditions in the banking sector, is it possible that they are in effect perfect substitutes?
- Or, if they are sufficiently independent and the instruments are set by different policymakers, would there be the case for a "push-me, pull-you" effect?
- How effective is macroprudential policy in maintaining financial stability?
- What is the effect of monetary policy on risk taking and financial stability?
- What is the risk of financial dominance, i.e., the risk that financial stability considerations undermine the credibility of the central banks price stability mandate?

As this is a very recent topic in the literature, the answers to this questions are scarce. According to Galati & Moessner (2012), the interaction between these policies depends on whether financial imbalances play a role in the monetary policy framework and they also argue that the challenge of combining both policies is similar, to some extent, to the challenge of coordinating monetary policy and fiscal policy. As for the case of the monetary policy and fiscal policy game, the authors suggest that the problem may be addressed by monetary policy taking macroprudential policy as given when setting short-term interest rates since the frequency of macroprudential policy decisions is likely to be lower than of monetary policy decisions. Beau et al. (2014) argue that macroprudential policies may alter the monetary policy transmission mechanism, because the former will act via the same channels as monetary policy, in particular the bank lending and the balance-sheet channels, as already discussed above. To the extent that spillovers may arise, fully optimal policy calls for at least some sort of coordination between these two policies.

A number of papers offer preliminary insights and suggest different ways of combining the macroprudential tool with the monetary policy instrument. **?** address these questions by adapting a New-Keynesian model from Carlstrom et al. (2010). This microfounded macroeconomic model features an agency problem, that gives rise to credit constraints and a 'risk premium' that depends on the degree of the credit constraints. The macroprudential instrument is a time-varying leverage ratio. The interaction between monetary and macroprudential policies is analysed in a cooperative solution under commitment and under discretion, in one hand, and in a Nash-equilibrium and a leadership equilibrium games, on the other hand. Findings suggest that, under a cost-push shock, welfare is improved if policy authorities coordinate and commit to a specific policy stance. In the case macroprudential policy and monetary policy do not cooperate and act under discretion, assigning a conservative policy mandate to both institutions improves welfare. In particular, the assignment of a leadership role to the macroprudential authority is also welfare beneficial. Finally, authors show that selecting a macroprudential instrument that resembles closely a monetary tool can cause costly coordination issues.

Bean et al. (2010) extend a New-Keynesian DSGE model to incorporate both physical capital and a simple banking sector, in order to analyse how the macroprudential policy tools might impact on the conduct of monetary policy.[34] As a macroprudential policy instrument, it was selected a (lump-sum) levy / subsidy on the banking sector, which is used to influence the amount of bank's capital that is carried forward. First, they analyse

[34]The authors adapt the model from Gertler & Karadi (2011).

the conduct of monetary policy and macroprudential policy when a single policymaker is in charge of both functions. Then, they compare the outcomes with the ones resulting from a distinct arrangement, in which macroprudential policy is delegated to a different agency. The results suggest that the possibility of a "push-me, pull-you" outcome arise under a mark-up shock, since macroprudential policy moves to maintain bank capital, ignoring the impact on the inflation gap and, in turn, monetary policy raises the policy rate more aggressively to contain inflation, not taking into account the capital gap. In this case, conflicting outcomes arise, suggesting that both policies should be coordinated.

Angelini et al. (2014) develop a dynamic general equilibrium model with a banking sector following Gerali et al. (2010) to analyse the interactions of the macroprudential policy and monetary policy in order to determine if they can cooperate to stabilise the economy. In this model, macroprudential policy is concerned with "excessive" lending and cyclical fluctuations of the economy. Therefore, the macroprudential policy authority minimises a loss function whose elements are variances of the loans-to-output ratio and of the output. The two instruments suggested are a capital requirement and a loan-to-value ratio (LTV). Based on this analytical framework, the interplay between macroprudential and monetary policies is modeled in two difference contexts. One is the cooperative context, where both policies jointly and simultaneously set the parameters of their respective policy rules to minimise the weighted average of their two objective functions. The other is the non-cooperative context where each authority minimises its loss function taking the policy rule of the other as given. Their findings suggest that the gains from cooperation are small in the context of a technology shock. In normal times, the contribution to macroeconomic stability of macroprudential policy is negligible. However, in the non-cooperative case, conflicts may arise, due to the macroprudential policy authority's incentive to stabilise the loans-to-output ratio, neglecting the impact of its behaviour on the objectives of the monetary authority. In particular, macroprudential policy becomes procyclical and monetary policy countercyclical. In this situation, it is also observed a substantial increase in the variability of the policy instruments. In the presence of financial and housing market shocks, advantages of macroprudential policy become sizeable. In the cooperative game, the central bank deviates from strict adherence to its objectives to help macroprudential policy achieving its goals. Hence, when the economy is hit by sector shocks, it is possible to observe a higher inflation volatility.

Mendicino & Punzi (2014), for example, develop a two-country model with two large economies, in which collateralised debt and heterogenous households are featured, with the purpose of evaluating the role of monetary and macroprudential policies in mitigating procyclical movements originated by the interlinkages between current account deficits

and financial vulnerabilities. They find that countercyclical LTV rules that react to house prices variables coupled with an interest-rate policy rule that respond to credit is an optimal policy intervention to deal with external shocks that cause current account deficits and imbalances in financial variables.

Using a dynamic stochastic general equilibrium (DSGE) model with housing, Prakash et al. (2012) paper shows that strong monetary reactions to accelerator mechanisms that push up credit growth and house prices can help macroeconomic stability. In addition, using a macroprudential instrument specifically designed to dampen credit market cycles would also provide stabilization benefits when an economy faces financial sector or housing demand shocks. However, the optimal macroprudential rule under productivity shocks is to not intervene. Therefore, it is crucial to understand the source of house price booms for the design of monetary and macroprudential policy.

Based on a New Keynesian framework that includes a banking system and financial frictions, Lima & Levine (2015) find that the deployment of macroprudential regulation together with standard monetary policy improves social welfare, regardless of the financial target used and the type of policy mandate under assessment (separate or unified). The welfare maximization is achieved under a partially unified mandate featuring a macroprudential rule reacting simultaneously to credit and credit spreads. Inflation stabilization is better accomplished in a separate mandate, with a standard Taylor rule and a macroprudential rule responding to credit and spreads. Despite showing macroprudential regulation improves welfare in every policy mandate considered in the analysis, their findings do not provide a definite answer in terms of the institutional mandates of monetary and macroprudential policies. A separate policy regime seems to perform also well in what welfare improvement is concerned, although this finding is not fully aligned with the consensus among policy makers and academics towards the joining of macroprudential regulation and monetary policy under a same authority.

In brief, this recent literature offers different ways of setting up macroprudential policy together with monetary policy, exploring not only the distinct sources of financial frictions and macroprudential instruments, but also the possible institutional arrangements that can be set. Overall, findings suggest that these policies are not perfect substitutes, thus macroprudential policy may play a role in promoting financial stability, even though the magnitude of the gains of employing this type of policy depends on the type of shock that impacts the economy. Furthermore, the papers suggest that there are gains from coordination of policies, because when the instruments are set separately by different institutions, a "push-me, pull-you" effect is likely to arise, under special economic situations. Thus, the "conflict of interest" argument seems to have some support

in analytical frameworks.

Smets (2014) argues that macroprudential policies can reduce the probability of systemic crisis, by curbing the financial cycle and by reinforcing financial system's resilience, reduce the probability of systemic crisis. Consequently, it can reduce the probability that monetary policy becomes constrained by the zero lower bound. However, there are limits to the capacity of macroprudential policies to restrain the tradeoffs of monetary policy. As Taylor (2010) points out, the stylised nature of this kind of models *illustrate how far we are from a monetary framework to evaluate such policies.*

6 Concluding remarks

This survey clearly shows that the occurrence of the global financial crisis and the subsequent explicit introduction of financial stability policy in the macroeconomic policies set irreversibly changed the debate regarding the institutional arrangements of monetary policy and banking regulation. In the aftermath of the global financial crisis, we have witnessed a change in the taxonomy used to refer to banking regulation and supervision to a more general concept of prudential regulation, comprising both macroprudential and microprudential approaches. This clear distinction between the macro and the micro prudential purposes of banking regulation and supervision brought a new view in the discussion of the design of monetary and financial supervisory architecture, that, although far from being settled, in certain dimensions there is a more consensual understanding of what the role of central banks should be on these grounds.

In addition, this review finds that nowadays there is a common view that central banks should have an explicit financial stability mandate, by playing a role in macroprudential policy, but the microprudential dimension of banking regulation and supervision should be assigned to an independent authority. This view is raised upon the stronger similarities between monetary and macroprudential policies, as underpinned above, and the allocation of financial stability objectives would take the most of the synergies arising from the interaction of the two policies (Smets (2014)). Nonetheless, this survey also highlights the need for empirical and theoretical evidence, which is still scarce, suggesting that this view is not yet informed by empirical and theoretical analysis, but mostly by personal opinions of researchers and policymakers.

Furthermore, this review also clearly highlights that these are factors other than economic ones, that may play a role in the design of policy mandates. As defended by a political-economy approach of this subject, the design of a model of financial regulation and supervision may be a result of political preferences, which may be also influenced

by the financial supervisory architecture already in place.

As Smets (2014) clearly puts it, the design of optimal institutional setups of monetary and macroprudential policies depends on the "*different appreciation of the pervasiveness of this interaction, the effectiveness of independent macroprudential policies, the extent to which monetary policy may be a source of financial instability, and the extent to which monetary policy can avoid being drawn into financial stability concerns—in particular, in times of crisis*". There is not yet a clear answer to all of these aspects and research is therefore needed.

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