Macro prudential governance and central banks: Facts and drivers

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ARTICLE INFO

Article history:
Available online 14 November 2015

JEL Classification:
E58
E63
G18

Keywords:
Macro prudential supervision
Micro prudential supervision
Central bank independence
Monetary policy rules

ABSTRACT

The Great Crisis has highlighted the importance of establishing macro prudential architectures to address problems of financial stability. Central banks are always part of macro prudential settings, but their role is far from being homogeneous across countries, reflecting the fact that according to economic theory there are pros and cons in extending central bank influence to macro prudential supervision. The issue is then genuinely empirical: are there any meaningful drivers explaining the actual choices made by policymakers about the central bank’s role in macro prudential governance?

We identify three potential drivers – micro supervision involvement, monetary policy discretion, overall institutional independence – and test for their relevance, by analysing current institutional settings in 31 advanced and emerging market economies. We find that central bankers already in charge of micro supervision and less politically independent are more likely to get extended macro prudential powers; the same is true, if they have low monetary policy discretion, being constrained by a monetary stability objective. We interpret these results by using a political economy perspective.

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1. Introduction

The Great Crisis has highlighted the need for financial stability. Recent reforms of financial regulation across countries have been motivated by the fact that sole attention to monetary stability and
micro supervision, i.e. the stability of individual institutions and markets, was not enough to guarantee the safeness and soundness of the financial industry. A broader approach, namely, macro prudential policy, i.e. the use of prudential tools to mitigate systemic risk, was deemed to be necessary to ensure the resilience of the financial system as a whole. A macro prudential framework has to address the cross-sectional dimensions which characterize any systemic risk distribution, and consequently different authorities have to be involved in macro governance, including the central bank. In fact in each country the already existing overall micro supervisory architecture can imply the existence of different authorities – at least two – excluding the cases where the central bank is at the same time also the single supervisor. The reform of financial supervision and the establishment of macro prudential regimes has gone hand in hand with various degrees of involvement on the part of central banks. Invariably, central banks have been involved in macro prudential settings, but their role is far from homogeneous across countries.

A central bank can be lightly involved, when the mandate of financial stability is shared by multiple agencies, the central bank just being one of them; the opposite is true when the central bank is the sole reference of the macro prudential mandate. Intermediate settings – when a central bank is coordinator or leading authority among multiple agencies – can occur.

In 2010, the US Congress passed the Dodd–Frank Act. This law created the Financial Stability Oversight Council (FSOC), which includes the Fed as the authority responsible for identifying risks and responding to events that threaten financial stability. In the EU, the European Systemic Risk Board (ESRB) is a new agency, created in the autumn of 2009 with the responsibility for macro prudential policies, where the coordinating actor is the European Central Bank (ECB).

The building up of macro prudential architectures has also characterized single countries within the European Union. In Germany, policymakers passed the Act on Monitoring Financial Stability in 2013 and set up a new macro prudential authority, known as the Financial Stability Committee (FSC), which works in close relation with the Bundesbank. In the UK, a key factor of the latest regulatory reform was the creation of a macro prudential agency within the Bank of England, namely, the Financial Policy Committee (FPC).

How to explain the major role taken by central banks in new macro prudential architectures? To anticipate the results of the review of the literature, from a theoretical point of view, pros and cons are present in extending the central bank influence in macro prudential policies.

Therefore, policymakers have to address a series of possible trade-offs between the expected gains and costs in having the monetary authority as a more or less influential actor in designing macro prudential strategies. The natural question that arises is genuinely empirical: is it possible to identify common drivers explaining political choices concerning central bank involvement in macro prudential governance?

In this paper we implement an econometric cross-section analysis of the determinants of central bank involvement in macro prudential governance, testing for different assumptions suggested by the existing theoretical and institutional literature. Time series analysis, although interesting, would be difficult to implement because most of our variables, such as involvement in macro and micro supervision and monetary goals, are substantially constant, or at least slowly-changing. One more limitation is the short sample.

Our empirical results provide evidence that: (a) central banks acting as micro supervisors of banking industry are more likely to be given deeper macro prudential powers; (b) higher central bank political independence is associated with lower involvement in macro supervision; (c) central banks pursuing specific price stability objectives are more likely to be endowed with macro supervisory responsibilities. We interpret these results by using a political economy perspective.

The present article differs from the existing literature in two main aspects. First of all, while the interaction between the macro prudential and monetary policy has been largely studied – see recently Schoenmaker (2014) and Smets (2014), among others – to the best of our knowledge there is nothing about the drivers of governance arrangements, i.e. which are the factors that can concretely

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1 Following the definition of the International Monetary Fund, the focus is on the concept of systemic risk, i.e. the risk of disruptions to the provision of financial services caused by an impairment of all or parts of the financial system, which can have seriously negative consequences for the real economy.
affect the extent of macro prudential powers being given to central banks. We provide an econometric model to test whether common factors are driving central bank involvement in macro prudential oversight.

At the same time, the study enriches the research area focusing on the effects of statutory Central Bank Independence (CBI). Since its onset (Bade and Parkin, 1977; Cukierman et al., 2002; Grilli et al., 1991), CBI has been considered a major determinant of macroeconomic performance (Alesina and Stella, 2010; Alpanda and Honig, 2010; Carlstrom and Fuerst, 2009; Cukierman, 2008; De Haan et al., 2008; Klomp and De Haan, 2010). More recently, the economic literature has been re-examining the relationship between CBI and the conduct of monetary policy (Alpanda and Honig, 2009; Down, 2008; Maslowska, 2009), the effect of CBI on financial stability (Čihák, 2007; Klomp and De Haan, 2009), inflation (Arnone and Romelli, 2012), and government deficits (Bodea, 2011), the level of central banks’ micro involvement (Dalla Pellegrina et al., 2013), as well as the political, institutional and cultural factors influencing the effectiveness of CBI (Acemoglu et al., 2008; Berggren et al., 2012; Eijffinger and Stadhouder, 2003; Gollwitzer and Quintyn, 2010; Hielscher and Markwardt, 2011; Keefer and Stasavage, 2002, 2003).

We enrich this broad picture by exploring the relationship between CBI and an important institutional feature, namely, macro supervision. Our results suggest that CBI is relevant not only for its beneficial effects on macroeconomic variables, but also influences policymakers’ decisions. In the last two decades the policymakers had increasingly realized the importance of using strategically the central banking design and the role of the central bankers, sometimes as scapegoats (Alesina and Stella, 2010).

We organize the paper as follows. Section 2 briefly presents the literature review, Section 3 delivers the dataset description, while Section 4 shows the empirical analysis and its results. Section 5 concludes.

2. Macro prudential governance and central bank involvement: the state of the art

Macro prudential policy and its relationship with central banking is a topic that has long been studied (Bean, 2011; Bernanke, 2007, 2011; Blanchard et al., 2010; Blinder, 2010; Borio, 2006, 2011; Brunnermeier et al., 2010; Goodhart, 2010; Goodhart and Schoenmaker, 1995; Herring and Carmassi, 2008; Lamfalussy, 2010; Masciandaro, 1995, 2007; Nier, 2009; Nier et al., 2011), in either advanced, emerging (Kawai and Morgan, 2012) or developing economies, as well as in close connection with other government agencies having responsibility for financial stability (Angelini et al., 2012; Gerlach, 2010).

The Great Crisis – which started in 2008, or rather in 2007 depending on the interpretations – re-awakened political and academic interest in macro prudential policies (Angelini et al., 2012; Beau et al., 2012; Kannan et al., 2009; Lambertini et al., 2011; N'Diaye, 2009). Recent literature delivers two main and contrasting results. The key question is: given two policies – monetary policy and macro supervision policy – having two different macro goals, which is the optimal degree of involvement of the monetary agent – i.e. the central bank – in the supervisory responsibilities?

On the one side, the more the central bank gains information advantages, the more its leading role in the definition and implementation of macro supervision can be supported. This position is founded on the fact that in each country the central banker is the liquidity manager and gain information on the health of the banking and financial system in implementing such a role. In fact nowadays the central bank is the unique monetary agent, that is, the agent designated by society to manage liquidity in order to pursue monetary policy goals. Being sources of liquidity, central banks are naturally involved as leaders in preventing and managing systemic banking crisis – in advanced, emerging and developing countries – having as de jure or de facto subordinates other government agencies entrusted with responsibility for financial stability. The central bank’s leading role in macro supervision is also supported by arguments related to the skill advantages, and economies of scale that derive from bringing all functions under the same umbrella. In other words, having the central bank as the leading

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2 Kawai and Morgan (2012).
actor in both policies increases the likelihood that the Tinbergen’s principle – i.e. the consistency between different goals and different tools – is respected.\textsuperscript{5}

On the other side also the opposite could be true, i.e. if the central bank is the leading macro supervisor the risk that the instruments of one policy can be assigned to the wrong objectives arises.\textsuperscript{6} At the same time when the central bank is the main responsible in maintaining financial stability the risk of financial dominance can increase, i.e. the likelihood that financial stability concerns undermine the central bank credibility and effectiveness as monetary authority.\textsuperscript{7}

Furthermore, potential shortcomings can occur if the involved central bank is not the micro supervisor, given that in this case it is more likely that its policy as macro supervisor can produce negative – although unintended – consequences. The intuition is simple: the less the central bank is involved as micro supervisor the less it is likely to be its information on the state of health of the single banking firms and consequently the higher will be the possibility to do mistakes as macro supervisor. At the same time, for the central banker to be a micro supervisor is not completely a free lunch. In fact if the central bank is also a micro supervisor, the risk of capture by banks can be a concern.\textsuperscript{8} Therefore the overall effect of the role of central bank as micro supervisor is theoretically ambiguous and have to be empirically analyzed. Finally and so far, the literature missed to consider the potential role of political drivers that can shape the policymaker’s decisions. If we adopt a political economy perspective in analyzing the building up of a new regulatory institution, it is possible to assume that the policymaker’s actual choices related to the macro prudential governance are conditional on the economic and institutional environment existing at a given time. It in turn determines the political weights placed on the pros and cons of central bank involvement. Recently this assumption has been tested in different studies that endogenized the shape of the financial supervision setting, taking into account the political cost and benefit analysis.\textsuperscript{9} These studies followed the intuition previously highlighted in the central bank independence literature, which discussed the issue of the drivers of the monetary setting suggesting that the political incentives can be a crucial factor in explaining different degree of central bank independence.\textsuperscript{10}

The perspective provided by political economics is based on the hypothesis that gains and losses of a given macro prudential regime – including the role that has to be assigned to the central bank – are variables computed by the incumbent policymaker, who maintains or reforms any institutional setting following his/her own preferences.\textsuperscript{11}

In this case a further driver in triggering the actual role of the central bank in the macro supervisory governance can be represented by the political role of the central bank as an independent authority. A leading role of the central bank as macro supervisor is likely to increase its overall powers, and the politicians can fear to create an overly powerful independent bureaucracy, considering also the fact that it is often claimed that implementation of effective macro supervision action needs constrained discretion.\textsuperscript{12}

Summing up the literature suggests that in selecting the optimal central bank involvement in macro supervision, policymakers are confronted with a trade-off. On the one hand, there are the potential net information gains – which increase if the central bank is also deeply involved in micro

\textsuperscript{5} In the debate on the relationships between monetary and supervisory task the importance of the consistency with respect to the Tinbergen’s Principle is highlighted in Smets (2014).

\textsuperscript{6} The literature confirms the well-known rule: given different objectives, different policy instruments are needed. For instance, price stability and interest rates (monetary policy) vs loan-to-output ratio stability and capital buffers (macro prudential policy). Anyway, a deep analysis of the tools and goals of macro prudential policy goes beyond the scope of this paper. For a comprehensive survey, see Brockmeijer et al. (2011).


\textsuperscript{8} See Boyer and Ponce (2012). On the relationship between financial stability and the central bank’s role in micro supervision, see Koetter et al. (2014).


\textsuperscript{11} Alesina and Tabellini (2004).

\textsuperscript{12} See Tucker (2014).
supervision; on the other hand, risks of capture, policy tool misallocation and of an over-powerful bureaucracy arise.

Economic and econometric analyses evaluating the relative merits in favor and against the central bank being assigned a leading role in macro prudential governance are still few and scattered.\textsuperscript{13}

3. Dataset and variables

The empirical analysis is based on data collected for 31 countries that are heterogeneous in terms of institutional framework and stage of economic development. Table A1 of the Appendix shows the details on data and sources.

In order to shed light on the existence of drivers which influenced the building up of the recent macro prudential settings, first of all we need to transform qualitative information into quantitative variables.

For the supervisory architecture, we use two indicators to measure two key features of the central bank’s role in financial supervision. First, the central bank involvement in macro supervision, our dependent variable; second, the central bank’s role as micro supervisor, which proxies the role of the central bank as the leading authority in micro supervision, as already discussed in Section 2.

To measure central bank involvement in macro supervision, we use the macro prudential index\textsuperscript{14} (MAPP, hereafter), indicating country by country the role of the central bank in the existing macro prudential framework. The index increases with the involvement of central bank in macro prudential policy. To the best of our knowledge, there are no other reliable indicators of the role of the central bank in macro supervision governance. On the other hand, we built the CBBA index\textsuperscript{15} to measure central bank involvement in the micro supervision of the banking industry. This index is a dummy variable which takes the value of one if the central bank is the main banking supervisory authority, and zero otherwise.

On top of that, we build also an index of involvement of central bank micro supervision of the financial system as a whole, i.e. banking, securities and insurance. In doing so, we implement a two-step procedure. We start from the Financial Supervision Herfindahl Hirschman (FSHH) Index. The FSHH is a measure of the level of consolidation of supervisory powers, which we derive by applying to this field the classical index proposed by Herfindahl and Hirschman.\textsuperscript{16}

We use the same methodology to construct the index of central bank involvement in micro supervision: the Central Bank Supervisor Share (CBSS) Index. The intuition is quite simple: central bank involvement in supervision is likely to be at its maximum when the central bank is the unified supervisor in charge, while the involvement is likely to be low the smaller the number of sectors is where the central bank has supervisory responsibilities. In other words we assume that the role and the responsibilities of the central bank as micro supervisor will be greater the larger is the number of sectors he daily knows and monitors.

To construct the CBSS index, we simply take the share of the central bank supervisory power in each country – already calculated to build up the FSHH index – which can range from 0 to 1.\textsuperscript{17} Fig. 1 presents the distribution of central bank involvement as micro supervisor. As a result, we have two alternative indexes to measure the impact of the role of central bank as micro supervisor if the expected sign of both variables is undetermined: higher levels of either the CBBA or the CBSS index are likely to be associated with higher level of the MAPP variable if the information gain effect prevails; the opposite is true if the capture risk effect dominates.

Now, following the discussion in Section 2, we have to measure two potential shortcomings in having a deep central bank involvement in macro supervision: too much bureaucratic independence in the institutional setting and excessive discretion in defining the monetary policy action. In other words,

\textsuperscript{13} See Borio and Shim (2007) and Lim et al. (2013a,b).

\textsuperscript{14} Lim et al. (2013a,b). We normalize the index to facilitate its use.

\textsuperscript{15} Authors’ calculations from “How Countries Supervise their Banks, Insurers and Securities Markets” (2009).

\textsuperscript{16} Hirschman (1964); see Masciandaro and Quintyn (2011). The detailed description of the methodology is in the Appendix.

\textsuperscript{17} This index in Masciandaro and Quintyn (2011) is similar to the one suggested later on in Lim and others (2013a,b).
we are looking for an institutional indicator which proxies central bank independence and a policy indicator, which summarizes the degree of discretion in the conduct of monetary policy.

We borrow a proxy for central bank independence from the rich existing literature on the subject. Acknowledging that *de facto* independence can sometimes lead to a different framework from *de jure* independence – particularly in emerging and developing countries\(^{18}\) – we concentrate our analysis on the legal features of independence. This choice is justified also by the fact that central bank independence cannot be assured without proper legal provisions,\(^{19}\) although we acknowledge that the measurement of institutional characteristics is inevitably linked to some degree of subjectivity. As for the choice of the proper index, among those proposed in the literature,\(^{20}\) to capture either the political or operational dimensions of CBI, we use the GMT Index,\(^{21}\) mainly for its empirical robustness.\(^{22}\)

**Fig. 2** shows the distribution of central bank independence. As GMT has 8 political independence criteria and 7 operational independence criteria, different aspects of central bank independence may have varying and contradictory effects on macro prudential involvement. This is why we divide the GMT index into political and operational subparts (*GMTp* and *GMTo*, respectively). It is noteworthy that the GMT index refers to monetary policy only, i.e. it measures the autonomy of goals and tools in implementing monetary policy and does not refer to independence in other potential tasks.

Given the institutional position of the central bank, every single central banker has the possibility of implementing various kinds of monetary policies. The bottom line – already discussed in Section 2 – is quite clear: higher monetary discretion increases the risks of misusing monetary policy tools in implementing macro prudential policy. We proxy for a central bank’s discretion in selecting its monetary goals. In doing so, we rely on four dummy variables (GOAL1, GOAL2, GOAL3 and GOAL4): (1) price and inflation; (2) M2 control; (3) output; (4) mix or generic goals. The underlying idea is as follows: the first three dummies indicate that the central bank is relatively constrained in pursuing monetary goals, meaning that its possibility to use the monetary policy to address macro prudential issues is

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\(^{18}\) Cukierman (2008).  
\(^{19}\) Bini Smaghi (2008).  
\(^{20}\) For a survey, see Ahsan et al. (2006).  
\(^{21}\) Grilli et al. (1991) set up the index and Arnone et al. (2009) updated.  
\(^{22}\) Maslowska (2008).
likely to be mitigated by those well-defined monetary purposes. In opposition to this, GOAL4 means that the central banker has strong discretionary powers in pursuing monetary goals. According to our discussion, we expect that the first three variables above have a positive effect on MAPP because they can be considered as a limit to the central banker discretion. On the contrary, GOAL4 should have a negative effect.

Finally, we add control variables. In order to control for the usual size effect, variable POP23 measures a country’s population. The scale variable is a standard control variable to check if the relative size of a country matters in explaining a given phenomenon. In this case, there could be a small country effect: a low population density could be associated with few regulatory agencies and/or more difficulty in building up new agencies. The intuition – which has been already used in other studies on the determinants of financial architectures24 – is simple: human capital is a scarce resource, particularly when specific professional skills are needed, as in the case of civil servants operating in the banking and financial industry. Therefore, it could be more likely to find greater central bank involvement in macro supervision, given that each country has at least a central bank, where that kind of human capital is already employed and available.

Moreover, we use three variables to describe the financial system, in order to test if some specific features of the banking and financial industry can trigger the selection of the macro supervisory setting. First, we use bank assets as percentage of GDP25 \( \left( \frac{\text{Bank assets}}{\text{GDP}} \right) \). Here we wish to test if the features of the banking industry – proxied by its dimension – can influence the political decisions in the supervisory design. Second, country’s latitude \( (\text{LAT}) \) is included to control for “endowment effect”26: the recent literature27 stresses the possibility that country structural and endemic features can condition the political decisions on the shape of the financial regulation and supervision. Thirdly, we add the standard variable MVB to control for market-based economy as opposed to bank-based as possible

\[ \text{CB INDEPENDENCE (GMT)} \]

**Fig. 2.** Central banks independence. Source: Grilli et al. (1991) and Arnone et al. (2009). For more details, see Table A1 in the Appendix.

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25 World Bank, Banking Regulation Survey.
26 Given climate conditions, economies closer to the equator are thought to be less hospitable for the development of financial markets. For more details, see Beck et al. (2001).
27 See among others Beck et al. (2001).
key driver in determining the supervisory setting. Then, we take into account the economic development of each country, which is a one more standard control variable. In this perspective, we use two variables: the unemployment level (UN09) and an index of the stage of development (DEVindex).28

Furthermore, given that our above discussion on policymaker preferences is based on the assumption that policymakers are there to help and there are benevolent politicians, we have to control for the presence of dishonest policymakers. In doing so, we use the degree of corruption in the public sector29 (CORRIND); note that higher values imply lower corruption. For more details on variables, see Table A1 in the Appendix.

4. Empirical analysis

Here we detail our empirical results, presenting first the descriptive statistics and then the econometric results.

4.1. Descriptive statistics

Table 1 provides some insight on the dataset. It shows the distribution of 31 countries according to the level of economic development, perceived level of corruption, size of economy, features of the financial sector, geographic location, and unemployment. It also delivers the values taken, respectively, by the indexes for central bank being the macro prudential authority (MAPP), the banking supervisor (CBBA), the financial supervisor as a whole (CBSS), the degree of CBI and its political and operational components (GMT, GMTp and GMTo, respectively). In particular, we first calculate the mean value of the MAPP, CBBA, CBSS, GMT, GMTp and GMTo, and then we compute the percentage of countries having a value above the sample mean; then we make this information interact with the level of other variables in the dataset.

Column (a) helps to sketch the main features of countries whose central banks have a strong role in macro prudential governance; those economies are characterized by a relatively high level of corruption, small populations and a mainly bank-based financial sector. At first sight, it appears that a

28 We follow IMF classification. Out of 31 economies, we have 10 advanced countries and 21 emerging/developing economies.

macro prudential leading role is assigned to central banks mainly in small developing and emerging economies, thus replicating what happens in micro supervision (Columns (b) and (c)).

Central bank involvement in macro supervision seems to be negatively associated with the degree of economic development. In particular, Column (a) shows that in advanced countries central banks are relatively less involved in macro prudential governance. Three different, although not mutually exclusive, explanations emerge. First, central banks of advanced economies may have a relatively scarce involvement in micro supervision, i.e. their information advantages are relatively low. Second, in advanced countries central bank independence is likely to be higher, meaning that the risk of bureaucratic political interference is greater and leads the policymaker to implement lower levels of central banking involvement in macro prudential governance. Thirdly the policymakers in the advanced countries are slowly adopting macro supervisory setting with a higher central bank involvement. Table 1 shows that the first effect seems to occur: central banks of developed economies are relatively less involved in micro supervision (Columns (b) and (c)). However, these descriptive results have weak explanatory power and hold just for our sample period; we need to implement econometric tests.

4.2. Econometric analysis

Our aim is to discover if it is possible to detect the economic and political drivers of central bank involvement in macro prudential governance that we have already presented in Section 2. For each country in the sample, identified by the subscript $i$, the initial equation is as follows:

$$MAPP_i = \alpha + \beta CBSS_i + \gamma GMT_i + \sum_{n=1}^{4} \delta_n GOAL_{ni} + \sum_{m=1}^{M} \theta_m X_m + \epsilon_i \quad (1)$$

As we are investigating the determinants of the choice of assigning macro prudential tasks to central banks, the dependent variable is the $MAPP$ index, which increases with the involvement of central bank in the macro prudential governance. The two key regressors are the index for central bank involvement in micro banking supervision ($CBBA$) and the index for CBI ($GMT$), which captures the bureaucratic power of the central bank. Furthermore we test the role of $GOAL_n$, which is the set of four dummy variables describing the degree of monetary policy discretion available to the central bank in country $i$.32

Control variables $X_m$ include: the set of $M$ standard covariates such as economic development indicators (OECD membership and unemployment rate), financial development indicators (bank assets over GDP, market- vs. bank-based index and latitude), country’s perceived corruption score, which checks for dishonest policymakers, and population. Finally, $\epsilon_i$ is an idiosyncratic normally distributed error term with zero mean and constant variance.

We estimate equation above by using OLS estimators with robust standard errors to fix any potential heteroskedasticity problem.33 In fact we cannot exclude a priori that the variance of the error term is non-constant. Heteroskedasticity may be a problem for more than one economic reason. For example, we cannot exclude that when the policymakers are designing the macro supervisory setting the central bank independence can be a relevant factor depending on the level of central bank independence itself. If this should be the case, some heteroskedasticity may arise. Although heteroskedasticity does not bias our estimates, we prefer to avoid non-constant error term variance, in order to have the best – i.e. minimum variance – among linear unbiased estimators.

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30 Among the advanced countries in our sample, only New Zealand has a central bank involvement in macro prudential supervision greater than the sample average.

31 According to the prevalent literature, the main reason is that in the 1990s most of emerging and developing countries faced deep financial crises that forced central banks to play a fundamental role in regulating the banking industry.

32 Specifically: $n = 1$ is the price with inflation targeting, $n = 2$ is the liquidity control, $n = 3$ is the real economy’s growth, while $n = 4$ is for other (residual) goals. We treat the latter as the base-category and omit it in order to avoid the dummy variable trap.

33 Note that we also run an Ordered Probit and obtained the same results in terms of magnitude and sign.
Before delivering our empirical results, we acknowledge that our sample is not so large,\textsuperscript{34} meaning that some caveats arise. In this perspective, the bottom line is that the MAPP index is only available for few countries and, to the best of our knowledge, there are no other reliable indexes capturing the macro prudential involvement of central banks. In other words, cross-sectional data are still scant, and future efforts will need to focus on extending the MAPP measures to as many countries as possible. Furthermore, an effective time series analysis is difficult to implement as most of our variables, such as CBIMS, CBI, involvement in micro supervision and monetary goals, are slowly changing.

Given the dataset and its limitations the investigation zooms on a restricted number of explanatory factors in each individual regression. At the same time, we use some controls expressed under the form of dummy variables. These are likely to be highly correlated both among themselves, and with other covariates. In this context, we rely on Variance Inflation Factor (VIF) method to check for multi-collinearity.\textsuperscript{35} Finally, we also control for the presence of outliers.\textsuperscript{36}

4.3. Causality between macro supervision, micro supervision and central bank independence

Our specification may give rise to issues of causality between the three crucial institutional variables, i.e. the dependent variable and the two main independent variables. Our assumption is that the observed central bank involvement in macro supervision was arranged assuming a given institutional setup in terms of central bank involvement in supervision and central bank independence. In other words, we exclude the possibility of the simultaneous determination by policymakers of central bank independence, central bank involvement in macro supervision, and central bank involvement in micro supervision.

To support our assumption we perform a country-by-country analysis in depth, comparing the dates in which macro supervisory settings, the central bank’s micro supervisory powers, and its independence were defined by national policymakers. This systematic descriptive analysis confirmed our assumption: across our sample we find that a macro supervisory setting has been formally established everywhere but in one country – Indonesia (2011) – and its establishment is subsequent to the latest reform of central bank involvement in micro supervision, as well as the latest reform of central bank independence. This means almost all policymakers selected the governance settings of macro supervision considering the already existing features of their central banks, in terms of both micro supervisory powers and independence status. At the end of the day, this allows us to minimize reverse causality risks.\textsuperscript{37} At the same time we acknowledge that we cannot exclude a priori any reverse causality risk, given that it is possible that the policymaker can do a review of the existing micro supervisory setting which produces to a comprehensive overhaul of prudential policy, including the introduction of the macro supervisory architecture.

4.4. Results

We estimate the basic and some alternative versions\textsuperscript{38} of equation above regarding the effects of the central bank as supervisor – (CBBA) index or (CBSS) index – of aggregate and distinct CBI indexes (GMT, GMTp, and GMTo) and of monetary policy dummies with GOAL4 treated as residual category of all less defined goals on macro supervisory powers (MAPP). Columns (1)–(3) also contain the

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\textsuperscript{34} The Shapiro–Wilk test confirms that errors are normally distributed, meaning that we can use the usual testing procedures, even with a relatively small sample.

\textsuperscript{35} VIF measures how much the variance of the estimated regression coefficients increases because of multi-collinearity. The VIF may be computed for each covariate by running a linear regression of that variable on all the other covariates, and then calculating the $R^2$ from that regression. The VIF is just $1/(1-R^2)$. It has a lower bound of 1 (no correlation), but no upper bound. According to a rule of thumb in literature, VIF < 5 or VIF < 10 means that multi-collinearity is low. We adopt a conservative approach, i.e., VIF < 5 is our threshold. Among others see Miles (2009) for details.

\textsuperscript{36} We use the DFBETA method.

\textsuperscript{37} We use appropriate time lags also for the other covariates, including monetary policy goals. For more details, see the Table A1 in the Appendix.

\textsuperscript{38} For each of them, the Ramsey test confirms that the linear function is adequate.
A complete set of controls mentioned above: index of perceived corruption and variables sketching country’s economic and financial environment. Table 2 shows the results.

Column (1) shows estimated results considering the role of central bank as banking supervisor (CBBA) and the “full” definition of GMT. The results seem to confirm our assumptions. The impact of CBBA is positive and significant at the 1% level, meaning that the policymakers are likely to assign leading macro supervisory powers to central banks already in charge of micro supervisory responsibilities over banking. The CBI effect is negative and significant at the 10% confidence level, implying that policymakers are not likely to assign a leading macroprudential role to a central bank whose bureaucratic power is already strong.

However we have to note that the significance of the overall CBI effect is not very high; therefore we decide to investigate the two main components of the CBI, i.e. the political independence and the operational independence (see below). Furthermore, GOAL13 shows the expected positive sign, even if only GOAL1, i.e. price stability, is significant. This can mean that a tighter monetary stability goal helps alleviating policymakers’ fears for a potential misuse of monetary policy tools. It is worth noting that price stability is the dominant goal of monetary policy during our sample period.

In Column (2), instead, we divide the GMT index into its two political and operational components (GMTp and GMTo, respectively). It is noteworthy that only GMTp is still both negative and significant at the 5% confidence level, while GMTo is not significant, although still negative. This empirical result suggests that what really matters is political autonomy, i.e. the independence of central bank in setting its goals without political interference. The less a central bank is independent, the more policymakers are likely to assign more extensive responsibility to central bank in macro supervisory governance. Our empirical investigation provides a direct test for the hypothesis that the policymakers can fear to create a too powerful bureaucratic institution: therefore they prefer to increase the responsibilities of their central banks the less their political independence is. This hypothesis has been already tested when the policymakers implemented the wave of financial supervision consolidation in the decade before the Great Crisis.39

Finally, in Column (3) we test what happens if we consider the role of the central bank in the micro supervision of the financial system as a whole (CBSS) rather than of the banking sector only (CBBA);
the variable becomes not significant. This seems to suggest that the skills and information advantages deriving from monitoring the banking industry matter.

Aside from OECD membership, as for the other controls used in the estimation, parameters related to financial development do not provide strong insights. This outcome indicates that country’s financial structure does not play a significant role in the choice made by policymakers to assign macro supervision to the central bank. It is worth noting, however, that this result is conditional on OECD membership, for which financial development is likely to matter. Therefore at this stage we cannot exclude that the policymakers’ choices on the supervisory setting can depend generally on the shape of the financial industry and specifically for example on the preferences of the bankers.

4.5. Checks for robustness

We now aim at deepening our analysis of the impact of micro supervision, CBI and monetary goals, by implementing the robustness checks shown in Table 3.

First of all, we check if financial micro supervision is really ineffective, replacing our CBSS index with the CBFA index from Masciandaro (2006). This index is an alternative way to measure central bank involvement in financial oversight, which increases as the degree of such an involvement rises. Column (1) shows that CBFA does not have an impact, confirming that micro supervision of the financial system as a whole has not a significant impact on the central bank role as macro supervisor.

Then we focus on the impact of CBI. In particular, we wonder if political independence is what really matters in shaping the central bank’s role with respect to the operational independence. In doing so, we build alternative versions of political and operational independence scores to overcome some of the drawbacks in GMT index.\(^{40}\) Political independence (GMT\(p\)) is described by five principles related to both government interference in the appointment of the central bank governor and the board of

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\(^{40}\) Dalla Pellegrina et al. (2013) show some of the advantages of disaggregating the GMT index.
directors and its composition. The GMTp score is then completed by other three criteria related to the conduct of monetary policy: (GMTp_6) on the possibility that no government approval is required for the formulation of monetary policy; (GMTp_7) on whether central bank is legally obliged to pursue monetary stability as its primary objective; and (GMTp_8) for the legal provisions strengthening the central bank’s position in the event of a conflict with the government. Among those recalled, criterion GMTp_7 appears the closest to our conception of the pursuit of monetary policy goals, as captured by the alternative set variables GOALi.

In a similar manner, operational independence (GMTo) is described by five criteria related to the limits on public debt financing and is supplemented by two additional principles referring to whether the central bank is responsible for setting the policy rate (GMTo_6), and whether it has no responsibilities for overseeing the banking sector (GMTo_7). Note that GMTo_7 is roughly the reciprocal of the variable CBBA.

Therefore, we estimate alternative specifications, where a narrower definition (GMTp_bis), which excludes principle GMTp_7, replaces the GMTp. We treat the legal provision to pursue monetary stability separately through monetary policy goal dummies. In particular, the GOALn set includes several alternatives, thus going beyond the simple binary statement of whether monetary stability is delegated to the central bank or not.

As for political independence, we addressed the possible problems linked to principle GMTo_7, since it tends to proxy micro supervision. Further GMTo_6 has instead the drawback of being correlated with the final objective of monetary policy included in the political independence score, since setting the interest rate is often functional to pursuing a specific policy target freely defined by the central bank. Hence, parallel to what we have done with the GMTp index, we set up narrower GMTo_bis consists in defining operational independence with the exclusion of principle GMTo_7, while GMTo_ter excludes also principle GMTo_6.

Column (2) shows that, even if we change the independence scores and put GMTp_bis and GMTo_bis into equation, only the political side still has a negative and significant impact on the central bank’s role in macro supervision. Results remain unchanged in Column (3), if we replace GMTp_bis with GMTo_ter. Thus, role of a central bank in macro supervision is negatively affected by its political independence. Policymakers seem to prefer a lower degree of independence for central banks. It is worth noting that these preferences can be motivated in more ways than one, given that it is well known that policymakers have more room to influence the central bank and make it take a short-sighted perspective, if the latter is weak, so that they can exploit short-run gains while paying hidden and/or postponed costs. For example in the case of the macro supervision policies the politicians can have an incentive to postpone restrictive policies which lean against the wind in order to please well defined constituencies, as the banking industry.

In order to check for the role of financial development, we used MVB and BankassetsGDP as interaction terms, but the results remain unchanged.

Finally, we want to see what happens if we use alternative indexes of CBI: we replace GMT with the indexes computed by Cukierman et al. (2002), which captured the de facto independence, (CUK). Column (4) shows our findings: CUK index effect is not significant and positive. We can conclude that the policymakers seem to be sensible only to de jure political independence. This result enriches the research area focusing on the effects of central bank independence, clarifying one more case when the difference between de jure and de facto independence is relevant. Up to now the literature stressed that the effects of the CBI on inflation can depend on this distinction. It has been noted that, particularly for developing countries, only the measure of the de facto independence – i.e., the turnover rate of central bank governor – is correlated with inflation performances.

Here we highlighted that when the policymakers designs the supervisory regimes the formal rules governing the relationships between politicians and central banks seem to be more relevant, 41 For a recent review of the relationships between policymaker preferences, monetary policy and central bank independence, see Eijffinger and Masciandaro (2014).
irrespective of the degree of economic development. We can conclude that the relevance of the two kinds of central bank independence indicators depend on which economic and/or institutional phenomenon is under investigation. In fact more recently it has been discovered\textsuperscript{42} that using more recent data also the relationship between inflation and de jure independence appeared to be without any meaningful statistical significance.

5. Conclusions

In this article we have investigated the economic and political drivers of the policymakers’ decision to assign macro supervisory powers to the central bank. Our empirical analysis shows that the latter’s role as micro supervisor of the banking industry is a significant driver. The bottom line is that micro supervisor powers are a proxy of the information advantages available to the central bank. Furthermore, stronger central bank political independence, which increases the risks of an over-powerful monetary authority, seems to imply lesser macro supervisory powers. Finally, rule-based monetary policy focusing on inflation targeting, which reduces monetary policy discretion, weakly increase the odds of a central bank being involved in macro supervision governance. Politicians seem to be wary of placing too much power in the hands of independent and/or discretionary central banks, although it is worth noting that the first feature – independence – seems to be more relevant.

The generality of our results can be checked in the future, by accumulating more information on additional country cases. So far the more relevant and recent case studies seems to be consistent with our tale. The two most influential central banks in the world – the European Central Bank (ECB) and the Federal Reserve System (Fed) – share two features: low involvement in banking supervision and high political independence. However, price stability is the main goal only for the ECB. Given the limited role in banking supervision and high independence from government interference of both the ECB and the Fed, we are not surprised to see that the involvement of either central bank in macro prudential governance has increased much less than other countries. It is interesting to note that recently – November 2014 – the ECB involvement in micro supervision has been increased, but after its macro supervisory role has been established.

Acknowledgement

The authors thank the Baffi Carefin Centre for financial support and two anonymous referees for their very constructive comments and useful suggestions on earlier drafts.

Appendix. The financial supervision Herfindahl Hirschman index

The robustness of the application of the FSHH to analyze the degree of concentration of power in financial supervision depends on the following three hypotheses.\textsuperscript{43}

First, it must be possible to define both the geographical and institutional dimension of each supervisory market: therefore, in each country (geographical dimension) we can identify different sectors to be supervised (institutional dimension). More precisely, in every country we identify three different sectors – banking, securities and insurance markets – and each financial sector is assumed to form a distinct perimeter for supervision. In our institutional perspective, the three sectors are equally important. It is evident that if we considered the economic dimension of each sector on top, we would

\textsuperscript{42} Crowe and Meade (2007).
\textsuperscript{43} Masciandaro and Quintyn (2011).
construct a weighted index, using as weights the relative size, with all methodological and data availability caveat.

Secondly, in each sector we identify the distribution of the supervisory powers among different authorities – that is, if more than one agency is present – and consequently their shares. For each sector, the degree of supervisory consolidation falls with the number of authorities involved in supervision.

Thirdly, we consider the supervision power as a whole, i.e. given different kinds of supervisory activity – banking supervision, securities markets supervision, insurance supervision – we assume perfect substitutability among them in terms of supervisory power and/or supervisory skills. The supervisory power is a feature of each authority as agency, irrespective of where this supervisory power is exercised (agency dimension).

Therefore, in each country and for each authority, we can sum the share of the supervisory power it enjoys in one sector with the share it owns in another one (if any). For each authority, the degree of supervisory power increases, the greater the number of sectors over which that agency exercises monitoring responsibility. All three dimensions – geographical, institutional and agency – have both legal foundations and economic meaning.

We calculate the FSHH Index by summing up squares of the supervisory shares of all the regulators of a country. For each country, the FSHH Index is equal to:

\[ H = \sum_{i=1}^{n} s_i^2 \]

where \( s_i \) is the share of supervisory power of the authority \( i \) and \( n \) is the total number of authorities in a given country. For each authority \( i \), we consider that in each country there are three main sectors to supervise (each sector has the same importance) and that in each sector we can have more than one authority (each authority has the same importance). We use the following formula:

\[ s_i = \frac{1}{m} \sum_{j=1}^{m} s_{ij}; \quad \text{and} \quad s_j = \frac{1}{m} \frac{1}{q_j} \]

where \( m \) reflects the number of sectors where the authority \( i \) is present as supervisor and \( q \) is the number of authorities involved in supervision in each sector \( j \). In other words, if in one sector there is more than one authority, the supervisory power is equally divided among the incumbent supervisors.

Table A1 Variables Description and Data Sources.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>SOURCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Bank as Macro Prudential Authority (MAPP)</td>
<td>The variable describes the macro prudential involvement of central bank. We normalized the original index from Lim et al. It increases with the involvement of central bank. It is updated to 2010.</td>
<td>Authors’ normalization of the index proposed by Lim et al. (2013a,b)</td>
</tr>
<tr>
<td>Central Bank as Micro Supervisor (CBSS)</td>
<td>The variable describes the involvement of the central bank in the micro supervision of the entire financial system. It takes values from 0 to 1 and increases with the involvement of central bank. It is updated to 2007.</td>
<td>Masciandaro et al. (2013)</td>
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<tr>
<td>Central Bank as Micro Supervisor (CBFA)</td>
<td>Central Bank involvement in financial supervision or “central bank as a financial authority”. It takes the following values: 1 if the central bank is not assigned the main responsibility for banking supervision; 2 if the central bank has the main (or sole) responsibility for banking supervision; 3 if the central bank has responsibility in any two sectors; 4 if the central bank has responsibility in all three sectors.</td>
<td>Masciandaro (2006)</td>
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<td>Central Bank as Banking Supervisory Authority (CBBA)</td>
<td>The variable describes the involvement of the central bank in the banking supervision. The variable takes value 1 if the central bank is the banking supervisory authority and zero otherwise. It is updated to 2009.</td>
<td>Authors’ calculations from “How Countries Supervise Their Banks, Insurers and Securities Markets” (2009) (continued on next page)</td>
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Table A1 (continued)

<table>
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<th>VARIABLE</th>
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<tr>
<td>Central Bank Independence (GMT)</td>
<td>The index is calculated as the sum of central bank’s fulfillment of 15 criteria, 8 for political independence and 7 for operational independence. Political independence is defined as the ability of central bank to select the final objectives of monetary policy, based on the following eight criteria: (1) governor is appointed without government involvement; (2) governor is appointed for more than five years; (3) board of directors is appointed without government involvement; (4) board is appointed for more than five years; (5) there is no mandatory participation of government representative(s) in the board; (6) no government approval is required for formulation of monetary policy; (7) central bank is legally obliged to pursue monetary stability as one of its primary objectives; and (8) there are legal provisions that strengthen the central bank’s position in the event of a conflict with the government. Economic independence is the central bank’s operational independence based on seven criteria: (1) there is no automatic procedure for the government to obtain direct credit from the central bank; (2) when available, direct credit facilities are extended to the government at market interest rates; (3) this credit is temporary; (4) and for a limited amount; (5) the central bank does not participate in the primary market for public debt; (6) the central bank is responsible for setting the policy rate; and (7) the central bank has no responsibility for overseeing the banking sector or shares responsibility.</td>
<td>Grilli et al. (1991) and Arnone et al. (2009)</td>
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<td>GMTp</td>
<td>GMT index considering only the (8) criteria for political independence.</td>
<td>Grilli et al. (1991) and Arnone et al. (2009)</td>
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<td>GMTp_bis</td>
<td>GMTp excluding criterion (7) in the political independence.</td>
<td>Grilli et al. (1991) and Arnone et al. (2009)</td>
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<td>GMTo</td>
<td>GMT index considering only the criteria (7) for operational independence.</td>
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<td>Monetary Policy Goal (GOAL)</td>
<td>The variable takes different values depending on the type of objectives specified with respect to monetary policy: 1 = price stability with inflation control; 2 = liquidity control; 3 = growth of means of payment in line with real economy growth; 4 = other, mix of objectives.</td>
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<td>Corruption index (CORRIND)</td>
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### Table A2 Summary Statistics.

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Source: Authors’ calculations.

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