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SUERF Conference Proceedings, No. 2016/4

Provided in Cooperation with:
SUERF – The European Money and Finance Forum, Vienna

Suggested Citation: Davies, Howard et al. (2016) : Central Banking and Monetary Policy: What will be the post-crisis new normal?, SUERF Conference Proceedings, No. 2016/4, ISBN 978-3-902109-83-5, SUERF - The European Money and Finance Forum, Vienna

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THE EUROPEAN MONEY AND FINANCE FORUM

Università Commerciale Luigi Bocconi
BAFFI CAREFIN
Centre for Applied Research on International Markets, Banking, Finance and Regulation

Central banking and monetary policy:
What will be the post-crisis new normal?

Edited and Introduced by

Ernest Gnan and Donato Masciandaro

Contributions by

Forrest Capie • Alex Cukierman • Jakob de Haan • Sylvester Eijffinger • Charles Goodhart • Ronald Mahieu • Aleksandra Maslowska-Jokinen • Anna Matysek-Jędrych • Martin Melecki • Bilin Neyapti • Fabio Panetta • Anca Maria Podpiera • Louis Raes • Alessandro Riboni • Davide Romelli • Francisco Ruge-Murcia • Pierre Siklos • Jan Egbert Sturm • Geoffrey Wood

A joint publication with the BAFFI CAREFIN Centre, Bocconi University

SUERF – Société Universitaire Européenne de Recherches Financières

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Published by
A joint publication with the BAFFI CAREFIN Centre, Bocconi University

SUERF – The European Money and Finance Forum

Vienna & Milan 2016

SUERF *Conference Proceedings* 2016/4

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Keywords: Monetary policy, central banking, prudential policy

JEL-codes: E31, E52, E58, G18

Vienna: SUERF (SUERF *Conference Proceedings* 2016/4) – August 2016

ISBN: 978-3-902109-83-5

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1. Central banking and Monetary Policy: What will be the Post-Crisis New Normal?

Ernest Gnan and Donato Masciandaro

Central Bankers are currently facing big challenges in designing and implementing monetary policy, as well as with safeguarding financial stability, with the world economy still in the process of digesting the legacy of the crisis.

The crisis has changed central banking in many ways: by shifting the focus of monetary policy from fighting too high inflation towards fighting too low inflation; by prompting new 'experimental' non-conventional measures, which risk to cause large, long-lasting market distortions and imbalances and which also have more far-reaching distributional consequences than 'normal, conventional' monetary policy; and by broadening central banks' responsibilities particularly in the direction of safeguarding banking stability and financial stability at large.

This raises several questions for the future: How long will ultra-easy monetary policies last? What are post-crisis growth trajectories, and how will the natural rate of interest rates evolve? How could an exit from ultra-easy monetary policy and a return towards higher nominal interest rates be eventually managed smoothly? Does ultra-easy monetary policy itself affect the economy in a lasting and structural way? Is the pre-crisis economic paradigm governing monetary policy still valid? If not, in what ways should it be adjusted? Are there any reasonable and practical alternatives? Against this background and given the larger post-crisis range of central banks' responsibilities: is the current institutional set-up governing central banks and their relationship to government, Parliament and the financial system still appropriate? What adaptations might be considered? Would they bring an improvement or, on the contrary, a set-back to the unsuccessful policy approaches of the 1960s and 1970s?

To discuss these issues, on 14 April 2016 the Baffi Carefin Center (Bocconi University) hosted a SUERF Conference. This introductory chapter aims to provide a framework for the various contributions in this book, and also summarizes some main ideas from later chapters for an overview.

1.1. PRE-CRISIS CENTRAL BANKING: INDEPENDENCE, INFLATION TARGETING AND THE 'GREAT MODERATION'

Before the crisis, monetary policy and central banking were essentially two sides of the same coin: the central banker of the 'Great Moderation' was essentially a monetary policy agent, primarily focused on ensuring consumer price stability, which can be pursued by steering short-term interest rates. The mainstream of modern central banking can be briefly summarized using the principal-agent terminology. The citizens, who represent the principal, realized that on average politicians in charge tend to use monetary policy tools to obtain short term macroeconomic goals, in particular to exploit a short-term inflation-growth and employment trade-off. The underlying assumption is that politicians are short-sighted, maximizing the probability to remain in office. Therefore, politicians tend to use monetization to address urgent problems of unemployment, fiscal unbalances, and banking bail-outs. But the more the markets are forward-looking, rational and efficient, the more it is likely that monetization policies simply produce more inflation and uncertainty, without any – even transitory – real gains. As citizens realize politicians' inflation bias, they are no longer able to exploit the short-term Phillips curve trade-off and moreover suffer from a lack of credibility, because the public would expect them to renege on any initial promise to ensure price stability. As a result, inflation expectations and thus inflation rise, without achieving short-term transitory real economic gains in return, resulting in an overall suboptimal economic outcome. To cope with the credibility and time inconsistency problems, the standard solution has become to change the rules of the game: monetary policy is delegated to independent central banks, where unelected public officials with long terms of office conduct monetary policy with a view to safeguarding the primary goal of price stability as mandated in the central bank statute. Since they are held accountable only with respect to the achievement of this clearly defined and narrow goal, which the public understands, their monetary policy is credible in the eyes of the public and does not suffer from the time inconsistency problem. As a result, a superior combination of low inflation and high growth and employment can be achieved compared to the previous solution of less independent monetary policy.

Consequently, for monetary policy effectiveness, it is crucial that the mandate of the central bank is well defined and established using three criteria. First, the primary goal of the central bank has to be monetary stability in order to avoid the short-term 'inflationary bias'. Second, the central bank must not finance public deficits and debt in order to avoid the 'fiscal bias'. Third, central bank involvement in financial regulation and supervision has to be designed in a way which avoids a 'bank bail-out bias'.

The central bank has to be protected from risks of political capture, by being granted functional, personal, operational and financial independence from government. This high independence finds its mirror, and is in fact enhanced and rendered sustainable, by ensuring that the central bank is strictly accountable on its actions in the pursuit of its mandate vis-à-vis the legislative and the public at large, which is ensured through a number of provisions ensuring transparency and regular and formalized reporting procedures. Over the last two decades, transparency has increasingly gained in importance, which reflects general societal developments but also theoretical considerations which suggest that clear communications about its aims and instruments helps the central bank to effectively anchor inflation expectations and thus to achieve its mandate more effectively and efficiently.

1.2. AFTER THE CRISIS: CHALLENGING THE PRE-CRISIS CONSENSUS

This was the broad consensus before the crisis. But now, after the crisis, the scenario is changing. The desire to avoid new cases of systemic banking instability and at the same time to address the deep economic crisis has focused new attention on the architecture of central bank regimes. Many policymakers wonder whether to reshape their central bank settings. New proposals to reform these systems have been enacted or are under discussion. At the same time, particularly in the advanced economies, central banks pursue ultra-expansionary monetary policies, with growing potential tension between monetary and financial stability.

The nexus between monetary policy and central bank governance deserves increasing attention at least from two different – but intertwined – perspectives. One aspect concerns decision-making procedures in central banks. In most modern central banks, monetary policy is designed and implemented by **committees**. This feature of central bank governance may influence monetary policy itself. By pooling knowledge and different professional as well as political backgrounds, committee decisions are hoped to yield superior decisions, which are more robust against gross errors than decisions by single persons. At the same time, committees may develop their own group dynamics, and monetary policy decisions become the endogenous result of a – sometimes complex – interaction between the rules of the game and the preferences of the players, i.e. the board members and the politicians.

The existing literature that looks at the link between monetary policy decisions and board members' diversity zooms essentially in on two issues: how monetary policy committees work, and how the specific composition of committees can

shape monetary policy outcomes, where the more disputed issue is related to the degree of activism, i.e. the 'dovish' attitude of monetary policy decisions. The role of preferences has been explored in the academic literature by focusing on the degree of activism in designing and implementing monetary policy actions. 'Activist' monetary policy can be used to smooth the impact of various macroeconomic shocks – real, fiscal, banking imbalances. In this literature, a specific jargon has been coined: a 'dove' is a policymaker who leans towards active monetary policies, while a 'hawk' is a policymaker who opposes them.

The contribution by **Eijffinger *et al.* (2016)** follows this strand of research. The authors draw parallels of the institutional status of modern monetary authorities and highest-level courts; they use this insight to translate empirical methods used to study deliberations of courts to the study of central bank committee voting behaviour. Employing spatial voting models, they use voting records to estimate the latent preferences of policy makers in various central banks. For the Bank of England, they find no evidence that internal MPC members are systematically more dovish than external ones, but the preferences of internals are more clustered. By contrast, they interpret the remarkable differences between internal and external members at the Hungarian central bank as an indication of highly politicized appointments. For the Fed, they find that Board members are on average more dovish than the Fed President but little evidence on the existence of a political appointment channel. They generally find no or only modest evidence for systematic differences according to Board members' career backgrounds.

Riboni and Ruge-Murcia (2016) point out that various authors may mean different things when distinguishing between 'hawks' and 'doves'. Apart from favouring or disliking 'activism' (as suggested above) or the propensity to vote for high versus low interest rates (Eijffinger *et al.*, 2016) in the monetary economics literature hawkishness or dovishness refers to the relative weight a policy maker attaches to inflation versus output or employment stabilization. Comparing their own reaction-function based assessment of hawkishness with the one of Eijffinger *et al.*, they find that results coincide only partly. Furthermore, particular voting procedures may influence voting behaviour; according to previous research by the authors, in practice major central banks' policy committees operate on the basis of a consensus model, which coincides with results from experimental economics. Finally, they ask what committee members in their voting behaviour actually maximize: public welfare in the sense of the best possible monetary policy decision, or maximization of their personal reputation; some research in this field indicates that external committee members tend to hold more extreme views and that anti-herding behaviour may reflect career considerations.

The development of the modern theory and practice of monetary policymaking produced also a change in the prescriptions on how central bankers should

communicate. During the 1970s and 1980s, central banks were very much shrouded in monetary mystique and secrecy. The theoretical rationale for the lack of monetary policy **transparency and communication** was given by the theory of **ambiguity**, credibility and inflation under discretion and asymmetric information. The bottom line was that with asymmetric information between the public and a policymaker, monetary policy ambiguity facilitates inflation **surprises** and consequently short run macroeconomic gains. The mix of a discretionary monetary policy with a short-sighted policymaker seems to justify ambiguity; however, in a world with well informed, forward-looking agents, which are aware of the time-inconsistency problem (in the extreme with rational expectations), the main result from opaque discretionary monetary policy will likely be higher and more variable inflation.

The intertwined concepts of rules in policy, on the one hand, and independence and accountability of the policymaker, on the other, produced a change in communication practices **from secrecy to transparency**. Monetary policy discretion and ambiguity were abandoned in favour of monetary policy 'rules' (in a broad sense, including monetary policy strategies which make the central bank's reaction function transparent for the public, e.g. inflation (forecast) targeting), which were explicitly announced and motivated. Transparency became a key feature of monetary policy. In a way, **communication became a distinct monetary policy instrument in itself**, as exemplified most recently by 'forward guidance' used by major central banks, including the Federal Reserve, Bank of England and ECB.

Masciandaro and Romelli (2016) investigate the evolution of the number of papers and articles on central bank communication between 2001 and 2015 and find a strongly rising trend until 2009 and a decline since then, while a steady flow of papers on the subject continues to be produced. A very similar development – albeit slightly lagged – has been observed for papers and articles on monetary policy transparency. The authors trace the reason for this development in the changing institutional setting that governs central banking. In addition, the increased complexity of crisis-related monetary policy measures and the wider range of central banks' responsibilities make effective communication and accountability key elements of successful central banking. Communication has developed into a key monetary policy instrument in itself. It can strengthen trust and credibility and stabilize expectations and thus reduce uncertainty. At the same time, it is by no means clear what the optimal communication strategy is: any communication can have intended and unintended consequences.

Since the crisis, central banks worldwide have taken on more and more **responsibilities**. The common trend seems to be an increasing involvement of central banks in financial **supervision**, also taking into account the new distinction

between macro and micro prudential supervision. This raises the question of potential conflicts – or synergies – with the central bank's **mandate** to safeguard consumer price stability. Furthermore, is it possible to make central banks responsible for banking supervision and financial stability at large in a way consistent with the present **institutional setting**, i.e. without introducing risks of political capture and/or banking **capture**? The issue becomes more urgent as the duration of ultra-easy monetary policies is becoming increasingly longer in advanced economies, generating increasing potential tensions between monetary and financial stability in the medium to long term.

Neyapti (2016) argues that the crisis was among other things triggered by lack of an effective institutional framework to prevent and deal with financial crises. Spread responsibilities and thus lack of accountability among various institutions led to slow recognition of the building up of risks. The crisis thus led to a rethinking of the roles of central banks, the state and financial institutions in achieving macroeconomic stability. But the issue is by no means resolved, neither in academia nor in policy. Effective macro-prudential supervision requires effective accountability.

Maslowska-Jokinen and Matysek-Jedrych (2016) argue that the death of classical monetary policy may have been called too soon. Particularly in less developed financial systems, reserve requirements, which basically acted as a tax on banking intermediation, are empirically found by the authors to have dampened pre-crisis credit growth and capital inflows and thus mitigated the crisis. Furthermore, they argue that reserve requirements and public knowledge about them can prevent bank runs. Also central bank transparency on financial stability issues – e.g. through publication of financial stability reports – may help to dampen credit bubbles. Rather than the quantity, however, it is the quality of information that matters. Regarding the role of central banks for financial supervision and stability, the authors argue that also in the future 'one size will not fit all'.

Melecky and Podpiera (2016) recall that before the crisis, there was a general tendency to unify prudential supervision in special agencies outside the central bank; since the crisis, in many countries prudential supervision has again been re-integrated into the central bank. The authors show empirically that countries with deeper financial markets and countries that undergo rapid financial deepening can benefit from having banking supervision in the central bank in terms of safeguarding financial stability. They also interpret their results as suggesting that policy makers benefit from detailed knowledge of the micro-structure of the financial system for safeguarding systemic financial stability.

Are central bank independence, accountability and transparency, and the focus on consumer price stability (as embodied in its purest form in inflation targeting), which were at the heart of the **pre-crisis central banking model, still functional**

and appropriate? Are existing **governance mechanisms sufficient in the light of central banks' increased powers**? What adjustments may be called for? To develop these themes it is important to consider the global evolution of the environment in which central banks operate.

Panetta (2016) offers a comprehensive diagnosis of current central banks' policies. Also in the light of the crisis experience, there is no reason to challenge central banks' primary objective of price stability. But central banks should not allow inflation to fall too low below their target for too long, because of the risk of debt deflation spirals and the risk of a de-anchoring of inflation expectations. The current low level of real equilibrium interest rates and the very low level of inflation in the euro area challenges monetary policy in the sense that the zero lower bound of interest rates has been reached. However, recent practice and also theory shows that nominal interest rates can fall below zero. Furthermore, central banks can also achieve further monetary expansion through enlarging the quantity of the money supply. The ECB's Expanded Asset Purchase Programme (APP) has so far been quite effective in stimulating demand and preventing inflation from falling even further. But monetary policy should not be the only game in town: fiscal policy should also play its role in adding stimulus. For sure, financial stability repercussions of expansionary policies must be monitored closely but financial stability also requires economic growth. The credit cycle in the euro area is still in a negative phase, there is no excessive risk taking. Prudential authorities, while closely monitoring developments, should not act prematurely as excessive restrictions might, by hampering the recovery, increase, rather than decrease, financial stability risks. Regarding the future, central banks' approach to 'never say never' will continue to apply in the future.

Cukierman (2016) addresses an issue which has become central for the conduct of monetary policy particularly during the crisis: the appropriate concept and estimation of the **natural rate of interest**, and the relevant interest rates to be considered in the implementation and in measuring the stance of monetary policy. He argues that, due to substantial increases in credit rationing and omission of the financial stability motive from the monetary rule during the global financial crisis, existing estimates of the natural rate are likely to be biased downwards. Hence, the zero lower bound constraint may not be as serious as implied by conventional estimates. **Long term risky rates** are more important determinants of the output gap and inflation than the short term policy rate. As seems also to have been recognized by major central banks, which have actively engaged in directly influencing long-term interest rates and risk premia, more attention should be payed to the long term risky rate and to the natural counterpart of this rate. This is particularly important during financial crises when long term risky rates and the short term policy rates tend to move in opposite directions. The introduction of a long term risky natural rate into the analysis of monetary policy

may also shed more light on the role of regulation and of other financial institutions in the determination of potential output and economic activity. Some authors have argued that in a crisis, equity injection is a superior policy compared to interest rate cuts or bond purchasing programs. Incorporation of the natural levels of risk and of risk aversion into a natural risky rate concept is likely to pave the way for shedding new light on the relative desirability of alternative asset purchases programs.

Capie and Wood (2016) offer a comparative history and analysis of governance in the Bank of England and the Reserve Bank of New Zealand. They show that discretionary monetary policy aiming to achieve a broad set of objectives under the Government's control was – apart from war times – experimented with only during a relatively short time in the second half of the 20th century. This experiment led to high inflation. By contrast, external anchors such as in particular a metal standard or also an external exchange rate anchor provided an effective tool for the preservation of the value of money in the long term. Without such anchor, monetary policy needs to be guided by a very clear price stability objective, and the central bank needs to have the instruments necessary to pursue its statutory objective, in order to avoid erosion of the value of money. Safeguarding financial stability should be the central bank's competence, not least because the necessary information and know how is more easily pooled at this institution and there are synergies with central banks' function as lender of last resort. What is to be avoided by all means is a lack of clarity on responsibilities among various government bodies and lack of accountability. As it cannot be taken for granted that the government uses its delegated power in the long-term interest of the electorate, central banks need to be granted independence; however, independence itself is subject to change, unless it is protected by high barriers against change in constitutional law. **Goodhart (2016)** supplements this analysis with a vivid account of how governance in the Bank of England changed over time as a result of historical developments (such as the post-WW I period), the appearance of outstanding personalities as well as group dynamics within the Bank of England, without changes in formal laws requiring such change. The result was that the nature of decision making varied between the extremes of committee decisions and concentration of power in a single person, i.e. the governor.

Finally, the crisis has not only resulted in different perceptions of the traditional macroeconomic short-term dilemmas that monetary policy faces – inflation versus employment, monetary policy versus financial stability – but it has also highlighted the importance of perspectives that have gained in importance as a result of non-conventional, 'more extreme' monetary policies, such as in particular **distributional effects of monetary and financial policies**. The complex relationships between money, finance and inequality have to be explored, consid-

ering also the possible implications for central bank governance. The crisis has strongly increased public attention and concern about the **consequences of rescuing troubled banks on public finances**, and on the value of financial portfolios. Bank bailouts and the level of involvement of central banks are subject to the attention of the media and the scrutiny of public opinion. Politicians who make decisions about saving a bank are aware that they will be challenged by the electorate for their choices; but also central bankers have increasingly come under scrutiny and public criticism. The crisis has also prompted central banks around the world to **buy large volumes of government debt**. These assets are used since they are the most liquid assets available to implement expansionary outright open market operations in order to stimulate aggregate demand and inflation. At the same time, sovereign debt purchase programs clearly have supported governments' financing of bank bailouts and countercyclical fiscal policies.

The more potential **distributional effects** of such ultra-easy monetary and financial policies become relevant and/or evident, the more likely heterogeneous preferences on these issues among citizens and/or politicians may trigger disputes on how the relationships between Parliaments, governments and central banks might be reconsidered. According to **Neyapti (2016)**, expansionary policies in response to the crisis have contributed to inequality; also macro-prudential policy should take distributional consequences more into account. **Panetta (2016)** points out that the impact of non-conventional monetary policies on inequality must be considered in a general equilibrium framework, which also takes into account the positive employment effects for workers; while the rich benefited from financial gains triggered by central bank asset purchases, the poor benefited from cheaper debt and jobs, which overall led to a decrease in inequality in Italy.

De Haan and Sturm (2016) revisit the question on how liberalization of the financial sector is related to income inequality. Contrary to previous research, they find that both financial development and financial liberalization are associated with increases in income inequality. The effect is stronger if financial development is higher. This needs, however, not necessarily be bad for the poor to the extent that finance may promote economic development and thus raise overall living standards. **Siklos (2016)** points out that the results from the quite limited number of available theoretical and empirical studies on this issue are not directly comparable, as they use different theoretical frameworks, define financial development differently, and define and date financial crises differently. Also, important social policy elements of financial systems, such as deposit insurance provisions, are neglected. More generally, Siklos opines that post-crisis ultra-easy monetary policies distort markets substantially and generate huge redistribution from lenders to borrowers.

1.3. CONCLUSION

A major innovation in modern monetary policy was the progressive merger of the analysis of the macroeconomic effects of public choices of monetary policy makers with the study of the structural features that characterize the policy makers (governments and central bankers), as well as the rules and institutions that shape goals and incentives of central bankers and economic agents.

The current debate on central bank governance and monetary policy in advanced economies is at a crossroads. For one thing, since 2008 central banks have pursued ultra-easy monetary policies, designing and implementing conventional and unconventional strategies. For another, central banks' involvement in banking supervision and financial stability have strongly increased. On top of that also the set of macroeconomic variables that may need to be considered by central banks – beside consumer price inflation, also growth and employment, financial stability, inequality – is being discussed.

The crisis has also accentuated the importance of international spillovers, through risk premiums, exchange rate fluctuations, asset prices, tensions among financial intermediaries, world trade and global demand. In this environment, central banks increasingly feel the international dimension of national monetary policies, and measures even though warranted from a single country perspective may not be optimal once global repercussions are considered. The problem is accentuated by globally divergent growth and inflation outlooks, which would normally call for different directions in major central banks' policy.

Overall, conference participants shared the view that reconsidering the pre-crisis central banking model would imply considerable risks, which are difficult to gage at this point in time and may be underestimated. How to hedge this risk is a fundamental issue that must be considered to understand not only what will be the economics of 'post-crisis' monetary policy, but also which political economy drivers motivate initiatives to reforms of central bank governance.

Central bankers are sailing in uncharted waters. While not offering answers to these complex and potentially far-reaching questions, the conference highlighted where the deeper issues and risks may linger beneath the surface.

2. Central Banking in the XXI Century: Never Say Never

Fabio Panetta[1]

2.1. Introduction

At first glance, today's global economic outlook gives plenty of ammunition to the critics of central banks. Take the euro area – though its problems are by no means unique – where notwithstanding a strongly expansionary monetary stance, inflation is persistently low, growth is weak, and the recovery far more fragile than one would hope. It is unsurprising that in this environment we have got caught in a crossfire of questions on the nature of monetary policy. Is the ECB pursuing the right objectives? Is it doing so effectively? Could zero or negative rates and intrusive asset purchase programmes cause all sorts of distortions, including financial bubbles or inequalities? Is the ECB fully aware of this? And if so, does it care?

These are important and intellectually challenging questions, and I will refer to them below to structure my remarks on 'what (I think) we learned' about monetary policy from or after the financial crisis. However, they also raise a key point that to my mind is by far the most important lesson we can take from the last eight years: when it comes to monetary policy, 'never say never'.

When H.G. Hawtrey wrote about central banking being an 'art' in 1932, he could not possibly have foreseen the policy palette that central bankers would have at their disposal in the 21st century. For that matter, central bankers in the early 2000s could hardly have imagined it either. When put to the test they proved braver and more creative than anyone – including those within their own ranks – could have expected. Two factors forced them to push the envelope: the end of the Great Moderation and their determination to do 'whatever it takes' to keep the economy stable. Pablo Picasso – admittedly a far better artist than your average central banker! – notoriously gave this piece of advice to his students: "Learn the rules like a pro, so you can break them like an artist." Central bankers learned and followed the (Taylor) rules for many years, but were quick to break them when they seemed out of step with the times. This is to their credit, irrespective of the many questions that can be raised about their specific choices, and of the uncertainty that continues to surround their ultimate success.

[1] Deputy Governor of the Bank of Italy.

But the fact remains that the woes of the euro area do raise interesting questions about the nature and conduct of monetary policy. In the remainder of this talk, I will focus on four of them. First, its objectives: should monetary policy continue to focus on price stability? Second, its effectiveness: does it have sufficient tools to fight deflation or lowflation? Third, its interaction with financial stability: should exceptional monetary expansions be avoided, so as not to trigger excessive risk-taking? Fourth, its distributional implications: does it increase income or wealth inequality? I will address each of these questions in turn.

2.2. IS THE PURSUIT OF PRICE STABILITY STILL WARRANTED? (YES!)

The popularity of inflation targets is at one of its all-time lows. Some remain sceptical of the need to use monetary policy to fight low inflation if or when the latter is mainly due to swings in the price of oil. Others, such as Issing (2016), argue that central banks should be more 'patient' and focus on longer-term horizons. Still others have suggested that the potential costs of ultra-expansionary monetary policies are likely to outweigh their benefits (Borio, 2015), particularly in cases where low inflation mostly reflects positive supply shocks[2].

In principle it is true that there are times when monetary policy should simply 'look through' a few consecutive observations of low, or even negative, inflation. Reacting to the short-term vagaries of the price level can be counterproductive. However, this argument can easily lead to an underestimation of the costs and risks of deflation that arise when inflation expectations become de-anchored, when nominal rates are at their lower bound, and when debt (public and private) is high.

Deflationary pressures pose a serious problem when they become entrenched in firms' and households' behaviour. Research at the Bank of Italy shows that adaptive learning can play an important role in this sense (Busetti *et al.*, 2014). If agents have incomplete knowledge of the behaviour of their central bank and learn from inflation outturns (bounded rationality), the effects of negative surprises may become extremely persistent. In particular, the shocks that hit the euro area over the last two years would reduce inflation by at least 1 percentage point more than in a standard rational expectation model (see Figure 2). Besides being a problem in its own right, this would also imply that the (standard) models central banks use for forecasting may become inaccurate and provide poor guidance for policy decisions.

[2] From this perspective the Great Depression is considered an outlier, a unique historical event with limited general lessons on the cost of deflation.

Our research also shows that there is a concrete risk of an outright de-anchoring of inflation expectations (Cecchetti *et al.*, 2015). As long as expectations are well anchored, changes in relative prices or supply shocks should affect the price level in the short- but not in the long-run. Hence, the correlation between short-term and long-term expectations provides a gauge of de-anchoring risk. In the euro area this correlation has risen in recent months. In particular, the probability of downward changes in short-term expectations becoming associated with variations in longer-term expectations has increased substantially (Figure 3). Technicalities aside, it is clear that even declines in inflation due to favourable supply shocks may have adverse consequences when nominal interest rates are at the zero lower bound and debt levels are high[3]. To cut a long story short, it is crucial that central banks keep pursuing their price stability target.

2.3. IS MONETARY POLICY APPROACHING ITS LIMITS? (NO!)

The next question is whether central banks can achieve their goals when interest rates are at the zero lower bound. Are their tools up to the task? This debate has intensified since the ECB Governing Council's decision of last March, but it is hardly new: doubts about the effectiveness of monetary policy, as well as claims that it has now 'really' reached its limit have been voiced after each round of monetary expansion in the last eight years on both sides of the Atlantic. The effectiveness of monetary policy might be hindered because of the ZLB; because 'you cannot push on a string'; or because monetary stimulus is necessarily weaker after a financial crisis, when firms and households want to deleverage and the bank transmission channel is broken (Masciandaro, 2016).

My initial response to this question is contained in the title of this speech: 'never say never'. There are no obvious limits to what central banks can do. The suspicion that they might really run out of tools and ideas is understandable, but it is backward-looking and has proved groundless more than once already. My considered response is that we now have enough information to reject the conclusion that the recent monetary policy initiatives did not work.

There is an apparently technical but actually crucial point that I would like to make before getting to the crux of the matter. To assess a policy intervention (monetary or otherwise), one needs to look at the counterfactual and not, or not only, at the data. The question is not whether we are happy with the current levels of growth and inflation, but whether we would be happier if the interventions had not taken place at all. This complicates the issue, making it more dependent

[3] See, *inter alia*, Neri and Notarpietro (2015).

on the assumptions one makes to get an answer, but it is the only serious way to perform a policy assessment[4].

The unconventional measures adopted by the Federal Reserve and the Bank of England have proven effective in supporting asset prices and in narrowing inflation and output gaps (Williams, 2014; see Table 1). Casiraghi *et al.* (2016a) offer a similar assessment for the Italian economy. The measures introduced by the Eurosystem lifted GDP by almost 3 percentage points from 2011-13. Looking forward, our estimates suggest that the Expanded Asset Purchase Programme (EAPP) could boost GDP in Italy by more than 2 points over a three-year horizon, and sustain prices by more than 1 percentage point.

The EAPP is not a beggar-thy-neighbour policy: it may imply a depreciation of the exchange rate, but this is not the only, or for that matter indispensable, transmission channel. The fall in the medium- and long-term yields of a broad set of financial assets puts downward pressure on bank lending rates and supports investment. Wealth effects from financial prices may give an additional boost to household consumption in the medium term (our estimates for Italy suggest that a 10 per cent increase in financial wealth would raise consumption by 0.5 percentage points in the medium term). Increases in residential house prices, together with the decline in long term rates, support residential investment.

The evidence we have so far on the effects of the programme is consistent with those predictions. The cost of new loans to households and firms in the euro area has fallen by 60 and 70 basis points, respectively, since mid-2014. For Italian firms, the cost of borrowing has come down by 120 basis points (Figure 4). The performance of Italian GDP last year was broadly consistent with our estimates, as we reported in our last *Economic Bulletin* (Figure 5). Of course, monetary policy cannot work alone. Its positive impact on the performance of the Italian economy was possible in light of the reforms implemented at the national level, such as the reform of the labour market, the emphasis on the spending review, the gradual reduction of the tax burden.

Inflation responded positively to the programme in the first three quarters of 2015. It subsequently weakened, but that has much to do with a worsening of global conditions. At any rate, without the programme the inflation forecast for 2016 would have been about half a percentage point lower.

It is clear that the challenges to price stability remain significant. However, these estimates suggest that there is little ground for arguing that monetary policy is powerless, or that central banks are now approaching the limits of what they can

[4] The long debate on the causes of the Great Moderation clearly demonstrates that it is impossible to distinguish 'good luck' from 'good policy' by just looking at the data: you need a model. The moderation has long since gone, but that principle applies equally to the problem we are discussing today.

deliver. I would therefore caution against listening to the siren song of those who claim the opposite. We should never forget that inflation is ultimately a monetary phenomenon. This is no mere theoretical statement. The success of the Bundesbank in the 1970s depended directly on this view, on the fact that central banks should not give up on price stability, and that they had the means to achieve it. That this view was quite unpopular at the time, when many wanted central banks to forgo controlling prices, should ring a cautionary bell today.

Of course, we cannot fine-tune the economy with monetary policy alone. Its transmission mechanism entails 'long and variable' lags and it can be stronger or weaker depending on the state of the economy, which in turn is influenced by a broad range of policies. Hence, it can be dangerous to let monetary policy be the only game in town. This takes us straight to the next question I would like to discuss, namely the relation between monetary and fiscal policy.

2.4. THE POLICY MIX

Many have advocated a key role for expansionary fiscal policy in lifting activity and employment (among others, Krugman, 2008). Bernanke argued that the poor performance of the euro area compared to the US after 2009 may have reflected the fact that fiscal policy was tighter than warranted by economic conditions[5]. In his Jackson Hole speech in 2014, President Draghi also signalled that fiscal policy was "less available and effective" in the EA, that it "could play a greater role" and that "the existing flexibility within the rules could be used to better address the weak recovery and to make room for the cost of needed structural reforms" (Draghi, 2014). By and large, the data seem to support these views. Indeed, looking at the cyclically adjusted primary balance, the fiscal stance in the euro area was less expansionary, if not contractionary, than in other advanced economies following the onset of the financial crisis (Figure 6).

The case of the euro area is, of course, peculiar in this respect. Not only is there no single fiscal policy, but many countries are also constrained in their ability to use fiscal policy countercyclically on account of high debt levels and/or political pressures. This issue has been important in the unfolding of the crisis and remains critical today. Nevertheless, maintaining a contractionary fiscal stance is clearly problematic in the current context. Furthermore, significant heterogeneity among European countries means that some economies have the leeway for an expansion that might prove beneficial for them and for the rest of the area.

[5] Bernanke (2015).

The complementarity of monetary and fiscal policy also lies at the root of the debate on 'helicopter money', i.e. the direct financing of consumption or public investment. As President Draghi has remarked, the concept is an interesting one and is currently being discussed by academic economists, though interpretations of what it means vary widely. It also presents a number of complexities, both in accounting terms and legally. It is an important debate, which should not be dismissed lightly, but the fundamental message we can take from that discussion is perhaps not for central banks, but for fiscal authorities.

To paraphrase the title of an old article by Franco Modigliani, we should not forsake stabilisation polices (Modigliani, 1977). The importance of fiscal discipline is indubitable, particularly in the light of the recent tensions in euro-area sovereign bond markets; but overly restrictive or otherwise misguided fiscal strategies might mean that, in this stabilization effort, fiscal policy becomes part of the problem instead of part of the solution.

2.5. MONETARY POLICY AND FINANCIAL STABILITY

Should financial stability considerations interfere with the determination with which central banks pursue their primary target? I would start by emphasizing the strong link between price and financial stability in the medium run. It is hard to maintain a sound financial system in a (persistently) depressed economy. All measures aimed at closing output and price gaps after a long recession are therefore compatible with the financial stability objective of reducing systemic risk.

True, this link may be loose in the short run (as Masciandaro recently restated). A large body of evidence suggests that risk appetite is endogenous and is affected by monetary policy. Investors take on risk, potentially up to undesirable levels, when monetary conditions are too loose. This is by now well documented for both bank lending and market finance[6].

The first issue is how to identify this phenomenon. In order to spot changes in investors' risk attitude, policymakers need to look at a broad set of information. Monetary policy decisions must be taken on the basis of indicators such as credit developments, bank lending conditions and asset prices[7].

In my view, the data speak quite clearly as of today. The Italian credit cycle, measured by a detrended credit-to-GDP ratio, turned negative around 2010 and has remained so ever since (Figure 7). The same is true of the euro area overall.

[6] Borio and Zhu (2012); Jimenez *et al.* (2014), for bank lending. Bekaert *et al.* (2013), for market finance.
[7] Alessandri *et al.* (2015).

Figure 8 shows a cyclical indicator that combines information on housing and financial prices and on credit aggregates. The indicator shows that the euro area is lagging behind the United States in terms of financial recovery, and that cyclical conditions in Europe are still mildly negative. This does not mean that risks may not be rising in individual countries or sectors, but nor does it signal 'excessive risk-taking' in the aggregate.

The second issue is what to do if and when the indicators signal an increase in systemic risk. My answer is that macroprudential policy should be used as the first line of defence. Of course, monetary policy can also play a role, but the debate on what exactly this role should be is far from over. Monetary policy has the advantage that 'it gets in all of the cracks' of the financial system (Stein 2013), but it might also be a blunt instrument, as the benefits of fixing sectorial imbalances through it may be offset by large macroeconomic costs (Svensson, 2015). Macroprudential policies instead can rely on a broad set of instruments (such as time-varying capital requirements, caps on LTVs, DTIs, risk weights, etc.) targeted at specific financial imbalances. National macroprudential authorities can address local risks, as has recently been done in a number of countries, without altering the monetary stance.

Against this background, let me emphasize that the key question is not whether monetary authorities should take financial stability issues into consideration – the answer is 'yes' and they already do. The issue is rather whether the micro- as well as the macroprudential authorities take the macroeconomic implications of their policies fully into account. I recently argued that the interaction between monetary policy and micro- and macroprudential supervision is indeed an issue, and one that matters for two reasons[8]. First, even from the microprudential perspective (and *a fortiori* from the macroprudential one) there is a clear link between capital requirements, credit, and economic activity. This link is likely to be particularly important in bank-based financial systems such as the euro area. Second, in and of itself slow growth poses a major medium-term risk for financial intermediaries. This implies that as long as there are no signs of generalized excessive risk-taking, it would be wise not to tighten the supervisory stance too much: this would guarantee that other stability-oriented policies do not undermine the efforts of monetary policy, delaying a recovery that banks need as much as firms and households.

Furthermore, when calibrating their interventions, supervisors should take into account the complementarity of micro- and macrosupervision, which rely on the same set of tools and similar transmission mechanisms. The overlap between micro- and macroprudential policies is particularly strong in economies with

[8] See Alessandri and Panetta (2015).

concentrated banking sectors, where the separation between 'micro' and 'macro' is tenuous. At a minimum, this complementarity gives macroprudential authorities in the euro area another reason not to be too restrictive (micro requirements are already high). Beyond that, it suggests that microprudential authorities may also want to reconsider their choices and ask themselves whether micro requirements are being tightened too much, or too abruptly, given the state of the economy.

2.6. THE DISTRIBUTIONAL EFFECTS OF MONETARY POLICY

Another important concern is that the current monetary policy stance may disproportionately favour the rich (those who own more financial assets and benefit from large capital gains) while 'expropriating' pensioners' savings via very low interest rates. Moreover, refinancing and open market operations are directed at favouring banks, rather than the average person.

This issue clearly deserves our attention[9]. Rising inequality poses delicate ethical issues. History suggests that it might also hinder growth and make our economies less stable. Furthermore, although inequality lies squarely outside the mandate of central banks, if their decisions were to affect income distribution systematically, some might think that they should be overseen more closely by the government. Hence, the very independence of central banks might be at stake.

As a general point, let me stress that it would be a mistake to deviate from a policy that is welfare-improving for the economy as a whole purely on the basis of distributional concerns. If we agree that monetary stimulus is necessary to improve the conditions of the Eurozone, we should pursue it without hesitation. The distributional spillovers of a socially optimal policy (if any) should be kept in check by other means, and not by giving up on the policy altogether. In other words, monetary policy should increase the size of the cake and leave the distributional choices to other policies.

Second, it is crucial to think about this problem from a general equilibrium perspective. A monetary expansion can affect income and wealth through a number of channels. It boosts financial assets that are held by the rich, but it also makes debt less onerous, thus helping the poor. It stimulates profits and capital markets, but it also raises employment, which is the main source of income for the poorest. We do not yet have a full formal model of these mechanisms, but this is no justification for not giving them serious consideration, or for focusing on one of them in isolation while ignoring the rest.

[9] These themes are developed further in Panetta (2015).

Ongoing research at the Bank of Italy tries to build up this 'general equilibrium' view from micro data. The project examines the impact of unconventional monetary measures on a large number of variables in individual Italian households' balance sheets[10]. The main finding is that the traditional effects of monetary policy via activity and employment have prevailed even during the global crisis. By far the most relevant short-term distributional implication of expansionary monetary policy remains that, by stimulating the economy, it positively affects the incomes of the less well-off, whose jobs and wages are more sensitive to cyclical fluctuations. Financial benefits for wealthy households due to capital gains do emerge, but they are smaller than the advantages for the low-income population stemming from the improvement of labour market conditions and from the lower cost of debt. Overall, inequality decreases (figure 9).

To those who are sceptical of this particular result, or of model-based estimates in general, I would ask Bernanke's simple question: "If the average working person were given the choice of the status quo (current Fed policies) and a situation with both a weaker labor market and lower stock prices (tighter Fed policies), which would he or she choose?"[11]. I believe the average person, or median voter, would be in favour of the current stance, both in the US and in Europe.

2.7. CONCLUSIONS

The crisis has taught us many lessons about central banking. The most important is that monetary policy is not a mechanical exercise carried out by wooden technocrats: central banking remains as much of an art today as it was in the 1930s. It is thanks to their creativity, coupled with their determination to do 'whatever it takes', that central banks have avoided a meltdown of the financial system and another Great Depression. But the mission has not yet been accomplished. Although the euro area is giving encouraging signs, its recovery from the worst crisis in its history cannot be taken for granted and, as of today, remains subject to significant risks. In such an uncertain and fast-changing environment, central bankers' proven willingness to be bold, decisive and innovative gives much ground for optimism.

[10] Casiraghi *et al.* (2016b).
[11] "Monetary policy and inequality", Ben S. Bernanke's blog, June 2015.

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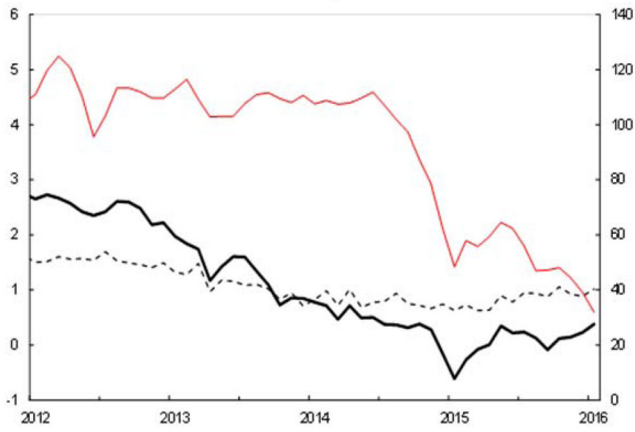
Table 1: Selected estimates of the effects of large-scale asset purchases on long-term rates

Study	Sample	Method	Estimates of effect (1)	Effect per purchases of 1% GDP (in bp)
Casiraghi *et al.* (2016a)	Italy SMP	time series	200 bp per €100bn	31
Ghysels *et al.* (2014)	Italy SMP	time series	100 bp per €100bn	16
Eser and Schwaab (2013)	Italy SMP	time series	190 bp per €100bn	30
Krishnamurthy *et al.* (2011)	postwar U.S., LSAP1, and LSAP2	time series	15 bp per $600bn	4
Gagnon *et al.* (2011)	LSAP1	event study	30 bp per $600bn	8
Gagnon *et al.* (2011)	LSAP1	time series	18 bp per $600bn	5
D'Amico and King (2013)	LSAP1 Treasury purchases	security-specific event study	100 bp per $600bn	27
Hamilton and Wu (2011)	U.S., 1990–LSAP2	affine no-arbitrage model	17 bp per $600bn	5
Christensen and Rudebusch (2012)	LSAP1, LSAP2, and	event study, affine no-arbitrage model	10 bp per $600bn	3

Notes: (1) Estimates for the US are from the survey in Williams (2014).

Figure 1: Inflation and monetary policy in the euro area

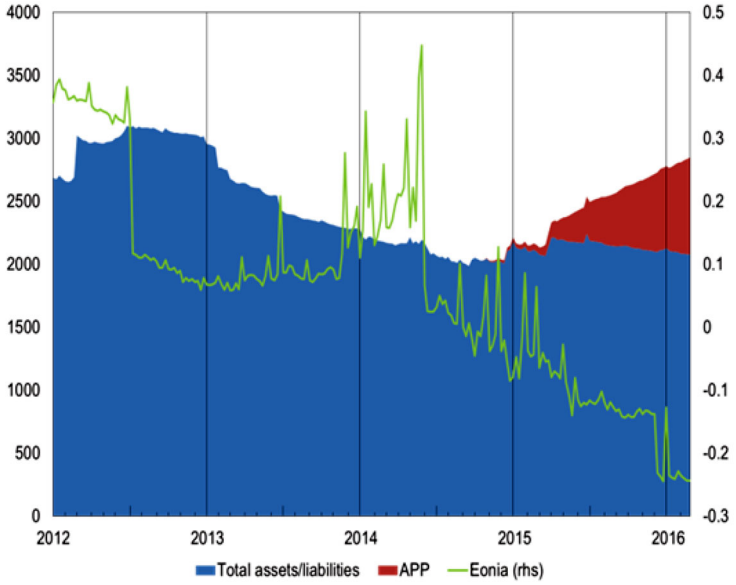
Price developments (monthly data)



Source: Eurostat.

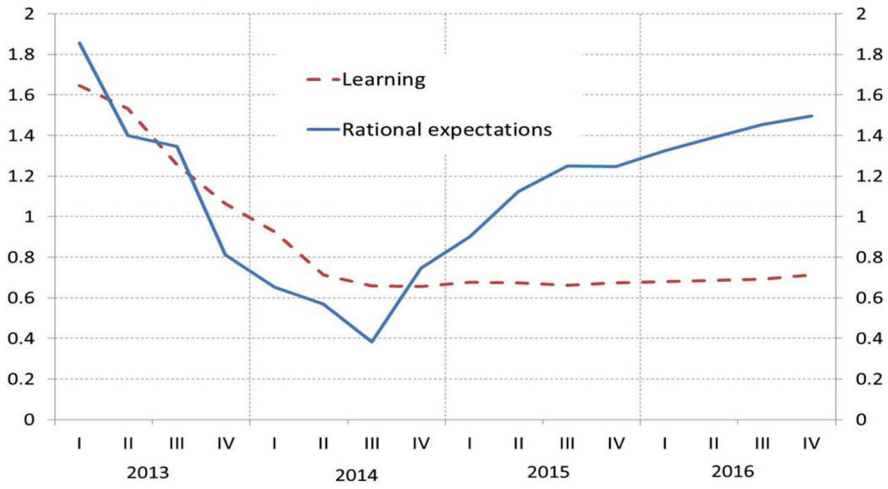
Figure 1: Inflation and monetary policy in the euro area *(continued)*

Eurosystem balance sheet and short-term rates (billions of euros; p.p.)



Source: ECB.

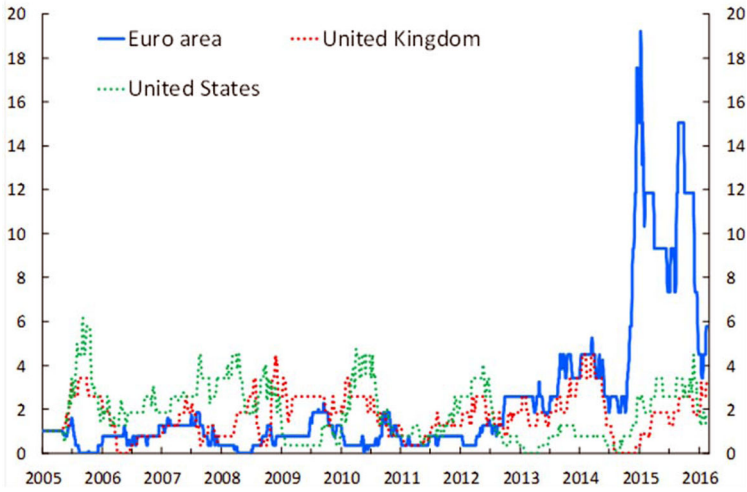
Figure 2: Price dynamics in the euro area under two scenarios (4-quarter change; per cent; quarterly data)



Source: Busetti et al. (2014).

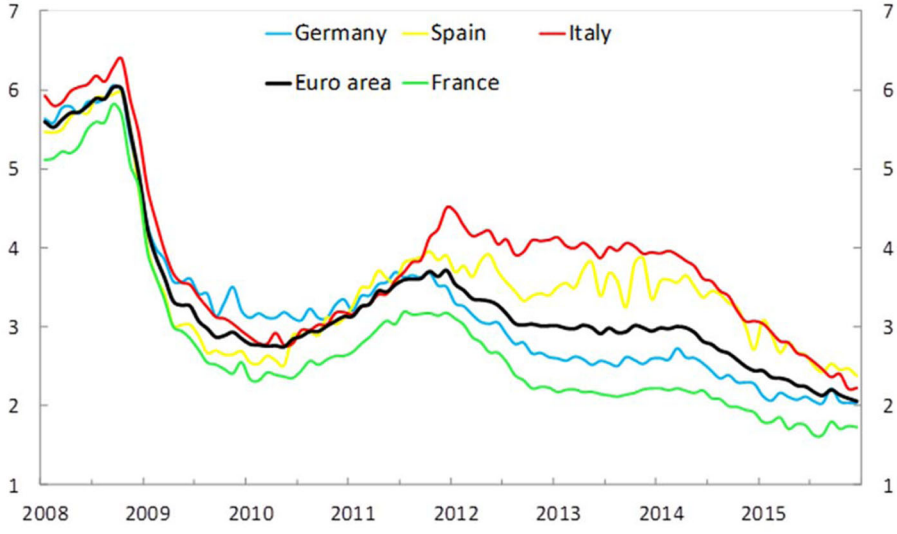
Notes: The baseline scenario is derived from a simple model with RE (designed to replicate actual euro area data until 2014 Q3, thereafter forecasts as of September 2014); the alternative scenario assumes instead incomplete information and recursive learning.

Figure 3: The risk of de-anchoring inflation expectations (daily data)



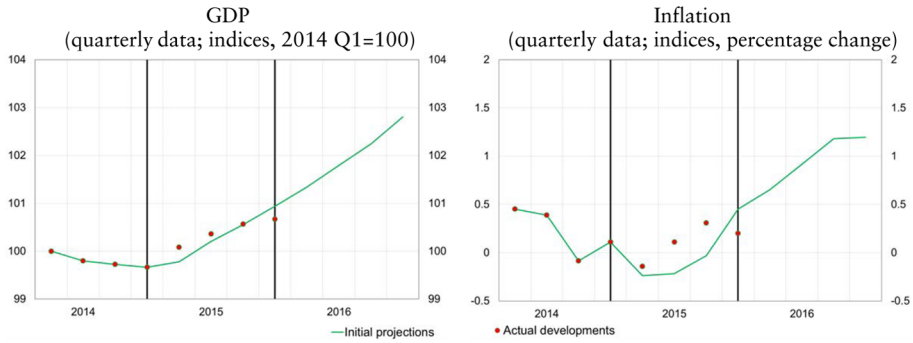
Source: Natoli and Sigalotti (2015), "An indicator of inflation expectations anchoring"
Notes: based on Bloomberg data.

Figure 4: Composite indicator of cost of new loans to non-financial corporations (percentage points)



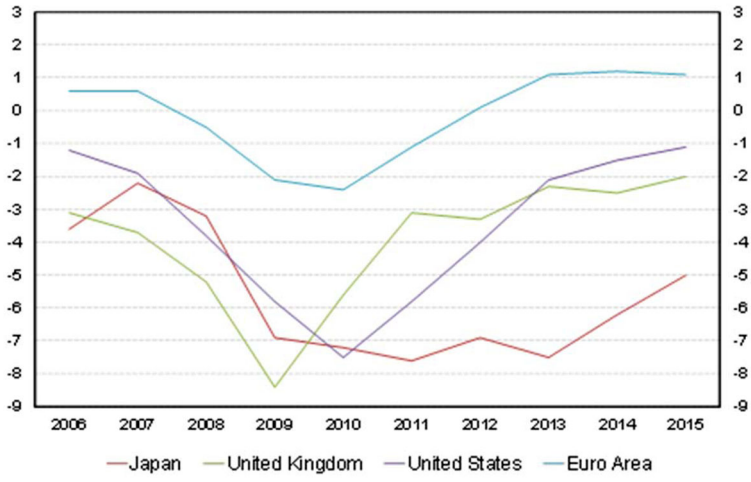
Source: European Central Bank.
Notes: Average of interest rates on new short- and medium-to-long-term loans weighted using the 24-month moving average of new loan disbursements. Includes overdrafts.

Figure 5: The effects of the APP in Italy: initial projections and actual developments



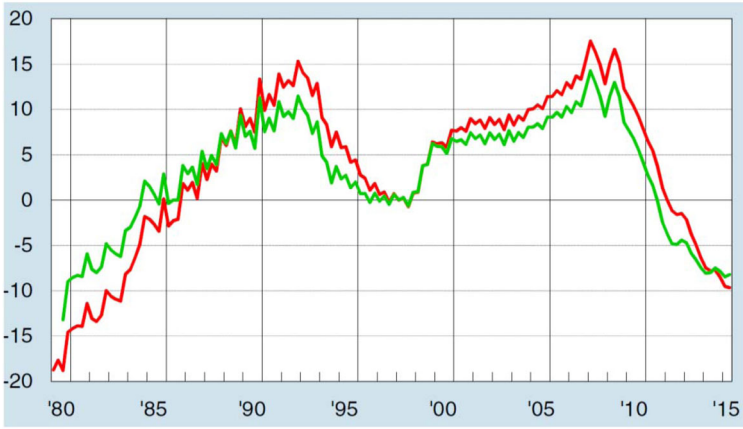
Notes: The projections presented in the above Figure incorporate the estimates of the macroeconomic effects of the APP that were included in the box 'The macroeconomic impact for Italy of the Eurosystem's Asset Purchase Programme' in Bank of Italy's Economic Bulletin, No. 2, 2015. The actual trend displayed by inflation in the fourth quarter of 2015 incorporates the provisional figure for December

Figure 6: Cyclically adjusted primary balance in advanced economies (percent of potential GDP)



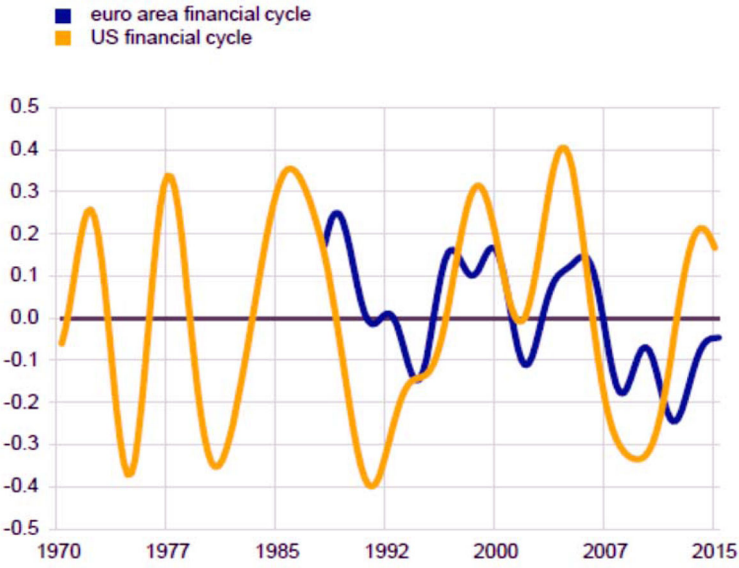
Source: IMF staff estimates and projections.
Notes: Cyclically adjusted primary balance is defined as the cyclically adjusted balance axcluding net interest payments.

Figure 7: The credit cycle in Italy



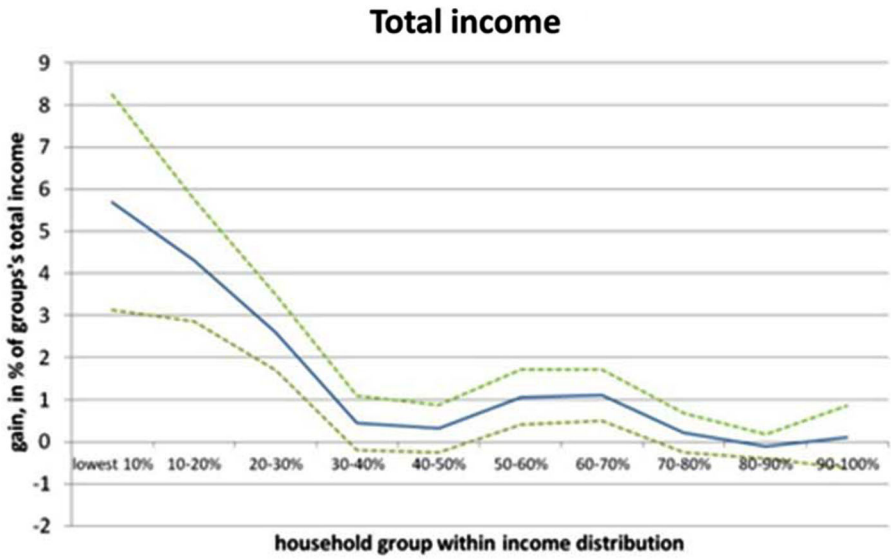
Source: Bank of Italy, Financial Stability Report, November 2015.
Notes: Estimates of the cyclical component in the aggregate credit-to-GDP ratio for Italy. Red line: estimate based on a standard Hodrick-Prescott filter. Green line: estimates based on a corrected version of the Hodrick-Prescott filter (see Alessandri et al., 2015).

Figure 8: The financial cycle in the euro area



Source: European Central Bank Financial Stability Review, November 2015.
Notes: The financial cycle is obtained as a time-varying linear combination of a set of indicators including total credit, residential property prices, equity prices and bond yields.

Figure 9: Distributional effects of monetary policy shocks



Source: Casiraghi et al. (2016b).
Notes: The figure reports the estimated effects of unconventional measures adopted by the ECB in 2011-2012 (SMP, 3-year LTROs and OMTs) on the income of Italian households. The impact is calculated separately for each decile of the income distribution, and it is expressed in percentage points relative to the initial income level. For each household, the overall income variation reflects three components: an increase in employment and wages, a fall in the interest rates on assets (i.e bank deposits and government bonds) and debt (i.e. bank loans), and capital gains stemming from a rise in house, bond and equity prices. Bands indicate +- two standard deviations around each group mean.

3. Reflections on the natural rate of interest, its measurement, monetary policy and the zero lower bound

Alex Cukierman[1]

3.1. Introduction

Wicksell (1898) conceptualized the natural rate of interest as the rate at which the price level is stable. This notion is a basic element of the modern New-Keynesian (NK) framework (Woodford, 2003; Gali, 2008). In this framework the natural rate is the real rate at which the output gap, and therefore inflation are equal to zero (or more generally to the inflation target) in the absence of temporary shocks. Given that shocks are stationary monetary policy is expected to gradually move inflation (as well as inflationary expectations when they are unanchored) toward the inflation target. In the standard NK model efficient monetary policy can be viewed as using the riskless short term policy rate to gradually move this rate toward its natural rate counterpart.

Since most investments are risky and their gestation period of longer duration this paper argues that it is important to also consider natural long term and risky rates of interest and their implications for the economy and for monetary policy. The investigation and estimation of a risky long term natural rate of interest is likely to bring to the surface real life factors that are abstracted from in existing literature. This is particularly important during crisis times when those two rates move in opposite directions[2].

The persistent decrease in long term interest rates since the beginning of the twenty first century and the intensification of this trend with the onset of the global financial crisis (GFC) nurtured the view that there has been a substantial and persistent decrease of the natural rate into the negative range (Laubach and Williams, 2015; Curdia *et al.*, 2015).

In many developed economies actual short term policy rates reached the zero lower bound already early in the crisis and have mostly stayed in this range since then. This, along with persistently low and even negative inflation rates, imply that actual real short term rates are bounded from below by zero. Given those

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I am indebted to Tommaso Monacelli for bringing recent estimates of the natural rate of interest to my attention. E-mail: alexcuk@post.tau.ac.il.

[2] Figure 1 in Gilchrist and Zakrajšek (2012) shows that the spread between risky and riskless US rates was at an all times high precisely when the short term policy rate reached the zero lower bound.

observations the finding that the real natural rate of interest is negative and is likely to remain in this range for a while constitutes a non-negligible constraint on the efficient conduct of monetary policy. It is therefore important to evaluate the extent to which recent estimates of the natural rate are as low as implied by recent research.

Since both the natural rate and the output gap are unobservable they have to be inferred from observables. Recent literature achieves this objective by applying either the Kalman filter or Bayesian estimation to alternative versions of the NK model. This paper argues that, since the NK model abstracts from credit rationing and from the financial stability motive on the part of monetary policymakers, existing estimates of the natural rate are likely to be biased downward, particularly so since the onset of the GFC[3].

It is well accepted that small and medium size borrowers are likely to be credit rationed due to moral hazard, insufficient collateral and other reasons. (Bernanke and Gertler, 1989; Bernanke, Gertler and Gilchrist, 1999). The decrease in the value of financial assets in the wake of the GFC increased the degree of credit rationing, first by reducing the value of borrower's collateral and second by reducing banking capital. Both factors reduce credit and aggregate demand. Since there is no proxy for this effect in the conventional NK IS relation the decrease in aggregate demand is interpreted by the estimation procedures above as a decrease in the natural rate of interest.

This potential bias is shared by both the Laubach and Williams (2015) as well as by the Curdia *et al.* (2015) papers. Since it also utilizes the monetary rule of the Fed to extract the natural rate the second paper is likely to suffers from an additional downward bias due to the fact that the monetary rules used in the paper do not feature a proxy for the financial stability motive of the central bank (CB)[4]. As a consequence the highly expansionary policies of the Fed in reaction to the subprime crisis are interpreted as a decrease in the natural rate further biasing this estimate downward[5].

The paper's organization follows. Section 2 documents the downward trend in (mainly) riskless long and short term interest rates since the start of the twenty first century and discusses the causes underlying it. Section 3 briefly reviews and compares alternative natural rate concepts. The following two sections analyse in some detail how changes in credit rationing and in monetary policy in the wake of the crisis might have biased recent estimates of the natural rate downward.

[3] Broadly similar, but somewhat less structured, arguments are made by Taylor and Wieland (2016).
[4] Chapter 7 in Cukierman (1992) discusses the impact of this motive on monetary rules.
[5] Interestingly the natural rate projections derived from the Curdia *et al.* (2015) framework are substantially more negative than those of Laubach and Williams (2015) who do not rely on the monetary rule to estimate the natural rate (compare Figure 3 with Figure 6).

Section 3 demonstrates this for the Laubach and Williams (2015) framework and section 4 for the Curdia *et al.* (2015) model. In the second model the natural rate is conceptualized as the rate of interest that would exist in the absence of monopolistic competition distortions. Since such distortions **are present in reality** their estimate of the natural rate appears to suffer from an additional downward bias. Section 5 makes a plea for defining and measuring a risky natural rate of interest and argues that such a concept is a useful complement to the existing riskless natural rate concept, particularly so, during times of financial turmoil. This is followed by concluding remarks.

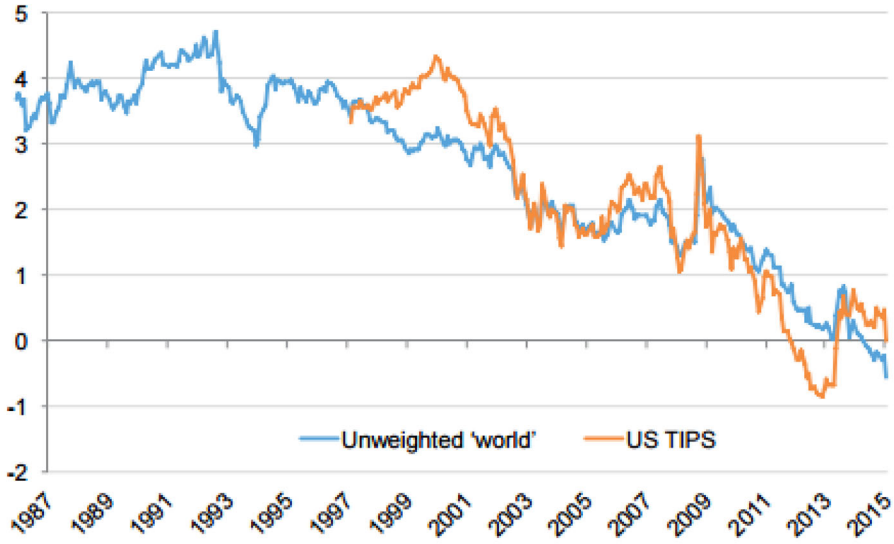
3.2. BRIEF LOOK AT THE RECENT BEHAVIOR OF RISKLESS LONG TERM INTEREST RATES AND ITS CAUSES

Long term risk free interest rates have been on a downward path since about the beginning of the twenty first century. This trend intensified with the outbreak of the CFC and persists to this day. **Figure 1** shows the behaviour of a simple average of real yields on C7 ten years government bonds excluding Italy between 1987 and 2015. The figure shows that this rate fluctuated between three and four percent prior to the beginning of the current century. It dropped to the two percent range between 2002 and 2007. Following some temporary violent fluctuations in the aftermath of Lehman's collapse and unusually expansionary monetary policies, first in the US and subsequently in the Euro area and other countries the long term risk free rate decreased further to the range between zero and one percent and even became negative occasionally.

3.2.1. What caused the downward trend in riskless interest rates?

Bean *et al.* (2015) usefully classify the potential factors underlying the descent in the riskless long term rate into the following three factors: Upward shifts in the propensity to save, downward shifts in the propensity to invest and an increase in the relative demand for safe assets. The empirical evidence is consistent with the view that the increase in the propensity to save is the most important factor. Several developments underlie the increase in the propensity to save: Increases in life expectancy not matched by increases in retirement age raised the urge to save more for retirement. This effect was particularly evident in developed economies and in China. The Chinese one child policy in conjunction with a very partial pension system in this country kept the saving rate in China at unusually high levels.

Figure 1. 'World' ten year risk-free real interest rate



Notes: 'World' real interest rate is an unbalanced simple average of G7 ex Italy ten-year real yields. Sliced UK indexed gilts were used to proxy world real yields from 1985-1996. From 1997-2006, 'World' rates were calculated using a simple average of spliced US ten-year TIPS and UK IGs. From 2007-2008, 'World' rates were calculated using a simple average of spliced ten-year US, UK, Canada, Japan, and France indexed bonds. From 2008-2015, 'World' rates were calculated using a simple average of spliced 10-year US, UK, Canada, Japan, France, and Germany.
Source: Bean et al. (2015), Figure 1.4.

This tendency was reinforced by an increase in the share of middle income individuals relatively to old individuals over the twenty years starting in the early nineties. Since the bulk of savings is done by middle income individuals whereas old individuals dissave an increase in this ratio raises the aggregate propensity to save. The importance of Chines savings for the behaviour of long term rates in developed economies was reinforced by large current account surpluses, gradual removal of Chinese capital controls and a sustained increase in the relative size of the Chinese economy. All those factors combined to create, particularly in the US, a 'global saving glut'[6].

Large current account surpluses in China and other East Asian countries led to the accumulation of foreign exchange reserves in the vaults of their central banks. Since central banks traditionally invest their reserves in a conservative manner this spurred an increase in relative world demand for safe assets. The dismal performance of some of those countries during the 1998/1999 East Asian crisis further increased the precautionary demand for global safe assets. Caballero *et al.*

[6] This term was coined by Bernanke (2005) and elaborated further in Bernanke (2007).

(2008) argue that, due to their stable political systems, wide capital markets and strong protection of private property this led to an increase in the demand for long term government bonds in the US and Europe and reduced interest rates on those safe assets.

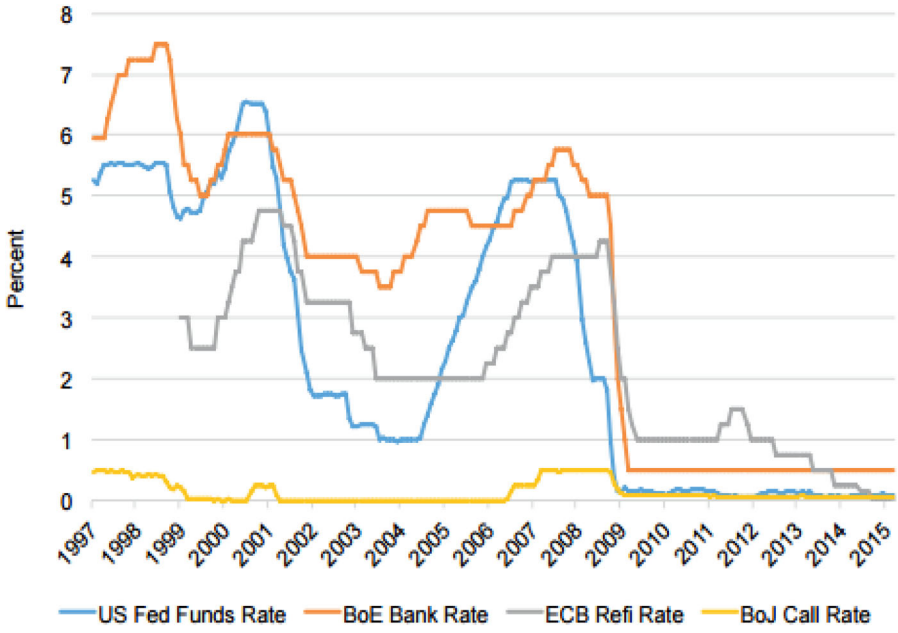
Prior to the crisis some of this demand for safe assets was also directed at high grade corporate and mortgage backed securities (MBS). Between 2009 and 2014 net new issues of MBS were mostly in the negative range (Cukierman, 2016; Figure 6). Caballero and Farhi (2014) argue that this partial extinction in the global supply of safe assets reinforced the downward trend in riskless long term rates. However, due to the large quantitative easing operations of major central banks it is likely that this effect is temporary.

Of the three long term potential channels conducive to low rates the long term decrease in the propensity to invest is the most controversial. This 'secular stagnation' hypothesis argues that the decrease in the real riskless rate is due to a decrease in the expected future output growth triggered by a slowdown in technological innovations in the advanced economies. The revival of this hypothesis is due to Gordon and Summers. In addition to a persistent lack of aggregate demand Gordon (2012, 2014) argues it is unlikely that the future will bring new general purpose technologies like the steam engine; railroads; electricity; the internal combustion engine and the digital revolution. Summers (2013) bases his secular stagnation hypothesis on the presumption that the natural rate of interest has fallen below the zero bound. Due to this bound monetary policy is unable to sufficiently revive aggregate demand which induces, through hysteresis, a secular slowdown in the rate of output growth. Both views imply there should be a positive correlation between expected output growth and real interest rates. Figure 2.A from Bean *et al.* (2015) suggests that this is hardly the case.

Although the downward trend in interest rates started some time prior to the GFC this trend was substantially reinforced by extraordinarily expansionary monetary policies of major central banks. **Figure 2** shows that shortly after Lehman's collapse the policy rates of the Fed, the Bank of England and the Bank of Japan quickly declined to the vicinity of the zero lower bound (ZLB)[7]. This was followed by massive quantitative easing operations over a number of years. Although central banks directly control only short term rates it is highly likely that the post-Lehman further decrease in long term rates and its persistence is largely due to those unusually expansionary policies. The ZLB constraint on monetary was bypassed by means of massive large scale purchases of assets.

[7] The policy rate of the, initially more conservative, ECB reached this range only in 2014 (further details appear in Figure 1.1 of Bean *et al.* (2015)).

Figure 2: Official policy rate



Source: Bean et al. (2015), Figure 1.1.

In the US a non-negligible part of the Fed's asset purchases were explicitly designed to reduce the term premium on long term bonds by acquiring such bonds and financing those purchases by the sale of short term bonds (Titan and Swanson, 2011). This downward effect was, and still is, reinforced by forward guidance concerning the path of future short term policy rates by Fed officials who periodically announce that the return to higher policy rates will be very gradual.

The post-crisis persistence of low interest rates is also related to the attempt by many central banks to preserve the competitiveness of their economies by prevention of domestic currency appreciation due to expansionary monetary policies in the rest of the world. This 'shadow currency war' pulls long term world riskless rates downward and prolongs the period over which the ZLB is binding.

3.3. THE MULTIPLE FACETS OF THE NATURAL RATE OF INTEREST

Wicksell (1898) characterized the natural rate of interest as follows: "There is a certain rate of interest on loans which is neutral in respect to commodity prices,

and tends neither to raise nor to lower them." Woodford (2003) and others embed this concept into the modern New-Keynesian (NK) framework. A basic building block of this framework is the NK IS relation that connects inflation to expected inflation and to the output gap. In this framework the natural rate of interest is conceptualized as the real interest that produces a zero output gap when both actual and expected inflations are equal to the inflation target and temporary shocks are set to zero. Since the shocks in the model are stationary and monetary policy is expected to gradually anchor both inflation and inflationary expectations to the inflation target, efficient monetary policy can be viewed as using its policy instruments to gradually move the policy rate toward the natural rate. At a more fundamental level the natural rate depends on the expected secular rate of growth of potential output and on the long run behaviour of intertemporal preferences.

A basic challenge to the implementation of this scheme is that potential output and, therefore, the natural rate are not observable variables. Consequently they have to be inferred from observable variables by means of a theory that links unobservable to observable variables. As a result empirical estimates of the natural rate and of potential output become model dependent. Recent empirical work attempts to overcome this challenge by using the Kalman Filter or Bayesian estimation to pin down the (a priori) unknown parameters needed to obtain estimates of the natural rate and of potential output. A related difficulty is that those methodologies and the theoretical models they are applied to still leave substantial freedom in the conceptualization of the natural rate of interest.

This freedom arises for two main reasons: First because, although related, short term and long term interest rates behave differently. Similarly, although related, risky and riskless rates also behave differently. The Cartesian product of those two classifications yields four possible conceptualization of the natural rate: A short term natural riskless rate, a long term natural riskless rate, a short term natural risky rate and a long term natural risky rate. Section 6 below argues that, of those four concepts, the one that is most important for investment and aggregate demand is the last one. However, it appears that to this date, the literature has not attempted to formulate and estimate a risky long term natural rate. Laubach and Williams (2015) interpret their estimates as referring to a long term natural rate. On the other hand Curdia *et al.* (2015) who are mainly interested in a comparison of two alternative monetary policy rules provide estimates of a short term natural policy rate.

Although neither of those papers explicitly states whether those estimates refer to risky or to riskless rates it appears that the second interpretation is more relevant since the observed interest rate they use is mainly the short term policy rate. This view is backed further by the fact that in the post crisis era all those estimates flirt

with the ZLB whereas, as shown in Gilchrist and Zakrajšek (2012), longer term **risky** rates are substantially above zero over the same period. Section 6 below elaborates on the desirability of formulating and estimating a long term risky natural rate.

3.4. ARE RECENT ESTIMATES OF THE RISK FREE NATURAL RATE OF INTEREST BIASED DOWNWARD?

The depth and persistence of low long term riskless rates both before and after the GFC nurtured the view that the natural rate of interest is currently lower than it used to be in the past. Structural empirical work by Laubach and Williams (2003, 2015), Curdia *et al.* (2015) and others confirms this view. Curdia (2015) even concludes that the natural rate is likely to be very low by historical standards for a long period of time.

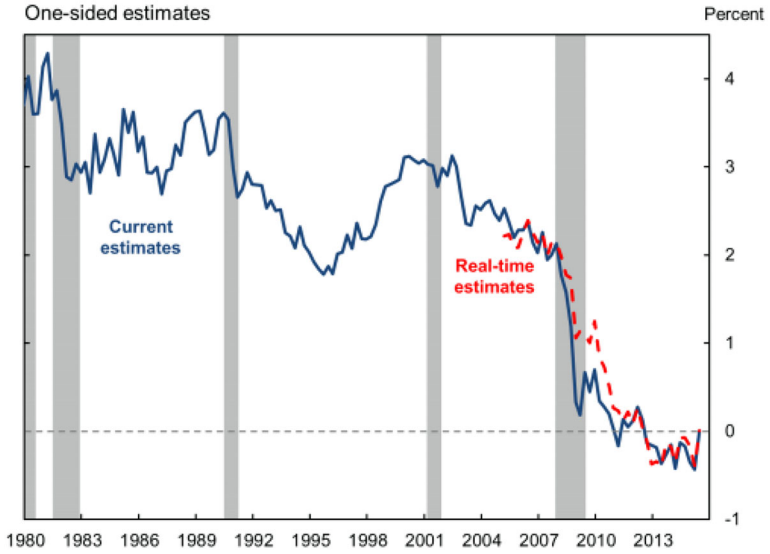
3.4.1. The Laubach and Williams estimates of the natural rate of interest

Laubach and Williams (2003) is one of the first attempt to estimate the long run natural rate of interest and the closely related secular rate of growth of potential output. Using their 2003 methodology Laubach and Williams (2015) (LW in the sequel) update their original estimates to include the period of the GFC. **Figure 3** summarizes the evolution of their risk free natural rate of interest. The figure shows that between 1980 and 2008 this rate decreased from a bit less than four percent to two percent with a dip to two percent in the mid-nineties, a recovery to 3 percent at the beginning of the twenty first century and a decrease back to two percent just prior to the downfall of Lehman Brothers. Following this event the estimated natural rate takes a further abrupt dip to the vicinity of zero and even becomes slightly negative from the end of 2013 and on.

This pattern is generally mirrored by LW's estimates of the rate of growth of potential output. In particular following the subprime crisis this estimate also decreases sharply from around 3 percent to the vicinity of two and a half percent (**Figure 4**). The co-movements between the natural rate and the rate of growth of potential output are a consequence of the fact that the structural model postulated and confirmed in LW implies that, up to a persistent stationary preference shock, there is a positive linear association between the natural rate and the rate of growth of potential output.

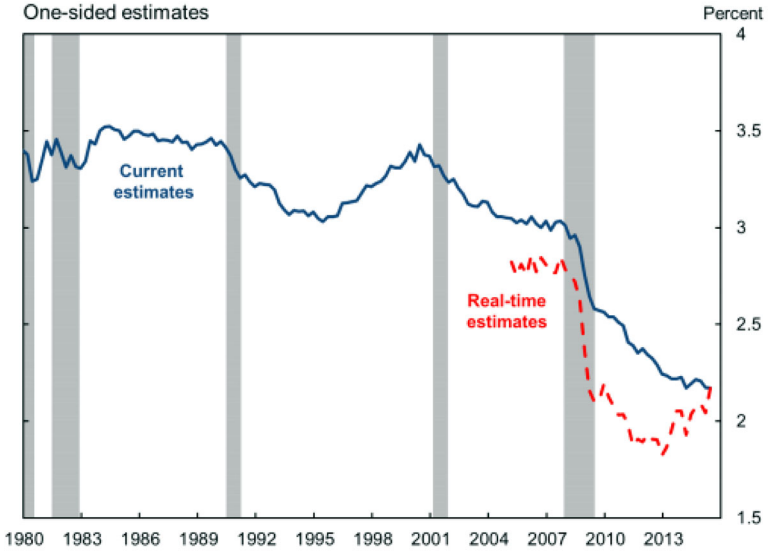
Since both the natural rate of interest and the rate of growth of potential output are unobservable LW postulate a standard New-Keynesian (NK) model and apply

Figure 3. Laubach-Williams model estimates of the natural rate of interest



Note: Real-time estimates represent the estimate of the natural rate based solely on data available a few months after the end of the quarter for which the estimate is reported.
Source: Laubach and Williams (2015), Figure 5.

Figure 4. Laubach-Williams model estimates of the trend growth rate of potential output



Note: Real-time estimates represent the estimates of the trend rate of growth of potential output based solely on data available a few months after the end of the quarter for which the estimate is reported.
Source: Laubach and Williams (2015), Figure 6.

Kalman filter methods to observable variables like actual output and inflation to estimate the unobservable time paths of the natural rate and the related trend rate of growth of potential output. Abstracting from lags, future expected potential output, relative prices and shocks the essence of their model is captured by the following two NK equations

$$y - y^p = -\beta(r - r^n) \tag{1}$$

$$\pi = \pi^e + \theta(y - y^p) \tag{2}$$

along with a structural equation that relates the (real) natural rate of interest, r^n, to the rate of growth of potential output, g^p

$$r^n = \delta g^p \tag{3}$$

Here y and y^p are the logs of actual and potential output, r is the actual risk free real rate of interest, π and π^e are actual and expected inflation, and β, θ and δ are positive parameters. The first equation is the NK IS relation that relates the output gap to the interest rate gap, $r - r^n$, and the second equation is the NK Phillips equation that relates actual inflation to expected inflation and to the output gap[8].

3.4.2. The impact of credit rationing on LW's estimates of the natural rate of interest

In the presence of some credit rationing aggregate demand and economic activity depend not only on the cost of credit but also on the availability of credit. To reflect this fact the NK IS relation in equation (1) is replaced by

$$y - y^p = -\beta(r - r^n) + \gamma L \tag{4}$$

where L is the volume of available credit and γ is a positive parameter. Equation (4) states that the output gap depends both on the cost and the availability of credit. Possible micro-foundations for such an equation may include a model in which the aggregate demand of borrowers with plenty of collateral reacts only to the cost of credit while the aggregate demand of borrowers with little collateral respond mainly or only to the degree of credit rationing. Credit rationing is likely to be particularly important for small and medium size enterprises that do not have direct access to the capital market and have to rely, therefore, on banking credit.

[8] The LW Phillips relation features a distributed lag on past rates of inflation that is summarized here by expected inflation on the ground that a main determinant of future expected inflation is past inflation. This compactification does not affect the main arguments that follow below.

Omission of a proxy for the degree of credit rationing as proxied by the level of credit from the NK IS relation creates a downward bias in the estimate of the natural rate of interest (and of potential output) when L goes down. The intuition underlying this claim follows: Due to the fact that both the output gap and the natural rate of interest are unobservable the Kalman filter procedure infers those two variables from observations on the actual values of output and inflation. Since it does not appear in equation (1) a decrease in L that reduces both output and inflation is attributed by the Kalman filter procedure entirely to a decrease in the natural rate of interest. This can be demonstrated more formally by expressing inflation in terms of the interest rate gap by substituting equation (4) into equation (2)

$$\pi = \pi^e - \theta\beta(r - r^n) + \theta\gamma L. \tag{5}$$

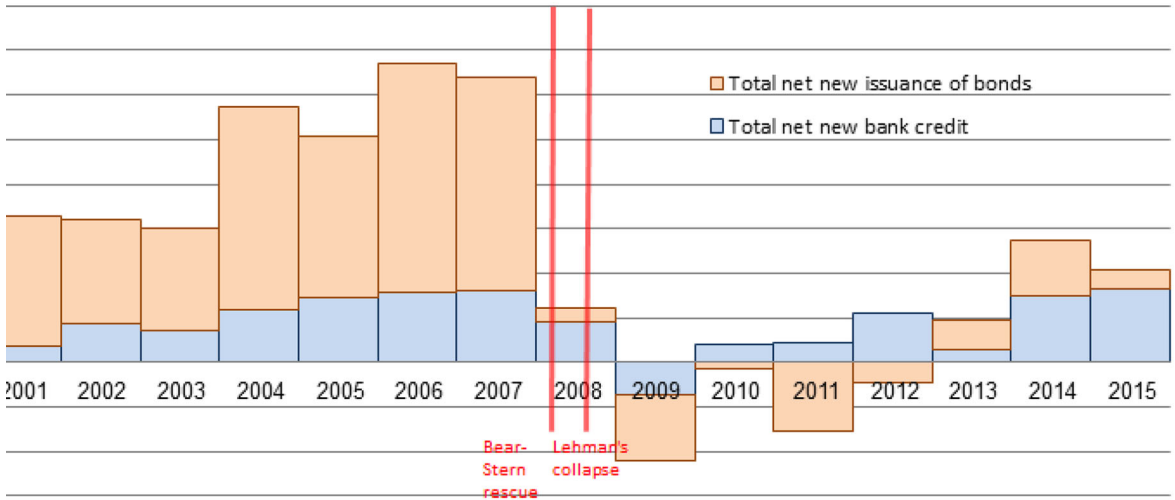
Equation (5) implies that a ceteris paribus decrease in L reduces inflation. Since the LW procedure omits L the Kalman filter interprets the decrease in inflation as a reduction in the natural rate (and through equation (3) also as a reduction in the secular rate of growth of potential output) in spite of the fact that, by assumption, there was no change in either of those variables[9]. Since there were no discernible changes in credit rationing prior to the subprime crisis this bias might have been relatively unimportant prior to the crisis.

But there is little doubt that it went up dramatically due to the credit arrest observed in the aftermath of Lehman's collapse. As a matter of fact it is likely that a large part of the decrease in the estimated natural rate of interest from around two percent just prior to Lehman's collapse to a bit above zero during 2009 is explainable in terms of a dramatic increase in credit rationing rather than in terms of a decrease in the natural rate. **Figure 5** shows that credit growth in the post Lehman era has been extremely sluggish at least through 2013. This observation is consistent with the view that the persistent decline of inflation is due, in large part, to a persistent decline in credit growth rather than to a further decrease in the natural rate. Cukierman (2016) argues that this persistent drop is due to a combination of the following three factors: A decrease in the value of collateral due to the decrease in asset prices, toughening of regulation on financial institutions and the collective trauma experienced by financial market participants once they realized that even a SIFI will not always be bailed out[10].

[9] Relatedly, Taylor and Wieland (2016) argue that a similar downward bias in the natural rate arises when financial regulation is toughened.

[10] The theoretical underpinnings of the last mechanism appear in Cukierman and Izhakian (2015).

Figure 5. Total net new bank credit + Total net new issuance of bonds in the US, excluding treasury bills (Billions of $)



Source: Cukierman (2016), Figure 5.

3.5. CURDIA'S *ET AL.* ESTIMATES OF THE NATURAL RATE OF INTEREST

Using a combination of calibration and Bayesian estimation Curdia *et al.* (2015; Figure 1) find that the natural rate dropped sharply to around minus ten percent in the aftermath of Lehman's collapse. They use a conventional NK model to compare the performance of the Taylor rule to an alternative Wicksellian rule in which the monetary authority gradually adjusts the federal funds rate (FFR) so as to attain the natural rate of interest in the no shocks long run equilibrium. They refer to those two monetary rules as the T and the W rules respectively and find that the second rule provides a more plausible description of actual US monetary policy during the sample period. Abstracting from lags, future expected potential output and shocks their model of the economy is also described by equations (1) and (2). As was the case in the LW framework their estimates of the natural rate are, therefore, potentially subject to a bias due to omission of a proxy for credit rationing in the NK IS relation.

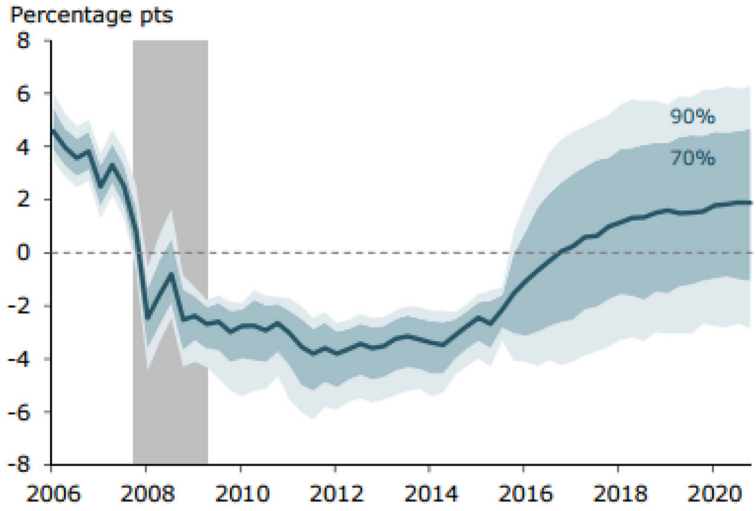
Although the spirit of the Curdia *et al.* (2015) and LW models of the economy is similar their methodologies differ in a number of important respects. In particular Curdia *et al.* (2015) interpret potential output as the efficient level of output. As in Woodford (2003) and Gali (2008) this is the level of output in a perfectly competitive flexible price economy. Correspondingly the natural rate of interest is defined as the rate at which actual output is equal to efficient output. Given that monopolistic competition is a more realistic approximation of markets than perfect competition the efficient output level requires that there exists a system of taxes and transfers that maintains all mark-ups at zero. Second, in order to compare the empirical performance of the T and W rules Curdia *et al.* (2015) add either of those rules or some combination thereof to the structure to be estimated and assume that the Fed sets the FFR by using either the T or the W rule. Finally they perform a large numbers of sensitivity tests.

3.5.1. The impact of the crisis on Curdia (2015) estimates of the natural rate of interest

Curdia (2015) utilizes an updated version of the framework in Curdia *et al.* (2015) to derive in sample and out of sample estimates of the natural rate of interest. **Figure 6** that summarizes those estimates shows that after becoming negative at the end of 2007 the natural rate decreased to around minus four percent during 2009, remained in this range over the entire 2010-2014 period, and is predicted to become positive again only in 2017. As was the case with the LW estimates the big drop in 2008/2009 raises again the suspicion that a large

part of the drop is due to a persistent increase in credit rationing rather than to a persistent decrease in the natural rate of interest.

Figure 6. Curdia's estimates of the natural rate of interest (annual rate)



Note: Blue shaded areas represent the range of possible estimates with 70% (darker) and 90% (lighter) probability. Gray bar indicates NBER recession dates.
Source: Curdia (2015), Figure 1.

But in the case of Curdia's estimates there is an additional factor that, most likely reinforces the post-Lehman downward bias in those estimates. The model used by Curdia *et al.* (2015) partially relies on either the T or the W monetary rule in order to estimate parameters and ultimately identify the path of the natural rate. The specifications of both rules abstract from the fact that since the onset of the subprime crisis the Fed's monetary policy was largely motivated by the financial stability motive[11]. As a consequence both interest rate and quantitative easing (QE) policies were largely responsive to the elevated demands for liquidity by the private sector.

Since both the T and the W rules do not feature a proxy for this reaction, the low interest rate policy of the Fed, as well as the substantial QE operations deployed with the arrival of the ZLB, are attributed to a low and even negative natural rate when, at least part of those policies is due to the reaction of the Fed to the decrease in credit and in asset prices. This omission biases the estimate of the natural rate downward. This can be seen more precisely by adding to both rules a proxy for the financial stability motive of the central bank (CB). A simple way

[11] An early analysis of the impact of this motive on the monetary rule appears in chapter 7 of Cukierman (1992).

to do that is to add a proxy for the deviation of the rate of growth of aggregate credit from a target level of this variable to the right hand sides of both rules. This is illustrated in what follows for the W rule (since the argument is identical for the T rule it is omitted). Abstracting from shocks and the adjustment lag in the CB nominal rate, *i*, the expanded W rule can be written as

$$i - \pi^e = r^n + \phi_\pi(\pi - \pi^T) + \phi_L(l - l^T) \tag{6}$$

where π^T is the inflation target, l is the rate of growth of credit, l^T is the target level for this rate and ϕ_π, ϕ_L are positive coefficients. The expanded rule states that when inflation and the rate of growth of credit are equal to their respective targets the CB conducts monetary policy so as to track the Wicksellian natural rate of interest, r^n [12]. But when the rate of growth of credit is below its target level, the CB reduces the policy rate and, if the zero lower bound (ZLB) is binding, engages in QE operations that are equivalent to further reductions in the policy rate.

The deep and persistent arrest in credit growth in the post-Lehman era documented in Figure 5 is consistent with the view that, during this period the credit growth gap, $l - l^T$, was negative implying that monetary policy was expansionary due to the financial stability motive. When, as is the case in Curdia *et al.* (2015), the term $\phi_L(l - l^T)$ is omitted from the monetary rule the Bayesian estimation procedure interprets the post-Lehman expansionary policies of the Fed as a decrease in the natural rate of interest inducing a further downward bias in the estimates of this variable[13].

Before concluding this section it may be useful to point out an implication of the notion that potential output is identical to the 'no distortions' level of output. As reported above, unlike LW, Curdia *et al.* (2015) interpret r^n as the no shocks interest rate at which actual output is equal to the level of output for which the monopolistic competition distortion is zero. Maintenance of this efficient output level calls for the existence of subsidies that eliminate the monopolistic competition distortion (Gali, 2008; chapter 5).

As a conceptual matter, and since such subsidies do not exist in practice, the natural rate in the model has to be sufficiently low in order to offset this distortion. This calls for a natural rate of interest that is permanently lower than the rate that would have existed if monetary policy had not been burdened with offsetting of the steady state monopolistic competition distortion. The extent to which this consideration pulls the entire path of estimated natural rates

[12] Implicit in this statement is the requirement that expected inflation is also equal to the inflation target.

[13] Relatedly, Taylor and Wieland (2016) attribute the downward bias in natural rate estimates to the omission of regulation from the NK IS relation and to a post-crisis downward deviation of the Fed's rate from the traditional Taylor rule.

downward is not a priori clear. This issue clearly deserves further scrutiny which, however, is beyond the scope of this paper.

3.6. THE CASE FOR DEFINING AND MEASURING A RISKY NATURAL RATE OF INTEREST

Since most investment activity is risky it is likely that such activity is more tightly related to interest rates that account for risk than to riskless rates. Real estate investment as well as consumption durables are also risky activities and are, similarly, more tightly related to risky rates. Investment and consumption demands are major components of aggregate demand. Hence aggregate economic activity should be more tightly related to risky than to riskless rates of interest.

This view is supported by empirical findings in Gilchrist and Zakrajšek (2012) ('CZ' in the sequel) that produce a broadly based index of interest rate spreads between risky corporate bonds and riskless US Treasury bonds during the 1973-2010 period ('CZ credit spread' in the sequel). CZ show that this index possesses substantial predictive ability for future economic activity. They further decompose this index of risk into two components: a component capturing the usual counter-cyclical movements in expected defaults, and a component representing the cyclical changes in the relationship between measured default risk and the CZ credit spreads to which they refer as an 'excess bond premium'. While the first component captures changes in the actual risk of default it is likely that the second is a proxy for changes in the pricing of risk.

CZ show that shocks to the excess bond premium that are orthogonal to the current state of the economy lead to economically and statistically significant declines in consumption, investment, and output, as well as to appreciable disinflation. Figure 4 in CZ also suggest that the positive relationship between the excess bond premium and economic activity is particularly in evidence during the 2007-2009 recession. This finding is consistent with the view that a non-negligible part of this recession was driven by increases in the pricing of risk.

The previous observations suggest that defining and measuring a natural rate of interest that also accounts for 'natural' long term risk and risk preference in the economy is a potentially fruitful extension of the existing riskless natural rate concepts. Risk and the pricing of risk are important determinants of both the supply and the demand for credit. Different secular components of risk and of its pricing imply, therefore, different levels of potential output and of the risky natural rate.

Recognition of the role of this concept opens the door for a more direct link between the health of the financial system, on one hand, and potential output and

the risky natural rate on the other. Since the health of the financial system depends, in turn, on the quality of supervision and of regulation such an approach paves the way for models that would more tightly relate potential output to financial institutions. It also may help establish a more direct link between economic performance, 'financial mood' and underlying financial institutions. By changing risk and risk premia long term changes in the structure of financial institutions and of regulation affect the long run level of credit and with it risky natural rates of interest. Highly visible traumatic events like letting a SIFI institution such as Lehman fail after bailing out many other such institutions are likely to have persistent effect on the "financial mood" and through it on the risky natural rate[14].

During periods of acute financial tensions the spread between longer term risky and riskless debt instruments widens providing an explanation for the fact that, in spite of extremely low short term policy rates, economic activity remains depressed as was the case during the GFC. Since risky long term rates have a substantially stronger impact on both the demand and the supply of credit than short term policy rates it is not surprising that economic activity was depressed during the crisis in spite of policy rates at the ZLB. Furthermore, during crisis times the importance of risk and the pricing of risk become more important determinant of economic activity relatively to the risk free rate than during normal times. Importantly, during a financial crisis risky rates go up rather than down – which pulls the risky natural rate up. A prolonged recession in the aftermath of a financial crisis can therefore be understood as arising from a persistent increase in the natural risky rate of interest due to increases in both risk and its pricing.

Those considerations suggest that during panics and acute financial crises the monetary authority should aim mainly at reducing the natural **risky** rate. Reductions in the short term policy rate is one way to achieve this objective. More important are measures aimed at the reduction of risk and of its pricing on longer term financial instruments. Demonstration of a strong determination to act as a lender of last resort also for risky assets on the part of the central bank is essential. From this perspective, the large scale purchases of long term riskless and risky assets by some major central banks during the GFC were essential for reduction of the risky long term natural rate.

During a financial crisis the capital constraints of financial intermediaries become more severe – which depresses their willingness to supply credit. He and Krishnamurthy (2013) argue that, in such circumstances, injections of equity capital by the CB are particularly effective. This finding along with the relative effectiveness of unconventional monetary policy instruments deployed during the crisis,

[14] Cukierman and Izhakian (2015) argue that the decision not to bailout Lehman and the ensuing panic permanently raised the public's aversion to bailout uncertainty.

suggest that the ZLB constraint on the short term riskless policy rate might be of lesser significance than currently believed.

3.7. CONCLUDING REMARKS

In conventional NK models of monetary policy the short term (real) riskless natural rate plays an important role as a guiding rod for the interest rate policy of the CB. With the onset of the GFC in 2007/2008 nominal policy rates of major central banks quickly reached the ZLB on the (nominal) policy rate and largely remain in this range to this day[15]. With very low and even negative inflation rates this implies that, approximately, the actual real short term policy rate is bounded from below by zero. Consequently if the real short term natural rate is negative the ZLB constitutes a serious constraint on conventional monetary policy.

Recent estimates of the natural rate imply that in the post crisis era the natural rate has been negative, and is expected to remain in this range for some time, supporting the view that the ZLB is a binding constraint on monetary policy. This paper argues that, due to substantial increases in credit rationing and omission of the financial stability motive from the monetary rule during the GFC, existing estimates of the natural rate are likely to be biased downward[16]. Hence the ZLB constraint may not be as serious as implied by those estimates.

There also are conceptual reasons which support the view that the ZLB constraint might not be as serious as it recently appeared to be. It is well accepted that long term risky rates are more important determinants of the output gap and inflation than the short term policy rate. As a matter of fact the conventional view of the transmission mechanism is that, by changing the short term policy rate, the CB will be able to sufficiently move long term risky rates and credit rationing so as to have an appreciable impact on the output gap and inflation. This mechanism is rather indirect even during normal times. But, as demonstrated by the experience of the GFC, it loses much of its punch during crisis times. Recognizing this fact the Fed and other central banks engaged in large scale asset purchases of varying maturities and risks.

This experience suggests that more attention should be payed to the long term risky rate and to the natural counterpart of this rate. Although this appears as a fruitful future research avenue at all time it is particularly important during financial crises when long term risky rates and the short term policy rates often move in opposite directions.

[15] An important factor in the developed world's race to the ZLB is the early and persistent reduction of the federal funds rate to this range by the Fed. This forced other central banks to follow suit in order to prevent excessive appreciations of their own currencies.

[16] Those factors existed also prior to the financial crisis but their relative importance increased substantially with its outbreak. The discussion in Taylor and Wieland (2016) also supports this conclusion.

Introduction of a long term risky natural rate into the analysis of monetary policy is likely to shed more light on the role of regulation and of other financial institutions in the determination of potential output and economic activity. Unlike the short term policy rate risky long term rate are seldom subject to the ZLB. As a matter of fact, during crises, they usually go up. This observation along with the higher relevance of risky long term rates for economic activity implies that the ZLB on the short term riskless policy rate may be of secondary importance. As a matter of fact it is possible that, even in the absence of a ZLB during crises, conventional short term interest rate policy loses much of its punch due to huge increases in demand for liquidity at such times.

Using a model of occasionally binding equity issuance constraints He and Krishnamurthy (2013) show that, in a crisis, equity injection is a superior policy compared to interest rate cuts or bond purchasing programs by the central bank. Incorporation of the natural levels of risk and of risk aversion into a natural risky rate concept is likely to pave the way for shedding new light on the relative desirability of alternative asset purchases programs.

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4. Monetary Policy Committees, Voting Behaviour and Ideal Points

Sylvester Eijffinger, Ronald Mahieu and Louis Raes[1]

4.1. Introduction[2]

While not obvious at first sight, in many modern economies, the position of a monetary authority is similar to the position of the highest-level court (Goodhart, 2002). For example, both bodies are expected to operate independently even though there are crosscountry differences in what independence entails. In the United Kingdom, the highest court is the Appellate Committee of the House of Lords (in short: Law Lords). There is a consensus among legal scholars that the powers of Law Lords with respect to the legislature are less wide ranging in the United Kingdom than the United States' counterpart, the supreme court (Goodhart and Meade, 2004, p. 11). In economic jargon one says that the Supreme Court has goal independence whereas the Law Lords have instrument independence.

If we compare the monetary policy committees in both countries (the Monetary Policy Committee and the Federal Open Markets Committee), we notice a similar pattern. The MPC has a clear inflation target, and therefor little goal independence. The FOMC has multiple objectives providing some discretion to the monetary policy makers.

Because independence is important for both the monetary authority and judicial courts, governments have applied similar recipes to guarantee independence. In the United States, the Supreme Court justices have lifelong appointments. Similarly, Board Governors, part of the FOMC, are appointed for fourteen years. These lengthy appointments serve to insulate justices and Governors from political pressure.

There are many more aspects with remarkable similarities (decision making procedures, the role of consensus, the role of the chairman, communications strategy etc.), see Goodhart and Meade (2004) for some examples.

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[2] This chapter is a shortened version of a chapter in preparation for the Handbook of Central Banking edited by David Mayes, Jan-Egbert Sturm and Pierre Siklos, Oxford University Press. We thank Alex Cukierman, Ernest Gnan, Charles Goodhart, Donato Masciandaro, Pierre Siklos and participants of the SUERF/BAFFI Carefin Center Conference 2016 for helpful comments.

However, details differ across countries and these details may matter. For example, most central banks have put a committee in charge of monetary policy and these committees vary substantially in many respects[3].

Besides guaranteeing independence, there are two additional concerns underlying the institutional design of a monetary authority or a judicial court. First, there is the need to balance independence with accountability. Second, there is the need to have sufficient technical skills[4]. Delegating important public tasks to individuals who are not elected and maybe even not directly under control of elected public servants requires a system of checks and balances as to ensure sufficient accountability. At the same time, both a monetary authority and a judicial court require some technical skills because these bodies often deal with complex issues.

Both monetary policy committees and judicial courts are the topic of extensive research. Given the similarities we described above, there has been occasionally cross-over between these literatures. Scholars thinking about decision taking in groups and committees often use monetary policy committees or judicial courts as an example. This overlap concerns mainly theoretical work[5].

Empirical work on monetary policy committees and judicial courts has evolved a bit more separately. One consequence of this is that we see different methodologies being used by scholars studying decision making at central banks and by scholars studying deliberations of courts.

In our own work[6] we use methods, which are predominantly used in the study of voting in legislative bodies and judicial bodies (e.g. the supreme court), to study voting at central banks. We do so because we believe that this methodological cross-over may be fertile. We do not claim that one methodology is superior over another, rather we feel that different approaches can prove to be complementary to each other.

4.2. RESEARCH ON MONETARY POLICY COMMITTEES

In the introduction we mentioned that the institutional design of central banks differs across countries. These differences often seem minor from a distance but could matter a lot in practice. The implication for research on central bank committees is that one should be cautious in generalizing the results of the study

[3] See for example the survey by Lybek and Morris (2004). The book by Siklos, Bohl and Wohar (2010) shows the diversity in institutional framework in central banks.

[4] On top of purely technical skills, there may be a need for some political skills as well, see Goodhart and Meade (2004) pp. 14-16.

[5] See Gerling, Grüner, Kiel and Schulte (2005) for a survey.

[6] See Eijffinger, Mahieu and Raes (2013a), Eijffinger, Mahieu and Raes (2013b) and Eijffinger, Mahieu and Raes (2015).

of one central bank. Many studies use the voting records of a particular central bank (most often the Federal Reserve or the Bank of England) to study a particular feature of the institutional design of that particular bank. As an example consider research studying regional bias at the FOMC[7]. Regional bias refers here to the notion that an FOMC member would systematically favor his or her home region by attaching disproportional weights to regional indicators when contemplating appropriate monetary policy. The study of this topic is motivated by the structure of the FOMC where regional representation is by design an important feature.

Jung and Latsos (2015) report that they find evidence of regional bias but they judge the impact to be fairly small. This finding is relevant for the design of monetary policy committees, but the question remains to what extent one can generalize this to other central banks. Jung and Latsos (2015) suggest to conduct similar research on other central banks where a regional bias may play a role as well and are rightly cautious in generalizing the findings to other central banks. However, if the possibility to generalize is limited, then studies of separate central banks resemble case studies.

Some studies lump central banks together in an effort to gain a cross-country perspective. For example Adolph (2013) is an impressive effort to study career concerns of central bankers and monetary policy in a wide range of industrial countries. Such a cross-country study seems more general than the case studies we mentioned before, but at the same time many details are swept under the rug[8].

For these reasons we caution the reader to put the research results on monetary policy committees in perspective. While some studies are impressive efforts of data collection and refined statistical analysis, good judgement is required to judge the merits in different contexts.

As mentioned before, research on monetary policy committees has focused historically mostly on the FOMC and the Bank of England. A first topic studied in the context of the FOMC is the aforementioned regional bias. A second branch of the literature has focused on the chairman. The chairman at the FOMC play an important role for different reasons. He heads the FOMC and leads the meetings. The chairman tends to lead the communication by the FOMC and as a consequence receives most media attention. Furthermore the Monetary Policy reports to congress, as required by the Humphrey-Hawkins Full Employment act of 1978, requires the Chairman to give an oral testimony to the Committee on Banking, Housing, and Urban Affairs of the Senate and the Committee on Financial Services of the House of Representatives.

[7] Papers studying this topic include Meade and Sheets (2005), Chappell, McGregor and Vermilyea (2008), Bennani, Farvaque and Stanek (2015) and Jung and Latsos (2015).

[8] Other cross-country studies are Vaubel (1997), Göhlmann and Vaubel (2007), Belke and Potrafke (2012).

The role of the chairman has been much discussed and many scholars have written on the influence of the chairman in decision taking at the FOMC, see Chappell, Mc Gregor, and Vermilyea (2007), Gerlach-Kristen, Meade *et al.* (2010), El-Shagi and Jung (2015), Ball (2016).

A third line of research is concerned with political influence. There is the concern that there might be (tacit) political influence on FOMC members. This pressure might come through informal conversations or might arise due to people with a specific partisan background being appointed into the Board of Governors. There is a long tradition in analysing these matters. Many researchers do believe that there is some steering by means of appointing candidates with a certain ideological profile. The extent to which this really influences decision making remains debated, see for example Chappell, Havrilesky, and McGregor (1993), Tootell (1996), Chappell, Havrilesky, and McGregor (1995), Havrilesky and Gildea (1995), Chang (2001), Falaschetti (2002), Adolph (2013).

The aforementioned branches of the literature all boil down to uncovering the preferences of FOMC members and analyzing the extent to which these are influenced by certain determinants, see also Havrilesky and Gildea (1991), Chappell, Havrilesky, and McGregor (2000), Thornton, Wheelock *et al.* (2014), Eichler and Lähner (2014).

The literature on the MPC of the Bank of England also has a strong focus on uncovering the determinants of dissent. One important difference between the MPC and the FOMC is that the MPC is considered to be more individualistic in comparison to the FOMC, see Blinder (2009)[9]. A consequence is that dissent is more common at the MPC.

The MPC consists of insiders and outsiders, that is MPC members appointed from within the bank and MPC members with no connection to the Bank. This is one particular feature which has drawn considerable attention in the literature investigating dissents at the Bank of England, see Besley, Meads, and Surico (2008), Harris and Spencer (2009), Gerlach-Kristen (2009), Bhattacharjee and Holly (2010), Harris, Levine, and Spencer (2011). However, there is some disagreement on how these two types of MPC members differ in their preferences and voting behavior from each other, see Eijffinger, Mahieu, and Raes (2013a).

Finally, besides the Bank of England and the Federal Reserve, also other central banks have been studied albeit to a lesser extent. Examples are Jung and Kiss (2012), Chappell, McGregor and Vermilyea (2014), Siklos and Neuenkirch (2015), Horvath, Rusnak, Smidkova and Zapal (2014).

[9] It should be added that the degree of individualism at the FOMC has evolved over time. Many researchers attribute a lower degree of individualism to the influence of the governor, see Blinder (2009).

The papers using the type of spatial voting models we advocate, fall in the line of research we have described in this section. These papers use voting records and use these to estimate the latent preferences of policy makers, which are then studied. Hix, Hoyland, and Vivyan (2010) is, to our knowledge, the first paper who applies Bayesian ideal point models to monetary policy committees[10]. Hix, Hoyland and Vivyan (2010) compare the ideal points of outgoing MPC members with the ideal points of their successors. Furthermore they explore how the median ideal point changes at the MPC over time. They find that the British Government may have been able to move the position of the MPC through appointments.

Eijffinger, Mahieu and Raes (2013a) also study the MPC of the Bank of England. Their sample is larger (spans more years and MPC members) and they use a variation of the spatial voting model used in Hix, Hoyland and Vivyan (2010). The focus lies on differences in ideal points between internal and external members, as well as differences related to career backgrounds. Eijffinger, Mahieu and Raes (2013a) argue that on the basis of the voting records it is hard to claim that internals are systematically (or on average) more dovish than externals. However, they find that externals have more dispersed preferences whereas the ideal points of internals seem much more clustered. They also find only modest evidence for systematic differences according to career backgrounds.

Eijffinger, Mahieu and Raes (2013b) is a follow up paper where the authors look at four other central banks. The central bank of Poland, the Czech Republic, Hungary and Sweden; studying the voting records of these central banks as separate case studies. The authors show for example a remarkable difference between internal and external members at the Hungarian central bank underlining the notion of highly politicized appointments at the Hungarian Central Bank.

Eijffinger, Mahieu and Raes (2015) studies the FOMC. In that paper the actual voting records are not used because there is a substantial literature arguing that voting records of the FOMC hide a lot of information[11]. The authors construct hypothetical votes from the transcripts and use these to estimate preferences. The authors find that Board members are on average more dovish than Bank presidents but there has been some variation in the median point in each of the groups in the past decades. Furthermore the dispersion in both groups has varied, suggesting varying levels of agreement. The authors also look at the influence of career background or the influence of the appointing president. In contrast to earlier work, the authors find little evidence on the existence or a political appointment channel nor evidence on important effects of particular career experiences.

[10] Although the idea is already touched upon by Chang (2003), she does not estimate Bayesian ideal point models.
[11] See also Meade (2005).

4.3. CONCLUSION

There is a substantial literature using voting records of monetary policy committees to learn about decision making at central banks. This literature is motivated by the fact that central banks ought to take decisions independently, need to be held accountable for their decision making and ideally leverage on the pooling of opinions.

Monetary policy committees come, however, in a wide variety of forms often reflecting their historical development. However, even if one could redesign a central bank from scratch, it is not entirely obvious how an optimal design should look like (Reis, 2013).

The literature has studied various aspects of committees around the world. These aspects include appointment systems, career concerns, the inclusion of outsiders, size, etc. Some aspects are relatively well understood by now, but generalizing conclusions requires carefulness because most of these studies are in essence case studies.

One way forward is the study of a more divese set of central banks. However to date, quite a few central banks are fairly reluctant to share transcripts and voting records, despite pleas for more transparency (Eijffinger, 2015).

The methods we put forward to study voting behavior of monetary policy committees are commonplace in the analysis of legislative bodies or judicial courts by until now underutilized in economics. While we see substantial advantages to this approach such as the flexibility to create quantities of interest and the careful incorporation of uncertainty, there are certainly drawbacks.

One objection against the approach outlined in this chapter is that it is too simplistic. We have heard on more than one occasion that a complex decision making process cannot and should not be reduced to mapping policy makers on one simple dimension. This objection is similar to objections made in the context of political science (see Lauderdale and Clark, 2014). However, as demonstrated in Eijffinger, Mahieu and Raes (2013a), even a single latent dimension generates low prediction error and hence leaves little room for statistical improvement.

We do not argue that spatial voting is superior to approaches commonly used in the study of monetary policy committees (e.g. estimating reaction functions). However, we find spatial voting models a neat addition to the toolkit of scholars investing committees.

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5. Collective Decision Making and Monetary Policy

Alessandro Riboni[1] *and Francisco Ruge-Murcia*[2]

In the past decades we have seen a dramatic increase in the number of countries that use some form of committee structure to formulate monetary policy. The observation that monetary decisions are made jointly by a group – rather than by a single policy maker – suggests that understanding collective decision-making is important to explain monetary policymaking. The work by Eijffinger *et al.* (2015 a, b) presented at this conference constitutes a valuable contribution to the literature studying the extent of preference disagreement within monetary policy committees.

The usual argument in favour of committee decision-making is that it draws and aggregates diverse viewpoints and thus ensures moderate and informed decisions. Members of monetary policy committees might reach different conclusions for several reasons, such as different information, different preferences, different models of the economy, and different decision-making heuristics (Blinder, 2007). Evidence of disagreement in committees is apparent from the official voting records. For instance, at the Bank of England, the Riksbank, and the Federal Reserve at least one member dissents in 63, 38, and 34 percent of meetings, respectively (Riboni and Ruge-Murcia, 2014).

Several approaches have been used in the literature to study the extent of preference heterogeneity within monetary policy committees. The pioneering papers by Belden (1989), Havrilesky and Schweitzer (1990), and Gildea (1990) have used a descriptive approach and analysed dissenting statistics. These papers find that district bank presidents tend to prefer tighter monetary policy than members of the Board of Governors in the Federal Open Market Committee (FOMC). Gerlach-Kristen (2003, 2009) show that outsider members at the Bank of England (i.e., those who are not career central bankers) dissent more often than insiders and tend to prefer lower rates, especially during economic downturns. Other papers estimate individual reaction functions (or Taylor rules) for each committee member and find preference heterogeneity to be systematic, but possibly small, and mainly related to the individuals' short-run response to inflation and output shocks (see Chappell *et al.*, 2005, Riboni and Ruge-Murcia, 2007, Besley *et al.*, 2008, Harris and Spencer, 2009, and Jung, 2013).

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Eijffinger *et al.* (2015 a, b) pursue a novel and interesting approach. They adopt a procedure by Poole and Rosenthal (1985) which was originally developed to analyse legislative roll-call voting behaviour in the US Congress. Eijffinger *et al.* (2015 a, b) show that voting in the FOMC and at the Bank of England's Monetary Policy Committee (MPC) can be projected on a basic, one-dimensional space: most of the variation in voting patterns can be explained by placement along the hawk-dove dimension.

The first comment on the approach undertaken by Eijffinger *et al.* (2015 a, b) is related to the interpretation of their hawk-dove score. It is unclear whether such measure is related to the committee members' fundamental preferences or, instead, simply captures patterns of voting behaviour. Eijffinger *et al.* (2015 a, b) denote a 'hawk' (resp. 'dove') as someone who is more likely to vote for high (resp. low) interest rate. In the monetary economics literature using quadratic loss functions (see for instance Clarida *et al.*, 1999), hawkishness and dovishness are defined somewhat differently: hawks are central bankers who worry more about inflation while doves are those who focus more on jobs. In other terms, being a hawk or a dove is directly related to preferences' parameters and is associated to the relative weight that central bankers attach to output versus inflation stabilization. In the standard New Keynesian framework, one can show (see for instance Riboni and Ruge-Murcia, 2007) that differences in the loss function's relative weight will translate into different responses to inflation and output shocks. For instance, a greater concern for inflation variability will imply a more aggressive response to inflation shocks. While Eijffinger *et al.* (2015 a, b) do not use data on inflation and output, the literature that estimates Taylor rules studies the individuals' responses to economic shocks, which are directly linked to preference parameters. Besides making it more difficult to interpret disagreement of opinions in terms of preference parameters, another downside of the approached based on Poole and Rosenthal (1985) is to disregard the information provided by unanimous votes, which constitute the majority of votes at the FOMC and at Executive Board of the Riksbank. In light of these shortcomings, we think that the contribution of Eijffinger *et al.* (2015a,b) would be strengthened if the authors emphasized the additional and novel insights from this approach compared to alternative approaches.

Table 1

	Eijffinger *et al.* (2015b) Hawkishness Ranking	R&R (2007) intercept	R&R (2007) Infation	R&R(2007) Unemployment
Large	1	●●●	●●●	○
Buiter	2	●	●●●●	●●●●
Vickers	3	●●	●●●●	●●●●
King	4	●	○○○	●●●●
Goodhart	5	○○○○	○○	○
Tucker	6	○○○○	○	○
Lambert	7	●●●●	●●	●●
Lomax	8	●●●●	●●	●●
Clementi	9	●●	○○○	○○○
George	10	○○○	○○○	○○○
Barker	11	●●●	●●	○○
Plenderleith	12	●	○○○○	○○○
Bean	13	○○○	○	○
Nickell	14	●●	●●●	●●●
Bell	15	●●●	●	●●
Allsopp	16	●●	●●●	○○
Julius	17	●	●●●●	●●●●
Wadhwani	18	○○○	○	●●●

To see whether the results obtained by different approaches are comparable, we present in Table 1 the findings of Riboni and Ruge-Murcia (2007), who estimate reaction functions of members of the Bank of England's MPC, together with the results by Eijffinger *et al.* (2015b). The first column presents the names of the MPC members. Riboni and Ruge-Murcia (2007) analyse a shorter period (from June 1997 to June 2006) than Eijffinger *et al.* (2015) and have estimated the parameters for 18 individuals only. The second column presents the relative position of each committee member in the hawk-dove scale as determined by Eijffinger *et al.* (2015). According to their estimates, Mr Large is the most hawkish committee member while Mr Wadhwani is the most dovish. In the remaining columns we present the coefficients of the individual reaction functions (namely, the intercept and the coefficients associated to inflation and to unemployment), which are obtained from Table 1 of Riboni and Ruge-Murcia (2007). Instead of showing the actual estimates of the coefficients, we present the results of Riboni and Ruge-Murcia (2007) in the following way. For each of the three coefficients we have ranked the 18 coefficients in ascending order and put bullet points to indicate the relative size of the estimated coefficient. For instance,

when the coefficient size of a given member belongs to the top quartile, we show four bullet points. When instead the coefficient size of a given member is among the smallest ones (i.e., in the bottom 25%), we show one bullet point only. An empty (resp. full) bullet point indicates that the estimated coefficient from Riboni and Ruge-Murcia (2007) is not significant (resp. significant at the 10 percent significance level or less).

Looking at Table 1, we observe that for some committees members the results from the two studies are quite comparable. For instance, Mr Large is the most hawkish members in Eijffinger *et al.* (2015). At the same time, when looking at his reaction function, the coefficient associated to unemployment is among the smallest one and is not significant, while the coefficient associated to inflation is relative large (in the top 50%). For other committee members, however, the results are less comparable. Mr Buiter, for instance, is defined as a staunch hawk according to Eijffinger *et al.* (2015b) but, when looking at his reaction function, he has been very responsive to both inflation and unemployment shocks. Similarly, while Ms Julius is ranked as the second most dovish committee member, she seems to respond aggressively to an inflation increase.

The second comment concerns the opportunity of using the procedure developed by Poole and Rosenthal (1985) to study voting behaviour in monetary committees. The procedure by Keith Poole and Howard Rosenthal is widely used in political science because it overcomes some of the problems encountered when studying roll-call data: namely, the fact that legislative votes are over multiple dimensions (fiscal policy, foreign policy, pork barrel spending, etc.), that bill and status quo locations are difficult to observe and measure, and that ideal point estimates are not on the same scale as bill locations. In contrast to the complexities associated with legislative data, data on monetary policy making are much simpler to analyse and interpret. In fact, voting outcomes and status quo locations are well-defined in the data and decisions concern only one dimension (i.e., the interest rate). In our views, this reduces the need of resorting to the procedure of Poole and Rosenthal (1985) to estimate the extent of preference heterogeneity within monetary policy committees.

The third comment is more general and concerns the assumption that voting is sincere. All papers mentioned above – the work by Eijffinger *et al.* (2015 a, b) as well as the papers that estimate individuals' reaction functions – implicitly assume that committee members reveal their true preferences when they vote. In practice, however, there is little or no reason to expect this. To see this, think of a chairman who proposes and votes in favour of a certain policy change. It is unclear whether such policy proposal reflects the most preferred policy by the chairman. More likely, this proposal internalizes the preferences of the other committee members. In other words, we expect that when making a proposal, the chairman does not

propose her ideal point but proposes the best policy among the ones that are acceptable and likely to pass. Notice that while the committee members' ideal points are a primitive of the analysis, the set of acceptable polices depend on the specific institutions and voting protocols adopted by the monetary policy committee. For instance, we expect that in committees that give more leverage to the chairman, the set of acceptable policies is larger. These observations point to importance of the voting process that leads to policy decisions: the estimation of committee members' ideal points cannot abstract from the particular voting protocol (implicitly or explicitly) adopted by the committee.

There is quite some variation in the way monetary committees make decisions. Blinder (2007) proposes the following classification of central bank decision-making. In his view, some committees (such as, the Bank of England's MPC) are individualistic: members express their opinion freely and decisions are made by majority vote. Other committees instead are consensus-based. Among them, Blinder distinguishes between 'autocratically-collegial' committees, where the chairman more or less dictates the group 'consensus', and 'genuinely collegial' committees where members ultimately compromise on a group decision. Examples of these committee types are the FOMC and the Governing Council of the ECB, respectively.

Riboni and Ruge-Murcia (2010) analyse several ways of aggregating preferences through voting in monetary policy committees: a consensus model, where a supermajority is required to reach a decision; an agenda-setting model, where decisions are taken with a simple majority rule, but the agenda is set by the chairman of the committee; a dictator model, where the chairman decides the interest rate, and finally a simple majority model, where the decision is taken by the median voter. The protocols have distinct time series implications for the nominal interest rate. These different implications allow us to empirically distinguish among the protocols using actual data from the policy decisions. Riboni and Ruge-Murcia (2010) estimate these models by the method of maximum likelihood using data from five central banks (the Bank of Canada, the Bank of England, the European Central Bank, the Swedish Riksbank and the US Federal Reserve) and find that the consensus model fits actual policy decisions better than the alternative models. This is observed despite the fact that all central banks (except the Bank of Canada) considered in the sample do not formally operate under a consensus (or supermajority) rule. This result is consistent with a large experimental literature on committee decision making that indicates a preference for oversized or nearly unanimous coalitions even in strict-majority rule games.

Finally, we believe that in order to understand why committee members disagree, it is important to understand what committee members maximize. When they

vote, do committee members want to choose the 'right' policy for the economy (i.e., low inflation and low unemployment) or do they maximize their reputation by choosing an action that makes them look smart or well informed? From an empirical point of view, these questions have received little attention by the literature on monetary policy committees. The theoretical literature has shown that depending on the specifics of the model, career (or reputation) concerns may either lead to conformity and few dissents (Visser and Swank, 2007) or, at the opposite extreme, to more dissents and contrarian positions (Levy, 2007). Meade and Stasavage (2008) provide some support to the prediction that reputational considerations reduce dissenting opinions. In particular, they argue that the FOMC's decision in 1993 to begin releasing full transcripts of its meetings has increased transparency and lowered the incentives for committee members to dissent. Hansen and McMahon (2014, 2015) study the Monetary Policy Committee of the Bank of England and argue that external members are systematically more likely to contradict public beliefs than internal members. However, they interpret their results as showing that internal members are more expert than external members and, consequently, attach more weight to their private signal. As shown by Levy (2007) such anti-herding behaviour may be the result of career concerns. Unlike members of other group decision-making bodies (e.g., legislators who are elected to represent particular constituencies) members of a monetary policy committee are appointed mainly because of their expertise in analysing the economy. Since expertise is the primary reason that justifies their appointment, it is natural to expect that committee members want to preserve their reputation for being high ability decision makers. We therefore believe that novel insights about monetary policy making by committee can be gained by studying the impact of career concerns on decisions and dissent behaviour in groups. More in general, the empirical analysis of monetary policy by committees would benefit by bridging the gap with the theoretical literature on deliberation and voting.

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6. From Silence to Voice: Monetary Policy, Central Bank Governance and Communication

Donato Masciandaro[1] *and Davide Romelli*[2]

6.1. Introduction

In the Concluding Remarks that Paolo Baffi – Governor of Bank of Italy – read on 31 May 1979, he stressed that "the actions of central banks are no longer cloaked in silence, and perhaps never will be again. Whereas in the past silence was seen as a guarantee of independence, today this is achieved by giving an explicit account of one's actions". In the Governor's words it is evident and illuminating the precognition of the increasing importance of the links between monetary policy, central bank governance and communication in influencing the overall effectiveness of the monetary action in the modern economies.

Only in the 2000s the economic profession began to take notice of central bank communication as an autonomous policy area. Just to give an indication of the growing interest since then, it is interesting to conduct a search in the economic literature on the terms 'central bank communication' (CBC), finding the papers and the articles that had the three words in the title (Figure 1).

In the 2001-2015 period 78 papers and articles were published having CBC in the title (yearly average: 5.4 publications), with a peak in 2009 (16 publications). After the peak the number of papers and articles decreased, remaining however significant on average (yearly average: 6.7 publications). Therefore academic interest in the topic seems to represent by now a well-defined niche in the monetary policy field, and the rationale is exactly its interconnections with both the policy design and the central bank institutional regime.

The aim of this note is to present the evolution of the relationships between monetary policy, central banking governance and communication in the last three decades – first the Great Moderation and then the Financial Crisis – as a story of two intertwined tales: on the one side the tale of how monetary policy and central bank governance are two sides of the same coin; on the other side the tale of how such monetary setting influenced the shape of the central bank communication.

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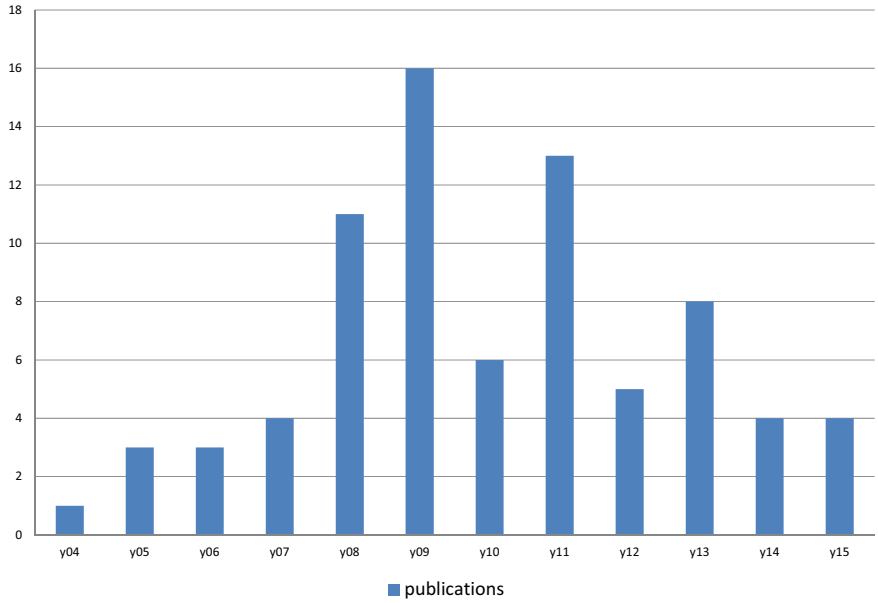
Figure 1: Central Bank Communication: Papers and Articles 2001-2015



Source: SSRN, JSTOR.

6.2. THE FIRST TALE: MODERN MONETARY POLICY AND CENTRAL BANK GOVERNANCE

Up to thirty years ago economic theory did not attribute importance to the concept of central bank governance. The institutional arrangements became important when the economic theory started to stress its role in determining the macroeconomic performances, i.e. during the New Classical Revolution. Then the role of the central bank design and governance was confirmed in the New Keynesian analysis of the monetary policy and the relevance of communication progressively emerged.

The theoretical bottom line can be summarized as follows (Masciandaro, 1995; Ejffinger and Masciandaro, 2014): the policymakers tend to use the monetary tools with a short sight perspective, using the inflation tax to smooth different kind of macroeconomic shocks – i.e. real (Barro and Gordon, 1983) and fiscal (Sargent and Wallace, 1981) unbalances – trying to exploit the trade-off between real gains and nominal (inflationary) costs.

The inflation tax finances the stabilization policies. But the more the markets are efficient the greater the risk that the short sighted monetary policies produces just inflation. In fact the rational private agents fully anticipate the political incentives

to use the inflation tax, fully adjusting the nominal variables. In this framework the Friedman-Lucas proposition on monetary policy neutrality holds.

Furthermore, the political inflation bias can dynamically generate greater uncertainty and negative externalities (such as moral hazard risks). The inflation tax is inefficiently used in a systematic way, becoming tendentially high and volatile and then producing only macroeconomic distortions. The inefficient use of inflation tax was empirically confirmed by the fact that the optimal taxation theory did not find any support in the data.

The optimal taxation theory claims that the benevolent policymaker chooses the rate of any taxation – including the inflation tax – to minimize the present value of the social cost; consequently inflation and tax rates have a positive relationship. If the optimal taxation theory empirically fails it is natural to conclude that the government is not benevolent, being affected by inflation biases.

Therefore, banning the use of the monetary policy for inflation tax purposes becomes the social goal. The institutional setting gains momentum; the relationships (governance) between the policymaker – who designs the overall economic policy – and the central bank – which is responsible for the monetary policy – become crucial in avoiding the inflation bias. The more the markets are rational the more the rules of the game between policymakers and central bankers gain momentum (Barro and Gordon, 1983; Backus and Driffill, 1985; Rogoff, 1985; Lohmann, 1992).

The optimal central bank governance has to be essentially a medal with two sides. On the one side, the central banker has to be independent, i.e. the central bank enjoys the ability to implement the non-inflationary monetary policy without any external (political) short sighted interference. The central banker becomes a veto player against inflationary monetary policies.

On the other side, the central banker has to be conservative, where conservativeness refers to the importance that he/she assigns to price stability in its relation to other macroeconomic objectives. The conservativeness is the necessary step to avoid that the central banker himself/herself becomes a source of the inflation bias. Independence and conservativeness become the conditions to implement credible non-inflationary monetary policies.

The trade-off between conservativeness and independence (Eijffinger and Hoeberichts, 1998) can be addressed using independence as a tool to implement conservative monetary policies. But the private agents trusts the central banker only if effective rules on accountability and transparency hold. In other words a conservative central banker is credible if he/she works in an institutional setting

which guarantees independence and accountability, acting in a transparent way and implementing an effective communication policy.

The relationship between independence and accountability represents the core of the so-called central bank governance. The central bank governance became the institutional setting for implementing the day by day monetary policy: given the long run goal to avoid the risk of inflation, the modern central banker can also smooth the real business cycles (Bernanke and Gertler, 1995; Clarida, Gali and Gertler, 1999; Woodford, 2003), using monetary policy rules (Taylor, 1993; Henderson and McKibbin 1993; Walsh, 1995).

Monetary policy becomes the final outcome of a complex interaction between three main components: monetary institutions, central banker preferences and policy rules (Persson and Tabellini, 1993; Svensson, 1995).

In this respect the huge literature on central bank governance can be described as a two stage process. Initially, the scholars involved in the field went on to verify the theoretical conjectures with comparative, institutional and empirical analysis. After constructing indices of central bank governance (Grilli, Masciandaro and Tabellini, 1991; Cukierman, Webb and Neyapti, 1992; Alesina and Summers, 1993), it has been attempted to determine whether and how the different indices could be considered as drivers in explaining the most important macroeconomic phenomena: inflation, public debt and interest rates, income and growth.

Taking advantage from the first wave of studies on the monetary regimes – including the critical views (McCallum, 1995) – the literature did an important step forward considering the central bank governance as an endogenous (dependent) variable that has to be explained (Posen, 1995). Which are the drivers that can motivate the decision of one or more countries to maintain or reform their monetary regimes? Why and how are the policymakers forced to implement monetary reforms that reduce their powers in using the inflation tax, changing the rules governing the central bank settings? So far various interpretative hypotheses were advanced to explain the genesis of the political process that leads a monetary regime to assume given characteristics.

Developments in endogenizing the central bank governance and thereby its effectiveness has been the subject of analysis in both economics and political science. All the hypotheses stress the importance of studying the role of the preferences of both the citizens and the governments in determining the central bank governance features. Furthermore, it is worth noting that the different views can be intertwined in studying under which economic, institutional and cultural conditions reforms of the central bank governance do take place or not. It is also evident that these studies acquire greater importance in periods – as the present period after the Financial Crisis – when there is a tendency to reform, or at least to question, the design of the central bank governance.

6.3. THE SECOND TALE, PART ONE: FROM AMBIGUITY TO TRANSPARENCY

During the 1970s and 1980s, central banks were very much shrouded in monetary mystique and secrecy (Goodfriend, 1986). The theoretical rationale for the lack of monetary policy transparency and communication was given by the theory of ambiguity, credibility and inflation under discretion and asymmetric information developed in the seminal article of Cukierman and Meltzer (1986). The bottom line was simple: with asymmetric information between the public and a policymaker, monetary policy ambiguity is likely to produce inflationary surprises and consequently short run macroeconomic gains. The mix of a discretionary monetary policy with a short sighted policymaker can justify ambiguity; the negative spillover, with rational expectations, is likely to be an higher and more variable inflation.

Therefore the development of the modern theory of the monetary policy, based on the intertwined concepts of rules in policy on the one side and independence and accountability of the policymaker on the other naturally produced a change in the communication prescriptions: from secrecy to transparency. The monetary policy discretion and ambiguity was abandoned in favour of monetary policy rules explicitly announced and motivated. Transparency became a key features of the central banking policy.

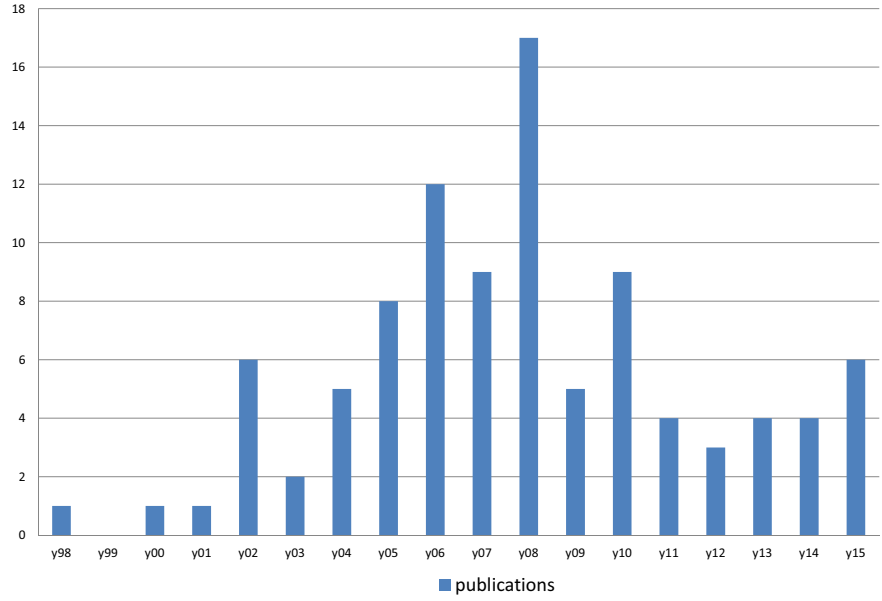
Also the academic profession took notice of central bank transparency as an interesting area of research. Again it has been conducted a search in the economic literature on the terms 'monetary policy transparency' (MPT), finding the papers and the articles that had the three words in the title (or alternatively 'central bank transparency') (Figure 2).

In the 1998-2015 period 97 papers and articles were published, having MPT in the title, with a peak in 2008 (17 publications).

It is worth noting that comparing the CBC publications versus the MPT publications (Figure 3), the not surprising results are as follows: 1) the MPT series is a bit older; 2) the total number of MPT publications is sufficiently greater (94 vs 78); the MPT peak is slightly both anterior (2008 vs 2009) and higher (17 vs 16 publications) respect to the CBC peak.

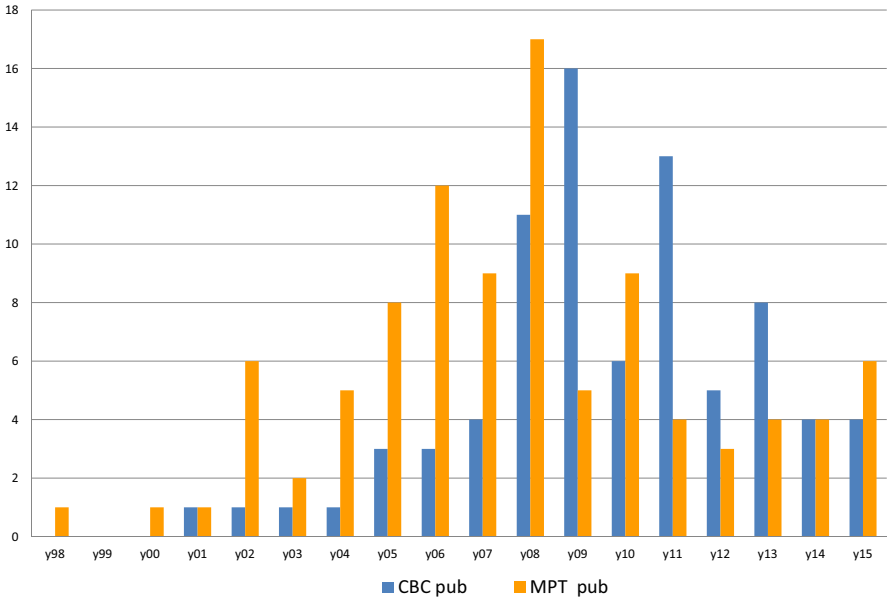
It has been progressively stressed that the effectiveness of central banks to affect the economy critically depends upon their ability to influence market expectations regarding the *future path* of interest rates, and not merely their current level. Therefore, the public understanding of current and future policy becomes critical for the effectiveness of policy. In other words, monetary policy increasingly became the art of managing expectations.

Figure 2: Monetary Policy Transparency: Papers and Articles 1998-2015



Source: SSRN, JSTOR

Figure 3: Monetary Policy Transparency vs Central Bank Communication: Papers and Articles 1998-2015



Source: SSRN, JSTOR

Consequently in the real world transparency of central bank decision-making has increased rapidly from the early 1990s beginning with the adoption of inflation targeting by the Bank of England, Bank of Canada, Reserve Bank of New Zealand and the Swedish Riksbank. Although the Federal Reserve System was officially not conducting inflation targeting, in practice it gradually shifted more or less as to inflation targeting. The European Central Bank adopted from its beginning a so-called two-pillar strategy with a monetary pillar focusing on monetary aggregates like M3, which it inherited from the Deutsche Bundesbank, and an economic pillar taking account of the drivers of inflationary expectations.

At the same time also the changing shape of the institutional setting motivated a shift in the central banks behaviour, that put a much larger weight on their communication with the public. In fact an important trigger for increased transparency has been the requirement for greater accountability of independent central banks. As central banks have become more independent over time, they have to pay closer attention to explaining what they do and what underlies their decisions (Briault, Haldane and King, 1996). More transparency and increased use of communication is partly a logical consequence of this development.

Even though central bank accountability justifies this trend towards more transparency, it is less obvious that more central bank transparency is also beneficial from an economic point of view. Therefore, many theoretical studies tried to analyse whether the trend towards transparency could be justified from an economic point of view as well. These studies vary not only with respect to the different aspects of central bank transparency, such as political, economic, procedural, policy and operational transparency, but also regarding the structure of the economy determining the monetary transmission mechanism (Issing, 2005).

Besides this theoretical research on the economic effects of more central bank transparency, a wave of empirical studies used institutional indices of central bank transparency.

The transparency literature can be distinguished within five different categories: political, economic, procedural, policy, and operational transparency. Building on these five categories, the first comprehensive index for central bank transparency was constructed for the central banks of Australia, Canada, Eurozone, Japan, New Zealand, Sweden, Switzerland, the United Kingdom and the United States (Eijffinger and Geraats, 2006).

Now in the overall issue of central bank transparency, which is the role of communication? The value of communication depends on its consistency with the central bank strategy. Assuming that the public has rational expectations, any systematic pattern in the way that policy is conducted should be correctly inferred from the central bank's adopted rule in managing the monetary policy action.

Before the Crisis the more common interest rate policy was the so called Taylor Rule (Taylor, 1993). Given the existence of macro targets – inflation rate and output growth – the Taylor Rule is based on the assumption that without short run shocks the nominal interest rate is equal to the sum of the real interest rate with the inflation rate – a natural interest rate, i.e. a rate at which the output growth equals its potential, without neither inflationary nor deflationary risks.

In turn the real rate of interest is defined in a medium term perspective by real drivers, i.e. the rate of saving (inter-temporal saving rate) and the rate of investment (capital marginal productivity). But short run shocks in the aggregate demand can occur, hitting the inflation rate – higher risks of today inflation/ deflation – and/or the output growth – higher risks of tomorrow inflation/ deflation.

Therefore the interest rate policy takes in account the shocks, reacting in a consistent way and taking into account which is the relative importance of the inflation and output growth discrepancies. In other words the nominal interest rate should be adjusted when either current inflation deviates from the inflation target or when current output growth deviates from the output target.

The Taylor Rule can be described as follows:

$$i = r + \pi + \alpha(\pi - \pi^*) + \beta(y - y^*) \text{ with } \alpha + \beta = 1$$

Where i = nominal interest rate, r = real interest rate, π = inflation rate, π^*= optimal inflation rate, y = output growth, y^*=optimal output growth, α, β = relative weights of the two macro goals.

Thus, when it comes to predicting the interest rate policy, it suffices to interpret (forecasts of) economic data in view of the central bank's policy rule; at limit there is no need for central bank communication.

Therefore we can define central bank transparency as how easily the public can know and understand the central bank strategy just from 'observables'. One might say that a central bank can be fully transparent without any communication. But the less is true that the monetary transparency is automatically guaranteed, the more it will be true that the design and the implementation of an effective communication policy – i.e. 'discovering the observables' – becomes necessary.

6.4. THE SECOND TALE, PART TWO: THE EMERGING ROLE OF COMMUNICATION

As a consequence the academic attention – as well as the sensibility of the central banker (Bini Smaghi, 2007) – zoomed also on the communication policy (D'Amato *et al.*, 2003; Blinder, 2009, Neuenkirch, 2011a).

Communication has developed into a key instrument in the central bankers' toolbox in recent years. Virtually all central banks in advanced economies have taken major steps in using communication as a key instrument in monetary policy-making, where usually the communication strategy is associated with the decision making process (Ehmann and Fratzscher, 2005a).

The increased importance of communication for policy makers is mirrored by the rapid development of the academic literature on this topic. Researchers have highlighted at least three reasons why communication may prove useful for central banks.

Firstly, communication may be a very direct and effective tool to influence expectations (Eusepi and Preston, 2007; Osterholm *et al.*, 2008; Sturm and de Haan, 2009; Drager *et al.*, 2015). Therefore, it plays a seminal role in improving the effectiveness of monetary policy and, consequently, the economy's overall performance (Blinder *et al.*, 2008).

Secondly monetary policy communication can be also a tool to strengthen credibility and independence (Hayo and Neuenkirch, 2014), as well as conservativeness (Eijffinger *et al.*, 2004). In fact communication may help the central bank to show how its policies are consistent with its mandate.

Finally and consequently – given the existence of the two above mentioned intertwined channels – communication may influence prices and interest rates in financial markets (Woodford, 2005; Brand *et al.*, 2006; Lucca and Trebbi, 2009; Neuenkirch, 2011b; Tang and Yu, 2011; Beck *et al.*, 2012; Smales, 2012; Chirinko and Curran, 2013; Egert and Kocenda, 2013; Lamia and Sturm, 2013; Kamada and Miura, 2014; Carvalho *et al.*, 2014; Hayo *et al.*, 2014).

More transparency over policy may lead to greater predictability of central bank actions, which, in turn, reduces the uncertainty in financial markets. The ability of policy makers to influence asset prices and the predictability of policy decisions are not independent of each other as communication that leads to high predictability of decisions may also have a significant effect on financial markets.

Furthermore in the modern monetary policy theory the relevance of communication becomes even more evident if we assume: non-rational expectations, and/or asymmetric information, and/or the absence of policy rules and credibility. If

one or more of these conditions hold, central bank communication may have an impact on financial markets (see also: De Haan, Eijffinger and Rybinski, 2007). The intuition is straightforward: if monetary policy discretion becomes an unpalatable quality, ambiguity is a central bank shortcoming, that has to be eliminated via effective communication policies. Therefore any kind of market imperfection reinforces the need of communication.

First, the assumption that the public will understand monetary policy perfectly regardless of the efforts that are made to explain it may be unrealistic. King (2005) poses that the public may follow simple (but possibly fairly robust) 'heuristics' in making decisions instead of following optimising behaviour. He argues that in this case central-bank communication can play an important role in leading people to choose heuristics of the right sort: "the more the central bank can do to behave in a way that makes it easy for the private sector to adopt a simple heuristic to guide expectations the better. A good heuristic from that point of view would be 'expect inflation to be equal to target'" (King, 2005, p. 12).

In other words, by communicating to the public the central bank may help anchoring expectations. Bernanke (2004) refers to the recent literature on adaptive learning in explaining why communication on these issues affects monetary policy effectiveness. When the public does not know but instead must estimate the central bank's reaction function, there is no guarantee that the economy will converge to the optimal rational expectations equilibrium because the public's learning process *itself* affects the behaviour of the economy. The feedback effect of learning on the economy can lead to unstable or indeterminate outcomes. In such a setting, communication by the central bank may play a key role in helping improve economic performance.

Second, financial-market participants generally do *not* have as much information as monetary policymakers do about a number of key inputs to policymaking, including the policymakers' objectives, their assessment of the economic situation, and their policy strategy. If there is asymmetric information, i.e. if the public and the central bank dispose of different information, it is perfectly rational for the public to adjust its expectations. The central bank may, for instance, provide information about its reaction function. This should lead, *ceteris paribus,* to an increase in the private sector's ability to forecast the central bank's policy instrument. One possibility in countries without explicit inflation targets is that central bank may provide information about the long-run inflation target of the central bank.

Likewise, central banks could also provide information on the relative weights that the central bank places on its output and inflation objectives in their monetary rules. Furthermore, the central bank may have better information on the economic outlook. Kohn and Sack (2004) argue that private agents may lend

special credence to the economic pronouncements of central bank, particularly if the central bank has established credibility as an effective forecaster of the economy. However, even if the central bank has private information an important issue that remains to be settled is under which circumstances release of this information may be beneficial, i.e. contributes to realizing the objective(s) of the central bank.

Finally, most central banks do not follow a fixed rule. For example, Bernanke (2004) poses that "specifying a complete and explicit policy rule, from which the central bank would never deviate under any circumstances, is impractical. The problem is that the number of contingencies to which policy might respond is effectively infinite (and, indeed, many are unforeseeable)." By commenting on recent or expected economic developments or by giving hints, the central bank may influence financial markets' expectations (see also: Siklos and Strurm, 2013).

However, it is by no means clear so far what constitutes an optimal communication strategy. Any communication strategy of a central bank can produce intended and unintended effects, i.e. the consequences of the three channels already described – expectations, credibility and macroeconomic variables – can be positive or negative. Therefore an approach of 'more information is always better' is neither sufficient nor correct.

Therefore the policy of communication adopted by each central bank have to be carefully studied (Aidarova and Seyitov, 2011; Garcia Herrero and Girardin, 2013) by highlighting at least three different aspects.

First of all, the contents of communication must be distinguished, which can be either a quantitative (Hayo and Neuenkirch, 2010) or a qualitative announcement; further the issues – macroeconomic performances, including inflation (Cihak *et al.*, 2012) and fiscal policies (Allard *et al.*, 2012) – or financial stability (Born *et al.*, 2010 and 2011) – can be relevant.

Secondly, the procedures of communication must be considered (Ehmann and Sondermann, 2012). These can take the form of either a press release, or of a press conference, or something else, including who is the speaker (Rozkrut, 2008). Also the language can be relevant (Hansen and Mc Mahon, 2015; Kawamura *et al.*, 2016), as well as the writing (Bulir *et al.*, 2008; Smidkova and Bulir, 2008).

Thirdly, the timing of communication must be investigated (Ehmann and Fratzscher, 2005b; Hu *et al.*, 2015), at least from two points of view: in absolute terms, by distinguishing periodical, institutional communication, which is predictable, from those announcements that are not; in relative terms, with respect to the functioning of financial markets (e.g., if the announcements are communicated when markets are closed or when they are open for business).

6.5. CONCLUSION: WHICH WILL BE THE 'NEW NORMAL' IN COMMUNICATION?

At the end of our story monetary policy, central banking and communication become three corners of the same triangle: the modern central banker was essentially a monetary policy agent, primarily focused on monetary stability goals, which can be pursued by maneuvering interest rates and implementing consistent communication policy.

But now, after the Financial Crisis, the scenario is changing. The desire to avoid new cases of systemic banking instability and at the same time to address the deep economic crisis has focused new attention on both the monetary policy design and the architecture of the central bank regime.

The central bankers have extensively used their monetary policy tools both in conventional and unconventional ways, while acquiring deeper supervisory powers over banking and financial intermediaries. Monetary activism coupled with higher degree of involvement in banking supervision open again the debate on the optimal degree of central bank independence and consequently on the opportunity to reconsider the institutional setting that governs the relationships between the incumbent governments and the bureaucratic monetary policymakers. Policymakers in all countries have wondered and are still wondering whether to reshape their central bank settings, changing the degree of independence.

Just to mention the more relevant episodes, it is well known that the European Central Bank degree of freedom in defining its monetary policy stance has been several times harshly criticized by some politicians for its hawkish attitude and harshly blamed by others for its dovishness. At the same time the European Central Bank is now deeply involved in banking supervision. Also in the United States an intense political debate originated from the monetary strategy that the Federal Reserve System designed and implemented in order to address and fix first the financial turmoil and then the economic stagnation.

Policymakers in all countries have wondered and are still wondering whether to reshape their central bank settings. New proposals to reform these systems have been enacted or are under discussion. All in all, the Crisis is challenging the consolidated central banking setting. Therefore a natural questions arises: how to explain the cycles in central banking governance, i.e. the possibility that peaks and troughs can occurred in the playing field of the central bankers?

A recent paper (Masciandaro and Romelli, 2016) offers a framework which intertwine economics, political economy and history, using a delegation framework in which the politician's choices related to the optimal central bank design are ever conditional on the economic and institutional environment existing at a given

time. Other thing being equals, cycles in central bank governance are more likely to occur when the odds of macroeconomic shocks, that are politically costly and at the same time can be accommodated using the monetary tools, are higher. As in the present times.

On top of that in extraordinary times – as the years we are living are – it is more likely that psychological biases can trigger the central bank behaviour. The behavioural economics has been recently introduced in the monetary policy analysis (Favaretto and Masciandaro, 2016), explaining how the loss aversion can motivate a policy inertia in taking decisions. In general it could be interesting to investigate if and how psychological biases can influence transparency and communication.

In such as situations it is evident that the central banking pillars of the monetary action must be reconsidered. But how should that been done? Is it possible to maintain the benefits of the mainstream of central banking maintaining monetary stability and also taking into account at the same time the importance of financial stability? Consequently, is it possible to reintroduce banking responsibilities into the central bank domain in a way consistent with the present institutional setting, i.e. without introducing risks of political capture and/or banking capture? Which are the consequences in shaping the communication policy? In fact the more the be 'observables' are in a state of flux, the more their discovering have to be carefully reconsidered.

On these questions the suggestion that can be made is that reconsidering the central banking benchmark implies a relevant risk assumption, which so far has been underestimated. How to hedge this risk is a fundamental issue that must be considered to understand not only what will be the economics of the 'post-modern' monetary policy, but also which political economy drivers are motivating the demand and supply of reform of the central bank governance, including the rules of game in terms of transparency and communication.

It is true that over the past three decades central bank's approach to communication has undergone a sea change (Dale *et al.*, 2008); at the same time we have to recognize that after the Crisis the central banks are sailing uncharted waters. Before the Crisis voice replaced secrecy; but after the Crisis which will be the 'new' voice? The only (preliminary) conclusion that it can be offered is that the answer, other things being equal, will depend on how much the 'new normal' in central banking will be different from the 'old' one.

Needless to say that among the other things that is unlikely that will remain the same it will be crucial to explore the evolution in the information and communication technologies and policies.

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7. From Monetary Policy to Macro-prudentials: the Aftermath of the Great Recession

Bilin Neyapti

7.1. Introduction

Monetary policy is about the determination of money stock and interest rates to affect economic activity in the short-, medium- and the long-term. Besides helping to eliminate recessionary or inflationary business cycles, controlling interest rates and the value of money have an important impact on economic prospects by way of affecting domestic and international transaction costs. From a normative perspective, the ultimate goal of monetary policy is to increase allocative and distributional efficiency that are, in theory, consistent with the price stability focus of the modern central banking practice. Low level and variability of inflation rates is necessary for investment and sustainable growth; provided that the benefits of growth are distributed equitably, it also contributes economic development[1].

This short paper addresses the monetary policy challenges of the 2007/8 crisis, named as the Great Recession (GR), that originated in the U.S. financial sector and spread to a large part of the rest of the world. Section II briefly overviews the macroeconomic setting in the aftermath of GR; Section III explains the associated institutional challenges and prospects. Section IV presents final remarks.

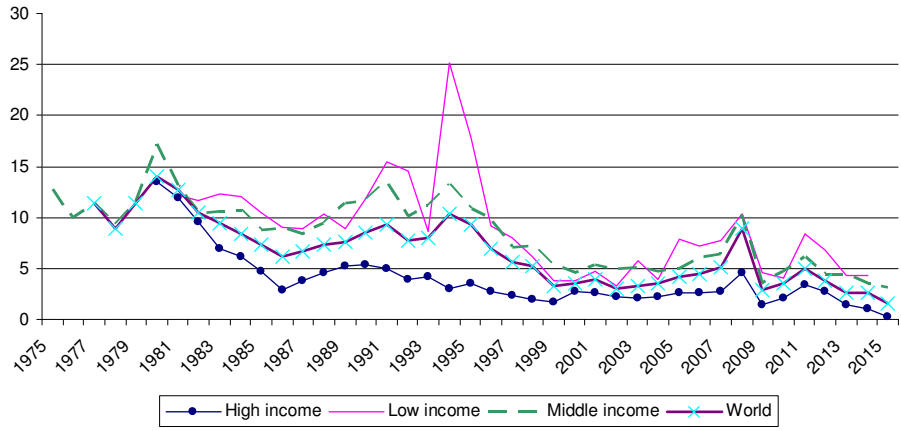
7.2. The Macroeconomic Setting and Monetary Policy Challenges

After the abolition of the gold standard in the 1970s, numerous countries tried to cope with severe macroeconomic stabilization problems using exchange rate and monetary policies, from which resulted the flexible exchange rate and rule-based monetary policy regimes as the convention for the best practice. By the 2000s, many developing countries reformed their monetary institutions: small island economies typically adopted currency boards; the Euro-zone and the ECB were established to utilize the so called optimal currency area; many sovereign governments increased the level of independence of their central banks; an increasing number of countries also adopted inflation targeting frameworks. These institu-

[1] High inflation is a major source of tax on low income groups whose assets are mainly money in circulation.

tional reforms that were based on the accumulated experience with fighting inflation since the 1980s, led inflation rates to fall to reasonably low levels all around the world by the 2000s, except for at most a handful of countries. Figure 2 shows that in the second half of the first decade of the 2000s, the average world inflation rate has been tamed well down to less than 10%. Neyapti (2012) demonstrates that the most effective institutional framework for inflation reduction during the 2000s has been inflation targeting.

Figure 1: Inflation trends around the world



Source: The World Bank, World Development Indicators.

Discussing the main differences between the Great Depression (GD) and GR, Cukierman (2011) points out that the Fed policies following GR were, unlike after GD, swift and effective to counteract the negative consequences of the crisis. This period was also associated with almost a paradigm shift because of heavy reliance on fiscal policy to alleviate the risks facing the banking system. Fiscal accommodation took the form of government purchase of large volumes of the troubled banks' shares and a sizable fiscal stimulus package[2]. Indeed, the US economy recovered in two years, though marking slowed growth rates since then (see Figure 2).

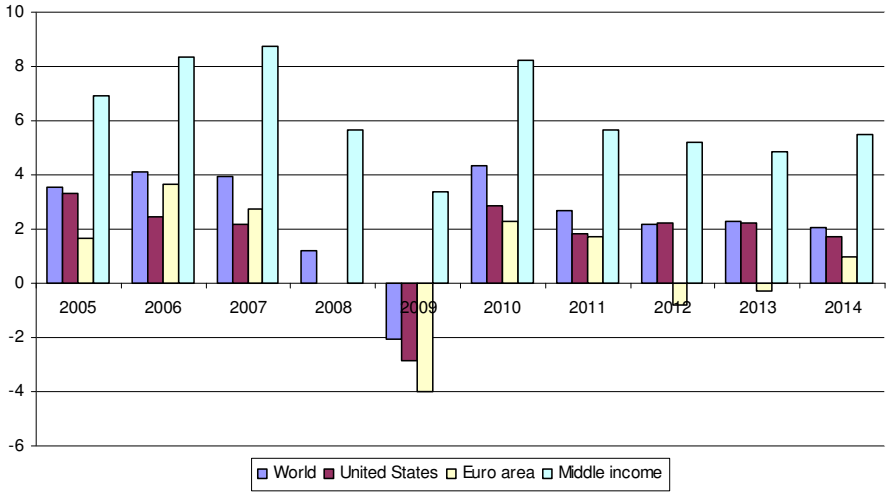
Accompanying the fiscal package, the Fed pursued an over-easy monetary policy to rescue banks from toxic and risky assets and securities. As a result, the Fed's balance sheet expanded by about five-fold[3]. Facing the banking sector fragility

[2] The first action (called Troubled Assets Relief Program) costed US$ 700 Billon and the second US$ 787 Billon (see Cukierman, 2011).

[3] Willamson (2015) states that Fed policies to counter the effects of the GR involved zero interest rate policy, interest payments on reserves and quantitative easing that involved swaps of short- term Treasury debt and mortgage based securites with long-term Treasury bonds. These policies led total assets held by the Fed to increase to US$ 4,498 billion by the end of 2014, from US$ 891 billion at the end of 2007.

and low risk appetite and deficient demand around the world, many countries also resorted to various unconventional measures that primarily included incomes policies to revive their economies. The significant fiscal component of the financial sector rescue effort and the Fed's quantitative easing thus partially offset the necessity of a holistic long-term and institutional approach to achieve macroeconomic stability, commonly termed as macroprudentials. However, the realization of the Keynesian liquidity trap, newly termed as the zero interest rate policy, rendered monetary policy ineffective with respect to real economic activity and led to worldwide prolongation of deflationary pressures.

Figure 2: Growth rate of Gross National Incomes around the world



Source: The World Bank, World Development Indicators.

Williamson (2015) notes that the effects of the Fed's policy is now mostly limited to its signalling role, as in the case of forward guidance. Indeed, Fed announcements of fractions of a basis point in the policy rate are a major factor in pricing global financial markets and exchange rates. However, their impact on real economic activity is illusive as non-performing loans and credit crunch keeps the prospects of economic recovery slim. Meanwhile, the global economic slowdown has been coupled with increased debt, particularly its short-term component, and debt service despite low interest rates (see Table 1).

Table 1: World Average of Debt and Debt Service, in percent changes from 2007 to 2013

External debt stocks	
% of exports	19.2
% of GNI	22.3
Short-term debt	
% of exports	93.1
% of total reserves	65
Total debt service (% of GNI)	58

7.3. STRUCTURAL AND INSTITUTIONAL CHALLENGES IN THE AFTERMATH OF GREAT RECESSION

The spread of recession to the world via financial systems and economic repercussions, highlighted the importance of achieving financial stability besides price stability for sustainable growth. While it was mainly the central banks, and the Fed in particular, that were blamed for not recognizing and acting to prevent the crisis before it unfolded, the lack of an adequate institutional framework to deal with financial crises may only partially be attributable to them[4]. It is clear that strengthening the bank regulatory and supervisory institutions (RS) is ultimately the responsibility of governments. In the period leading to the 2007 crisis, RS of the US banking sector exhibited too complicated a set up to allow for a clear identification of the entity that can be held accountable for not predicting and not acting upon for the prevention of GR. The aftermath of GR has thus led to the rethinking of the art of monetary policy making in conjunction with the roles of the state and the financial institutions in achieving macroeconomic stability. The emphasis in that regard has been on instituting prudential RS mechanisms for the financial sector to match the level of sophistication of financial innovations and instruments. Identification of the roles of institutions and/or agents responsible for macroprudentials, and RS remains to be a largely unresolved matter in both the scholarly and policy circles, however.

Despite the need to devise such mechanisms to cope with the principal-agent problem in the financial sector, which is an evident source of imprudence, resistance of strong financial lobbies also continued to prevail. This institutional frailty thus continues to pose risks for the financial sectors, and thus for economic development at large[5]. The risks are notable in view of the continued global

[4] The literature presents both the pros and cons of vesting the regulatory and supervisory functions with the central bank (see, for example, Goodhart, 1995).

[5] Bootke and Palagashvilli (2016) also discuss the long-term risks of short-run relief programs that emanate from the ill-design of the current RS framework.

economic slowdown and increasing private debt that is encouraged by low interest rates. Housing price bubbles pose an additional risk.

Given this conjuncture, it is clear that central bank transparency is a valuable tenet of the policy making process in reducing variability in expectations. It can, however, be observed that central banks that pursue inflation targeting (IT) are more transparent than others, due to the very nature of the IT regime[6]. Possibly for this reason, the empirical analyses point at no notable differentiation of the effects of central bank transparency and independence. It should also be noted that, for an effective macroprudential policy, accountability carries at least as equal importance as transparency, and these two institutional features are mutually reinforcing. Using legal indices of RD, Dincer and Neyapti (2014) shows empirically that quality of RS is positively associated with bank performance. In this respect, the post-GR episode appears to be characterized by a vast amount of quick corrections, rather than deep institutional restructuri4ng to establish a firm RS mechanism to eliminate the foreseeable risks in the financial sector.

An additional risk for the future macroeconomic prospects is the distributive effects of the crisis. Inflation, as a form of tax, redistributes income from the poor towards the rich. It may then be expected that low inflation environment observed during the past two decades (see Figure 1) would be associated with improved income distribution. This association is not observed however, including the case of the U.S.[7]. Komlos (2016) shows that middle class welfare got the hardest hit whereas the top quintile has improved significantly in the US between 2000 and 2011. Neyapti and Aksit (2015) argue that in high-income countries economic downturns last longer and income distribution in the aftermath of the crises are worse than average. The authors explain this by the developed countries' ability to resort to various incomes policies to prevent economic and political crisis from surfacing to the full extent, thus often leading to the build-up of distributional problems and macroeconomic risks. Expansionary policies that followed GR fit into this category. Neyapti and Aksit also argue that developing countries have deeper recessions that results in more improvement in income distribution than the average. The increased emphasis on equitable distribution should therefore be one of the targets of macroprudential policy, to define the "new normal" in the post-GR era.

6 The average of the transparency index is 10.3 in the IT countries versus just 4.3 in non-IT (calculated based on the indices of central bank transparency of Dincer and Eichengreen, 2014).

7 Similar evidence is shown for Turkey for the period that followed the disinflationary period in the first decade of 2000s. Neyapti (2013) argues that expected welfare gains were not obtained due to inadequate structural reforms to achieve allocative inefficiency.

7.4. FINAL REMARK

Financial crisis that led to the Great Recession provoked rethinking about the art and science of monetary policy making. Though the quick recovery in the US economy that involved fiscal and monetary rescue operations appears to reflect skillful policy management, institutional measures, specifically adopting clear frameworks to establish accountability for macroprudentials, have been inadequate. Identifying institutions accountable for excessive risk taking in the financial sector is essential to avoid future economic crises. The strength of the financial lobbies is like a snake eating its own head; financial sector's resistance to RS reforms that could help avoid excessive risks and returns renders macroeconomic development unsustainable. Economic efficiency needs to be balanced with equitable redistribution of welfare gains in order to achieve sustainable economic development. Hence, macroprudential policies that target price and financial stability – besides a strong emphasis on the mechanisms to establish fair income distribution – need to be the new normal of macroeconomics in the 21st century.

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8. Post-Crisis Regulatory and Supervisory Arrangements – The New 'Old' Central Banking

Aleksandra Masłowska-Jokinen[1] *and Anna Matysek-Jędrych*[2]

8.1. Introduction

The Global Financial Crisis (GFC) exposed clear gaps in the pre-crisis regulatory and supervisory framework in most of financial systems worldwide, but not in all financial systems. Optimal design of supervisory and regulatory arrangements in the post-crisis perspective requires identifying elements that failed in helping predicting current slowdown, and those that directly or indirectly affected vulnerability of financial markets. Both tasks appear to be as challenging as twelve labours of Hercules: demanding, covering wide aspects of financial and macroeconomic environment, requiring cooperation of many key agents in all markets; hence truly virtually impossible.

Instead of identifying 'failed' elements, we propose the positive approach to the post-crisis regulatory and supervisory framework, which is proving that some institutional arrangements and basic elements of financial safety net helped some countries avoid the crisis.

There are many important questions, which should be treated as a starting point for discussing changes in supervisory and regulatory framework, especially in relation to the central banking. Should central banks become less powerful and be made more subject to political control, or be given more tools to achieve financial stability? Should the trend of removing central banks from direct supervisory responsibilities be reversed? Is the period of 'central banks' triumph', a period in which their independence and autonomy was widely accepted, now over?

8.2. Literature

The institutional framework for central bank policy is evolving. Changes tend to occur after the most significant financial and economic crises. The period following the Great Depression saw a wave of state ownership of central banks

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(Capie *et al.*, 1994; Elgie & Thompson, 2002; Wood, 2005), the period following the Great Inflation resulted in growing transparency and accountability of central bank policy (Capie *et al.*, 1994; Elgie & Thompson, 2002; Wood, 2005). The global financial crisis probably will be another defining moment in the history of central banking.

Over the last several years many central banks have made significant strides towards greater accountability and transparency (according to Cukierman (2001) both concepts should be even perceived as *twin issue*). Although, it seems to be impossible to define the optimal level of central bank transparency, many researchers attempt to measure the current level of transparency and indicate current tendencies in this particular aspect of the central bank policy (Geraats, 2001; Oosterloo, de Haan & Jong-A-Pin, 2007; Dincer & Eichengreen, 2010; Čihak *et al.*, 2012). Greater accountability has run hand-in-hand with moves towards greater central bank independence (Fischer, 1995, pp. 201-206; Eijfinger & Hoeberichts, 2000, pp. 73-96; Lastra, 2006). The last one qualitative aspect of central bank policy arrangement – no less important that the three mentioned above – is its credibility and reputation.

Central bank communication became a critical element of monetary policy after the financial crisis (Siklos, 2014). Recent experience showed that the content of communication matters the most (Siklos, 2014), and clear statements about the banks future actions could even help to avoid financial crisis (Schwartz, 1986). Finally, the times when a central bank was considered a *modern one*, that is excluding supervisory role out of its jurisdiction seems to be soon over. Although the literature still divides itself between supporters and opponents of a central bank being involved in financial supervision (*the integration and separation view*, see for example Masciandaro, 2012a, 2012b), but a few countries have already delegated financial supervisory responsibility to their central banks[3].

8.3. DISCUSSION

In a recent report for the National Bank of Poland (Masłowska-Jokinen & Matysek-Jędrych, 2016) we identify differences among seemingly similar countries (OECD) in respect to the design of their regulatory and supervisory framework and a role played by central banks in financial safety net.

[3] The Bank of England and the Bundesbank are the key examples.

Table 1: Diagnosis of pre-crisis and post-crisis landscape of central banking

Pre-crisis consensus	Post-crisis landscape
Neat separation between monetary and financial stability functions. Central banks as an ultimate source of liquidity have the classical lender of last resort role, but there was intellectual permission for decoupling of the two functions in crisis management process: monetary policy for prices stability goal, while regulation and supervision for financial stability goal. Price stability is sufficient for macro-economic stability (i.e. price stability is the best monetary policy contribution to macroeconomic stability) – canonical macroeconomic models with the primary role of price rigidities as a form of departure from a fully equilibrating and well-functioning economy (Woodford, 2003, Walsh, 2010). Short-term interest rate was sufficient to capture the impact of monetary policy on the economy. This was reinforced by the believe that central banks would not have to drive policy rates to zero in nominal terms. The specific version of the 'keep-your-house-in-order' doctrine, which is similar to the reasoning behind the microprudential approach: when each country on a stand-alone basis is sound, the world will be sound, as well. In a consequence, all central banks did everything to ensure price stability in their own economy.	There is no agreement on whether or how far monetary policy regimes should be adjusted to lean against the build-up of financial imbalances. One view is that monetary policy regime should focus on price stability and financial stability is best ensured through the established macroprudential framework, and central banks are not exposed to the risk of losing credibility (Bernanke, 2009, Blanchard, Dell'Ariccia, Mauro, 2010, Bean, 2010, 2011). Another view is that macroprudential framework might not be sufficient, and central banks through the monetary policy should play active role in stabilizing the financial system (Cechetti *et al*., 2000, Borio & Lowe, 2002, Papademos & Stark, 2010). It is agreed that 'cleaning' the debris of financial crisis through monetary policy is costly and that interest rate policy is not enough. Central banks have introduced additional tools to influence longer-term interest rate and financial conditions, such as credit term and credit spread through so-called unconventional or balance-sheet policy (Bini-Smaghi, 2009, Borio & Disyatat, 2010, Curdia & Woodford, 2010, Matysek-Jędrych, 2013). There is a broad consensus that financial regulation and supervision needs go beyond a microprudential perspective and adopt broad, macroprudential orientation. It is also widely believed that central banks should play a key role in the macroprudential policy. There is general agreement that low and stable inflation does not guarantee financial and macroeconomic stability. The sources of global financial crisis emerged during the Great Moderation era. There is no agreement on the primary tool of monetary in the aftermath of global financial crisis: interest rate or balance-sheet policy. One view is that policy should be accommodative as possible. Another view is highlights the collateral damage of such an accommodative policy kept beyond the crisis management phase (Borio & Disyatat, 2010, Hannoun, 2010).

Source: Authors' compilation on Borio (2011) and Eichengreen *et al.* (2011).

The study's major theme that designing general 'one for all' supervisory and macroprudential standards does not make a country immune to the crisis was verified with a series of empirical tests.

Although, central banks could not be blamed for the genesis of the crisis, most of them appeared to be ineffective in relation to most of crisis resolution tasks. Interest rate cuts – some of them on an unprecedented scale – proved to be inadequate, massive injections of liquidity failed to rebuild confidence for a long time. Thus, it is not surprising, that the crisis has shaken the fundamentals of the central banking world (Table 1).

8.3.1. The possible new role of monetary policy tools – the case of reserve requirements

Literature on GFC causes and consequences announces possible changes in the way monetary policy is made in the future. There is also a view that monetary policy tools can be used to foster financial stability objectives. Stein (2013) discusses superiority of monetary tools and fallibility of supervisory instruments. Regardless the type of financial intermediary, they all face the same market interest rates, and "changes in rates may reach into corners of the market that supervision and regulation cannot". Both monetary and macroprudential policies affect the cost of credit, and therefore the instruments used by one policy can affect the instruments used by other (Kohn, 2015). In our report we show that "death of classical monetary policy" might have been called too soon.

Based on a series of estimations, we demonstrate that countries, which had reserve requirement (RR) present prior to the crisis had observed smaller growth of banking credit, as well as their credit-to-GDP gaps were not rising before the crisis. By introducing a dummy for countries, which experienced crisis before 2007, we show that learning mechanism might be working here (Masłowska-Jokinen & Matysek-Jędrych, 2016).

RR, in general, can be analyzed as a tax on bank intermediation (Walsh, 2012). And, since taxes lead to taxes-avoidance, the role of RR depends on the existence of non-taxed institutions – the market structure of the banking system. The less developed financial system, the more effective RR is in suppressing credit growth. In a study analyzing Latin American experience prior and post GFC, Tovar, Garcia-Escribano and Vera Martin (2012) show that RR have a moderate and transitory impact in slowing the pace of credit growth. Particularly in Colombia and Peru, unsuccessful interest rate tightening in response to an unsustainable flowdriven credit boom in Colombia and Peru during 2006-2008 was supported with reserve requirement to contain the risk. Reserve requirements were also successfully used in the aftermath of the 2009-10 global crisis to manage excessive liquidity (Montoro & Moreno, 2011). In a more heterogeneous sample of 49 countries and period 2000-2010, Lim *et al.* (2010) find RR to be effective in reducing the procyclicality of credit growth, at least in the short run.

Raising reserve requirements decreases probability of attracting capital inflows, which might occur in result of an increase in policy rate. They tighten domestic financing conditions, while keeping deposit rates stable. Therefore, RR can be used individually or to strengthen the effectiveness of monetary policy. Especially during periods of rising inflation or rapid credit growth, raising RR may be more effective because they directly affect the supply of credit (Montoro & Moreno, 2011). Moreno (2008) underlines this to be important in countries where financial markets are less developed and pass-through mechanism is smaller.

The role of obligatory reserve requirements has been decreasing steadily and some countries have chosen to eliminate this monetary instrument (for example Australia, Denmark or Sweden)[4].

Table 2: Role of monetary policy in fostering financial stability

Tool set	Goal	Instruments
Monetary policy	price stability	policy rate, standards repos
	liquidity management	collateral policies, interest on reserve, policy corridors
	lean against financial imbalances	policy rate, reserve requirements, mop-up of liquidity, FX reserve buffers

Source: Galati and Moessner (2011) and Hannoun (2010).

A central bank, despite eliminating of such reserve, as Woodford (2002) explains, can still actively participate in a market for overnight central bank balances. But the role of RR is not one-sided. Existence of RR and public knowledge about them can reduce vulnerability to bank runs. Thus, information about obligatory required reserves could lead to '*transparency effect*' of RR, especially in countries without an explicit DIS. Some advocate that reserve requirements can serve as an insurance policy against the risk of inflation (Calomiris, 2014), whereas Gray (2011) underlines that the role of RR is predominantly prudential, monetary and that of liquidity management (Table 2)[5].

8.3.2. Central bank transparency and its effect on minimizing the costs of financial crisis

Importance of clear communication for successful monetary policy has been discussed recently to a greater extent. The analysis of benefits and costs of increased communication between a central bank and financial market, however, is still not sufficiently exhausted. Analyzing the role of central bank transparency (CBT) for guiding private sector forecasts, Ehrmann, Eijffinger and Fratzscher (2010) find empirical evidence that several of transparency measures are effective in smoothing forecasts updates and in result reducing of forecasters' disagreement. CB financial transparency contains important information for financial market; it eliminates noise and move stock markets in the expected direction. Financial Stability Reports are in this respect superior to speeches and interviews, since, as Born, Ehrmann and Fratzscher (2011) explain, the latter affect the market only moderately and cannot reduce market volatility.

[4] Based on the IMF survey (Gray, 2011) over 90% of 120 countries oblige depository institutions to hold minimum reserves.

[5] In a historical overview of RR in the United States, Carlson (2015) explains that the goal of introducing reserve requirements in the US was to provide prudential supervision, to secure banks' solvency and liquidity.

Although high transparency is considered a positive factor improving market efficiency, there are doubts whether transparency size is limitless. Analyzing central banks' behavior after the burst of financial crisis in 2007, one cannot keep unnoticed a fact of sudden backward trend. Monetary policy-makers found themselves in an unknown territory and decided at first to limit the amount of information sent to the public. Soon after that, several central banks (Reserve Bank of New Zealand, Norges Bank – Norway, Riksbank – Sweden and Federal Reserve in U.S.) decided to increase their transparency by publishing a variety of macroeconomic predictions. These actions prove that degree of central bank communication is evolving and gives the basis for hypothesis: clear central bank communication ex-ante and ex-post financial crisis about monetary and supervisory policy helped to decrease the proneness of financial market to that crisis.

By including indicators of CBT (especially transparency regarding financial stability) into the model explaining variability in credit, we have verified this hypothesis and contributed to the existing literature with new recommendations (Masłowska-Jokinen & Matysek-Jędrych, 2016). Based on the estimations for the period prior the crisis, we conclude that CBT worked as an additional cushion against excess credit growth. Using credit-to-GDP gap and credit-to-GDP growth as dependent variables, empirical analysis showed that smaller growth of credit is present in countries having more open central banks. This effect is especially visible among non-crisis countries. Introducing greater monetary and financial transparency early enough (for example in 2000) is associated with output staying above its potential level also during the crisis. Central banks financial stability reports have become more and more important for financial markets and, based on the series of empirical tests, we underline the importance of proper central bank communication, also in the area of financial stability (e.g. central banks covering financial stability issue; publishing financial stability reports, their coverage and forward-looking character; publishing stress test results).

Taking Finland as a case study, we have shown that communication is important not only between monetary authority and a market. The right level and content of communication is also crucial for institutions co-responsible for macro- and micro-supervision. The Bank of Finland, not being officially responsible for macroprudential duties, performs macro-level stress tests and analysis of early warning indicators on a macro-scale. At the same time Finnish supervisory agency FIN-FSA makes analysis on the company level. Close cooperation between institutions in sharing a common pool of data required for regulation, supervision and macroprudential policy is additionally complemented with the legislative responsibilities of the Ministry of Finance. The Ministry, after recommendations provided by the former two institutions, makes a decision about introducing particular macroprudential instruments (for example caps on loan).

8.4. CONCLUSIONS

The Global Financial Crisis once again proved that central banks are the key participants in economics and finance, perhaps even the most important ones. As such, they require clear objectives, instruments and communication about them. They do not, however, need a "total makeover". Importance of clear communication between a central bank and various market participants was proved unquestionable long before the crisis. Recent experience strongly confirmed, though, that the content of the messages matters the most. Additionally, we have shown that intensification of financial transparency before the crisis was associated with smaller credit growth. This effect was especially visible in states, which were classified after year 2008 as non-crisis countries.

Academics and policymakers have been searching for a new set of monetary policy instruments, which would allow the central bank to fulfil both goals, i.e. monetary and financial stability. Based on results from our report, we think that a decision to eliminate reserve requirements from a standard monetary policy array may be ill-conceived. Financial markets in many countries, including some European Union states, are still considered as underdeveloped and face threats of excessive capital flows. Therefore, central banks, should actively adjust its reserve requirements accordingly to the size of credit growth, because, next to being a typical instrument of monetary policy, it seems to be effective as a macroprudential policy instrument, as well.

Based on the literature review we observe evolving institutional arrangements in relation to the central bank. Some countries have already decided to delegate a new set of goals and instruments to their monetary authority, creating a new standard of an institution responsible for price and financial stability. Others, including international advisors, still try to define what would be the next central banking model. Our report has a clear answer to this quest for standardization: "one size does not fit all" in relation to the broadly defined financial safety net and a central bank's role in it. By comparing similar broader arrangements among countries, we show that the same regulations, structured in exactly the same manner, do not guarantee immunity to crisis. Therefore, we see the new perspective of central banking to be defined by, among others: the possibility of targeting financial stability, the trade-off between central bank credibility, independence and the policy of financial system procyclicality reduction and the arrangements for relations between central bank and government.

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9. Central Bank Design and Banking Supervision

Martin Melecky and Anca Maria Podpiera[1]

The agenda of "*Central Banking and Monetary Policy: Which Will Be the New Normal?*" conference included a timely discussion about the involvement of central banks in the banking supervision, in the context of an optimal design of central banking. In the last 15 years, numerous changes in the institutional structures of prudential supervision have taken place. Prior the global financial crisis, central banks' involvement in the prudential banking supervision has diminished due to a tendency to unify the prudential supervision in agencies outside of central banks. The aftermath of the global crisis sparked a new wave in which many countries integrated prudential supervision back under the authority of central banks. Nevertheless, the question of the optimal placement of banking supervision still persists while the empirical evidence is yet limited. Our empirical analysis suggests that countries with deeper financial markets and countries undergoing rapid financial deepening can benefit from having bank supervision in the central bank to better foster financial stability.

9.1. Historical perspective of central banks' involvement in microprudential banking supervision

Besides their traditional role in the conduct of monetary policy and financial stability, some central banks have also assumed banking supervision authority. Changes in the institutional structures of prudential supervision, and especially the banking supervision, are among the transformations that have shaped the central banks in the last 15 years. Most important changes were related to the consolidation of prudential supervision and the involvement of central banks in bank supervision and eventually in the unified supervision. Namely, decisions concerned whether there should be one or multiple supervisory authorities and whether and how the central bank should be involved in supervision. A historical change in the architecture of prudential supervision was the establishment in 1998 of the UK's Financial Services Authority (FSA) that was mandated with supervising all subsectors of the financial sector. With this, the banking supervision was removed from Bank of England's mandate.

[1] World Bank.

Similar changes followed the UK's historical move, mainly during 2002-2007. A number of countries, for instance, Germany and Malta in 2002, Belgium in 2004, Colombia in 2005, Poland in 2006, founded FSAs[2] that were assigned with the prudential supervision of all financial subsectors. Other countries assigned the unified supervisory responsibilities to their central banks: for instance, Ireland and Kazakhnstan (2003) and the Czech Republic and Slovak Republic (2006). Some countries chose to partially integrate the prudential supervision – two financial sectors supervised by the same institution – either in the central bank or an agency outside of the central bank (for instance, Croatia in 2004, Trinidad and Tabago in 2005). This wave of changes in the architecture of prudential supervision proved to be also a good opportunity to create an institutional framework for increased attention to business conduct supervision and its complementary function to prudential supervision. For instance, the central bank of the Czech Republic created a unit in charge of supervising business conduct of financial institution when it became the sole prudential supervisor in 2006.

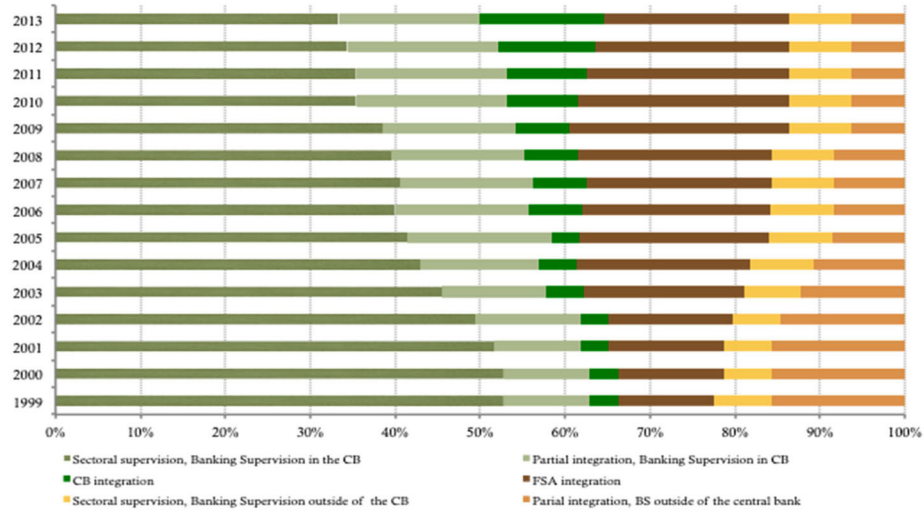
Figure 1, which is based on the updated database of financial supervisory structures in 97 high- and middle-income countries compiled by Melecky and Podpiera (2013), illustrates these changes. The dataset distinguishes among the following types of institutional structures: sectoral, partial or unified, with banking supervision in or outside the central bank. The figure shows that there has been a tendency among countries in the database to unify the prudential supervision. Between 1999 and 2010, the unification scene was dominated by consolidations in FSAs, with 14 new unifications of prudential supervision in a FSA and only five unifications in a central bank. This led to a diminished prevalence of central banks in the prudential banking supervision, proportionally even more in high-financial-depth economies. Nevertheless, a new wave of changes toward integrations in central banks was prompted by the global financial crisis. During 2011-2013, consolidations in central banks have dominated, with 8 new supervisory integrations in central banks. In 2013, the prevalence of central banks in banking supervision, based on our database, was similar to the corresponding figure back in 1999, when the proportion of countries hosting the banking supervision in their central banks was 65 percent.

The same data set also reveals certain inertia in the changes in the supervisory architecture until 2010. Countries that had originally sectoral or partial integration with the banking supervision outside of the central bank typically tended to either maintain their prudential supervisory structure or unify it in a FSA. At the same time, countries in which the central bank supervised the banking sector showed a higher probability to integrate the prudential supervision of financial subsectors under the central bank than under a FSA. However,

[2] FSA stands for Financial Supervision Authority, Financial Services Authority or Financial Services Agency.

after 2011, the changes were rather radical, with countries, such as Hungary or the UK, switching from FSA to central bank integration.

Figure 1: Development of institutional structures for microprudential supervision



Source: updated database based on Melecky and Podpiera (2013).

In an attempt to understand patterns of supervisory integration across financial subsectors, Melecky and Podpiera (2013) used the dataset described above to analyze country characteristics that increased the probability of integration before the global financial crisis, with the integration under the central bank being considered the highest level of integration. They found that small open economies were more likely to integrate their prudential supervision across financial subsectors. In addition, financial deepening was an important determinant as well. The size of the banking sector influenced positively the integration but development of the other financial subsectors affected negatively the tendency to integrate prudential supervision. Banking sector characteristics, for instance high aggregate liquidity exposures, increased the likelihood that a county would integrate prudential supervision. Finally, the number of past financial crises strongly increased the probability that a county would opt for integrating its prudential supervision. In addition, there is a particularly relevant finding for the discussion here, namely that the positive effect of the number of past crises and the negative effect of the stock market capitalization appear to influence only the preference toward the central bank unification.

The literature remains divided on whether placing bank supervision in the central bank is beneficial for financial stability. It produces two alternative hypotheses for empirical work: the possible synergetic and positive effect on financial

stability from placing bank supervision in the central bank *versus* the possible negative effect from the same arrangement because of lack of checks and balances. In particular:

– On the one hand, placing bank supervision under one roof with the central bank may facilitate coordination and possible synergies in systemic risk management, crisis preparedness, and crisis resolution (De Grauwe, 2007; Cecchetti, 2008; Claessens *et al.*, 2010; Brunnermeier *et al.*, 2009)[3]. The crisis experience showed that as long as the central bank is the lender of last resort, it is probably not a good idea to be isolated from supervision of institutions that create credit (De Grauwe, 2007). Information gains from having banking supervision in the central bank could make monetary policy more effective (Goodhart and Schoenmaker, 1995; Herrings and Carmassi, 2008). Crisis experience further revealed close links between the monetary policy and the financial stability – monetary policy has an important role to play in in the prevention of financial crisis. An additional argument is related to the central bank capacity in attracting more skilled staff (Quintyn and Taylor, 2007).

– On the other hand, there are several reasons for separating the powers for microprudential and monetary policy: (1) potential conflicts of interest between monetary policy and supervisory mandates; (2) the reputational risk, as poor supervisory performance could damage the credibility of monetary policy makers; (3) the possible moral hazard effect, as banks can become less risk averse if the lender of last resort is also the supervisor; and (4) the potential that the bureaucratic powers of the central bank could become too big (Gerlach *et al.*, 2009; Cecchetti, 2008; Masciandaro, 2009).

9.2. NEW ANALYSIS OF THE EFFECT OF PLACING MICROPRUDENTIAL BANKING SUPERVISION IN CENTRAL BANKS ON FINANCIAL STABILITY

Our new work examines whether placing the microprudential banking supervision in the central bank can improve the management of systemic risk in the financial sector, and more specifically, whether it mitigated the likelihood of banking crises during the global financial crisis of 2007-2012. The global

[3] This arrangement can capitalize on several factors: (1) the possibility for combining the knowledge of banking microstructures with the central bank's expertise in evaluating macro and financial conditions; (2) the opportunity for monetary policy makers and bank supervisors to internalize and align each other's objectives; (3) the potential for faster delivery of complete supervisory information about bank credit risk (solvency) to the lender of last resort in crisis times; and (4) the likely better capacity to coordinate cross-border supervision of regionally or globally systemic banks because of the greater role that central banks play in policy on international finance and management of the balance of payments.

financial crisis is still the elephant in the room for policy makers. One reason for the lingering uncertainty over how best to ensure the financial stability is that policy makers in many countries have failed to see the big picture of their financial systems through a proper macroprudential lens. Since the big picture is derived from a good knowledge of the microstructure of the system, separating microprudential supervision of banks, typically the systemic part of the financial system, from the central bank, typically entrusted with financial stability, could be suboptimal for fostering financial stability. This work contributes to the literature on optimal institutional arrangements for financial sector oversight and the early-warning models of banking crises.

The empirical literature that addresses the pros and cons of placing bank supervision in the central bank is just emerging, but is gaining importance. In one of the first studies, Masciandaro, Pansini, and Quintyn (2011) find that the degree of central bank involvement in supervision, with the highest involvement occurring when the central bank is the unified supervisor for all financial subsectors, did not significantly affect economic resilience (real GDP growth during 2008-09). They also find that unifying microprudential supervision, either in the central bank or in a financial supervisory authority, negatively affected the measure of economic resilience. Boyer and Ponce (2012), using a formal model, argue that concentrating supervisory authority in the hands of a single supervisor could make the capture of the supervisor by banks more likely. Hence, full integration might not be the supervisory arrangement of social preference. Masciandaro and Romelli (2015) find that the occurrence of systemic banking crises as well as the reforms other countries are undertaking in the same period are important drivers of reforms in supervisory structure.

We find that placement of bank supervision in the central bank reduced the contribution of financial depth to banking crises. Our analysis is the first to show that having bank supervision into the central bank could generate macroeconomic benefits by, at a minimum, helping countries with significant financial depth or those undergoing extensive financial deepening to lessen their propensity for future systemic crises. Many countries still keep the banking supervision outside the central bank, partly because empirical evidence on which institutional arrangements work better in preventing or coping more efficiently with future banking crises is lacking. Other countries cannot reform because there is no political consensus and the reform requires broad support from the highest political levels (such as the parliament) for implementation. These results could help build the needed political consensus for reform.

9.2.1. Regression model and estimation methodology

We aim to identify variables that could have helped predict banking crises during 2007-12. We put an emphasis on identifying features of the supervisory architecture that could have lowered the probability of banking crises, and among them, we focus on the placement of banking supervision in the central bank. We analyze this question using a cross-sectional regression model that employs data from 124 countries.

9.2.1.1. Regression Model

We use the systemic banking crisis database of Laeven and Valencia (2013) to identify banking crises in individual countries. We construct a binary variable that takes the value of 1 if a country experienced a systemic banking crisis after 2007 according to Laeven and Valencia (2013) and 0 otherwise. There are 25 crisis countries; hence, about 20 percent of the 124 countries in our sample suffered a banking crisis during 2007-12. In addition, for the robustness tests, we use the banking crisis classification of Reinhart (2010) and Reinhart and Rogoff (2011). We relate this dependent variable to explanatory variables averaged over 2003-07.

More specifically, we estimate the following model:

$$y_i = \alpha + \Sigma_j \beta_j z_{ji} + \Sigma_p \delta_j x_{pi} + \varepsilon_i \quad (1)$$

where i identifies the country, y is the binary (0/1) crisis measure; z_j is a set of j = 3 institutional supervisory variables: (1) our variable of interest, a 1/0 dummy variable, indicating whether microprudential supervision of banks was in the central bank (hereafter BPSCB); (2) an index that measures the quality of microprudential supervision (Anginer, Demirgüç-Kunt, and Zhu, 2013)[4], and (3) a variable indicating how many years a central bank has been publishing a Financial Stability Reform (FSR) as a proxy of quality of financial stability.

To construct the BPSCB variable, we rely on the data from Melecky and Podpiera (2013) and the 2003, 2007, and 2012 Bank Regulation and Supervision Surveys of the World Bank. The variable takes the value of 1 if the banking supervision is placed under the central bank and 0 otherwise. Note that the value of 1 is assigned both to countries with an institutional arrangement of fragmented, sectoral supervision in which the banking supervision is under the central bank as well as to countries with a unified supervision of all subsectors under the central bank. In contrast, the value of 0 is assigned to countries if the bank super-

[4] We followed the Anginer, Demirgüç-Kunt and Zhu (2013) methodology and computed the index by aggregating the answers to 14 selected questions on supervisory powers that were collected in the 2003, 2007, and 2011 surveys conducted by Barth, Caprio, and Levine (2001).

vision is in an agency other than the central bank, including a financial supervisory authority that oversees all main financial subsectors on a microprudential basis.

The vector x_p is a set of $p = 10$ macroeconomic and financial variables used in the literature as established determinants of banking crises (Demirgüç-Kunt and Detraghiache 1998, 2005; Kaminsky and Reinhart, 1999; Babecky *et al.*, 2013) and/or the global financial crisis (Lane and Milesi-Ferretti, 2011; Berkmen *et al.*, 2009; Frankel and Saravelos, 2012; Masciandaro, Pansini, and Quintyn, 2011; Caprio *et al.*, 2014; Eichengreen and Dincer, 2011). The *macroeconomic variables* include GDP per capita, the real output gap[5], inflation, the real interest rate, and the exchange rate, while the set of *financial variables* includes the real private credit gap[6] to identify credit booms, the private credit-to-GDP ratio, a liquidity indicator (ratio of private credit to deposits), and a measure of financial openness (Chinn and Ito, 2007)[7]. In addition, we estimate an alternative regression that replaces the ratio of private credit-to-GDP with an alternative measure of financial depth, the ratio of deposits to GDP, that we consider a more sustainable and robust measure of financial deepening than the credit to GDP ratio. We also condition on the cumulative number of past banking crises that a country experienced from 1970 to 2006 to allow for some historical dependence in the modeled crisis variable and investigate whether there could be a positive learning effect from the experience of past crises on a country's propensity to experience future crises. Parameters α, β, and δ stand for estimated coefficients and ε_i is an error term.

9.2.1.2. Estimation methodology

We estimate the regression model explaining the probability of a banking crisis with a *binary choice logit* model with robust standard errors. Given the cross-country nature of the analysis, there is a risk of omitted relevant variables. We mitigate this risk by using a robust set of crisis predictors well established in the literature, which helps achieve a satisfactory fit of the model to the data. We further assess the risk of an incompletely specified model using standard statistical tests.

5 The trend was estimated using the Hodrick-Prescott filter for the period 1990-2011.

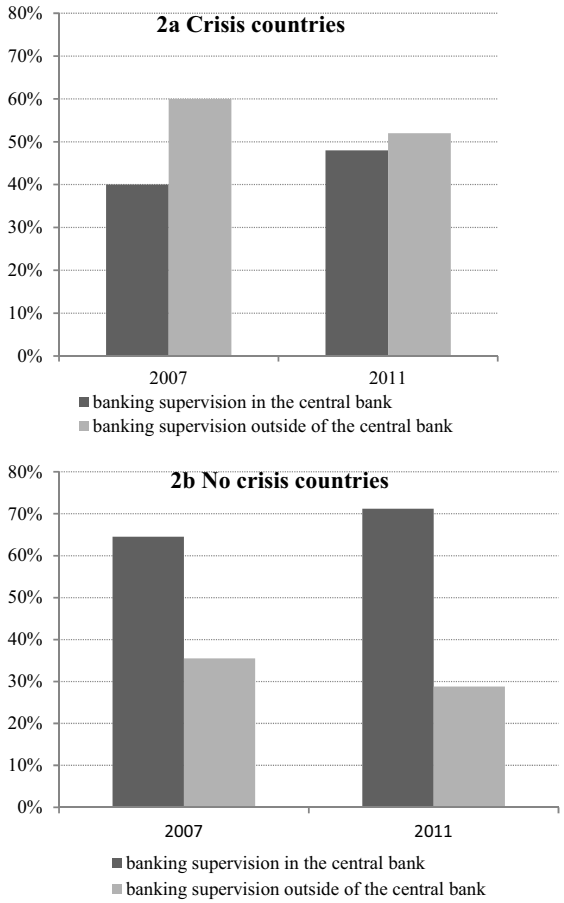
6 The trend was estimated using the Hodrick-Prescott filter for the period 1995-2011. The period is shorter than for the computations of the GDP trend due to data constrains.

7 We use gap measures instead of growth rates of real output and credit to be consistent with the measures of business and credit cycle overheating used in monetary policy models (Adolfson *et al.*, 2008; Christiano, Eichenbaum and Evans, 2005; Smets and Wouters, 2003) and Basel III.

9.2.2. Data Description and Summary Statistics

In 2007, 60 percent of those countries that soon experienced a banking crisis had the bank supervision outside their central bank (see Figure 2). Evidently, the crisis period triggered reforms. The share of countries that experienced a banking crisis and had bank supervision in the central bank increased to 48 percent in 2011. Among the countries that did not experience a banking crisis, 65 percent had the bank supervision in their central bank in 2007. This percentage increased further to 71 percent in 2011. Overall, the trend of placing bank supervision in the central bank seems to have increased for both crisis and non-crisis countries.

Figure 2: Involvement of central bank in bank supervision by crisis experience



Source: The proportions of countries are calculated based on Melecky and Podpiera (2013), World Bank's Bank Regulation and Supervision Surveys, and Laeven and Valencia (2013).
Note: "Crisis countries" are those that experienced a financial crisis during 2007-2012; "no-crisis countries" are those that did not. The sample contains 25 crisis countries and 122 no-crisis countries.

9.2.2.1. Macroeconomic and financial variables

On average, the crisis countries in our sample are characterized by a higher level of development (GDP per capita), lower inflation, and a higher output gap than the countries that did not experience a crisis. Changes in the real exchange rate were also significantly different among the two groups of countries, showing, on average, local currency appreciation for crisis countries and local currency depreciation for non-crisis countries (Table 1, panel a). Turning to the financial variables in the five-year period preceding the global financial crisis, we found that the private credit-to-GDP ratio and the deposits-to-GDP ratio (financial depth variables), the degree of financial openness, and the private credit-to-deposits ratio (that is, the exposure to aggregate liquidity risk) were, on average, significantly higher in crisis countries than in non-crisis countries (Table 1, panel b).

Table 1: Summary statistics for crisis and no-crisis countries

	Crisis countries		No-crisis countries		Difference		
	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.	t-stat
a. Macroeconomic variables							
GDP per capita	27277.72	2961.12	10944.51	1331.63	-16333.2	3017.5	-5.33
Real GDP gap	0.241	0.089	-0.173	0.076	-0.42	0.160	-2.58
Real interest rate	0.011	0.558	0.632	0.41	0.62	0.86	0.7
Real exchange rate change	-4.01	1.08	1.56	1.05	5.57	2.17	2.56
Inflation	4.14	0.65	6.01	0.506	1.87	1.069	1.75
b. Financial variables							
Real private credit gap	-1.96	0.75	-2.3	0.382	-0.33	0.85	-0.4
Private credit to GDP	101.04	11.16	41.02	3.41	-60.02	8.8	-6.8
Private credit to deposit	134.44	11.29	85.44	3.29	-48.99	8.65	-5.66
Deposits to GDP ratio	82.15	13.04	49.6	4.15	-32.56	10.5	-3.08
Financial openness	1.77	0.25	0.53	0.152	-1.23	0.335	-3.68

Source: Authors' calculations based on World Bank's FinStats database and Chinn and Ito (2007).
Note: "Crisis countries" are those that experienced a financial crisis after 2007; "no-crisis countries" are those that did not. Std. err. = standard error; GDP = gross domestic product.

9.2.3. Discussion of Estimation Results

When conditioning on all institutional macroeconomic and financial variables, we find that institutional variables, including the proxy for placing bank supervision in the central bank (BPSCB), are not statistically significant at common levels-columns (1)-(4) of the results table (Table 2). The difference between the specifications corresponding to columns (1) and (2) as well as between those of

(3) and (4) comes from the financial depth variables in the regressions: in the columns (1) and (3), the financial depth variable is the credit-to-GDP ratio, while in the columns (2) and (4) the financial depth variable is the deposits-to-GDP ratio. Columns (1)-(2) of the Table 3 show the results of the regressions that include the variables for quality of microprudential supervision and of financial stability. Since their coefficients are not significant and their data coverage is very limited, we exclude them from further regressions. Among the macrofinancial variables, the GDP gap and the private credit-to-deposits ratio stand out as the most significant, with several other variables marginally significant.

We attempted to derive a parsimonious regression specification because of numerous significant cross-correlations among the macrofinancial variables. For this purpose, we employ the Lasso (least absolute shrinkage and selection operator) penalized regression estimator of Tibshirani (1996), which has the effect of shrinking coefficients of unimportant variables to zero, as a variable selection tool to reduce the set of indicators. The Lasso method is supported by extensive theoretical work[8]. As a result of the Lasso variable selection, BPSCB, the inflation, and the growth in real exchange rate were eliminated along with several other variables. The corresponding parsimonious regressions thus include the number of past crises, the GDP gap, the real interest rate, the ratio of private credit-to-GDP, the ratio of private credit-to-deposits, and the deposits-to-GDP ratio in the alternative regression (column 6). We also tested for omitted relevant variables and could not reject that our model is properly specified[9].

The signs of the estimated coefficients in the parsimonious regressions are as anticipated and are mostly in line with the literature. First, we see that countries that experienced a higher number of past crises had a lower probability of experiencing another crisis after 2007, likely as a result of efforts to address macroeconomic, financial, and institutional vulnerabilities after the past crises. Second, countries with greater deviations of real GDP from its potential showed a higher propensity to experience banking crises after 2007. This result is consistent with other earlier studies of banking crises, such as Kaminsky and Reinhart (1999) and Gourinchas and Obstfeld (2012), and Frankel and Saravelos (2012) which investigated the determinants of the recent global crisis. Our results also show a negative impact of the real interest rate on the probability of a banking crisis: low real interest rates support excessive borrowing that can ultimately generate banking crises. Frankel and Saravelos (2012) associate higher saving rates with lower incidence of crises. In contrast, Demirgüç-Kunt and Detragiache (1998, 2005) find that exposure to high real interest rates, which could intensify credit

[8] See section 3.4 in chapter 3 of Hastie *et al.* (2009) for a detailed description of the Lasso and Zou (2006) for a liteerature review. We performed this regression in Stata with the plogit procedure.

[9] We used using Stata's linktest. The results are available from authors upon request.

Table 2: Estimated determinants of the probability of banking crisis

	Explanatory variables:	Dependent variable: Binary crisis measures (0/1 dummy)											
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Supervisory Block	Number of previous crises	-1.44 (1.24)	-178 (1.24)	-1.3 (0.82)	-1.553** (0.68)	-0.97* (0.56)	-1.206** (0.560)	-1.531* (0.895)	-1.002 (0.644)	-0.977 (0.638)	-1.144* (0.62)	-1.076 (0.661)	-1.408** (0.593)
	BPSCB	-1.18 (1.06)	-1.18 (0.99)	-0.808 (0.76)	-0.823 (0.772)								
	Quality supervision	0.011 (0.224)	0.012 (0.23)										
	Length of FSR publication	-0.84 (1.24)	-0.51 (1.12)										
Macro-financial block	GDP per capita	9.3e-05 (5.7-05)	9.3e-05 (5.8-05)	2.4e-05 (3e-05)	2.7e-05 (2.2e-05)								
	GDP gap	-0.59 (1.24)	-0.85 (1.12)	1.19** (0.586)	1.096* (0.569)	1.15** (0.45)	1.008** (0.432)	1.09** (0.517)	1.531 (1.084)	1.18** (0.534)	1.25** (0.51)	1.21** (0.529)	1.102** (0.481)
	Inflation	0.71* (0.41)	0.71* (0.41)	0.373 (0.24)	0.391* (0.18)								
	Real interest rate	-0.54* (0.31) ()	-0.53* (0.29)	-0.173 (0.138)	-0.187 (0.167)	-0.3*** (0.09)	-0.26*** (0.088)	-0.25*** (0.0912)	-0.24*** (0.0935)	-0.200 (0.26)	-0.265*** (0.098)	-0.26*** (0.0925)	-0.27*** (0.097) (0.0976)
	Change in real exchange rate	-0.243 (0.15)	-0.25* (0.15)	-0.161 (0.113)	-0.182* (0.085)								
	Real private credit gap	-0.27 (0.21)	-0.26 (0.204)	-0.166 (0.121)	-0.158 (0.133)								
	Private credit–to-GDP ratio	0.016 (0.016))		0.015* (0.08)		0.02*** (0.007)		0.02*** (0.008)	0.022*** (0.008)	0.02*** (0.008)	0.028*** (0.008)	0.022*** (0.008)	
	Private credit–to-deposit ratio	-0.027 (0.18)9 (0.018)	-0.036* (0.014)	0.02* (0.011)	0.03*** (0.009)	0.022** (0.008)	0.04*** (0.009)	0.024** (0.01)	0.021** (0.01)	0.022** (0.009)	0.022** (0.007)	0.023** (0.01)	0.037*** (0.01)
	Deposit-to-GDP ratio		0.007 (0.014)		0.0084 (0.007)		0.016** (0.005)						0.021*** (0.007)
	Financial openness	1.27 (0.5)	1.38** (0.5)	0.45 (0.335)	0.486* (0.25)								

Table 2: Estimated determinants of the probability of banking crisis *(continued)*

Explanatory variables:		Dependent variable: Binary crisis measures (0/1 dummy)											
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Interactive terms	BPSCB*nr of prev crises		-1.44 1.24)					1.091 (1.035)					
	BPSCB*GDP gap								-0.483 (1.185)				
	BPSCB*real interest rate									-0.06 (0.289)			
	BPSCB*private credit to GDP										-0.012* (0.007)		
	BPSCB*private credit to deposits											-0.004 (0.006)	
	BPSCB*deposits to GDP												-0.013** (0.006)
	Observations	68	70	121	121	124	124	124	124	124	124	124	124
	Pseudo R-squared	0.58	0.245	0.474	0.466	0.404	0.395	0.413	0.406	0.405	0.428	0.408	0,405

Notes:
(1) The shaded columns present the results of the estimation including deposit to GDP ratio.
(2) Robust standard errors in parentheses;
*** p<0.01, ** p<0.05, * p<0.1.

risk as well as negatively affect bank profits, was a source of bank fragility during 1980-2002.

We confirm the results from earlier studies that countries with greater financial deepening and countries taking greater aggregate liquidity risk (ratio of private credit-to-deposits) are significantly more prone to banking crises. Demirgüç-Kunt and Detragiache (2005), Gourinchas and Obstfeld (2012), Schularick and Taylor (2012), and Babecký *et al.* (2013) find, as we do, that the credit-to-GDP ratio is a consistent predictor of banking crises. In addition, Lane and Milesi-Ferretti (2011) find that the credit-to-GDP ratio and its change over 2004-07 could also help explain the intensity of the 2008-09 global recession[10]. The alternative specification, including the deposits-to-GDP ratio (column 6), reconfirms the positive effect of high financial depth on the probability of banking crises found in the literature. Our finding that high aggregate liquidity risk increases the tendency toward banking crises confirms earlier results from Caprio *et al.* (2014)[11].

To examine a hypothesis that effects from placing bank supervision in the central bank materialize only in certain country circumstances, we interact BPSCB with the variables that enter the parsimonious regressions. Columns (7)-(12) show the results, including the individual interactive terms. They show a significant and negative coefficient on the BPSCB's interaction with the ratios of private credit-to-GDP and deposits to GDP, respectively. The marginal effects suggest that placing bank supervision in the central bank can help reduce the positive effect of a greater financial deepening on the probability of crises by more than a half. In countries with greater financial depth it might be more beneficial to house bank supervision under one roof with the financial stability, and eventually macroprudential supervision, so that knowledge of the microsources of macroprudential risks could be more readily available for taking informed and timely policy action to mitigate systemic risk. Therefore, it is the countries with deeper banking sectors that could benefit the most from the crisis-mitigating effect of placing bank supervision in the central bank.

9.2.4. Robustness tests

The results survive several robustness tests of alternative definitions of the dependent variable, an alternative construction of our explanatory variables of interest, and an alternative estimation model, with a different functional form. We used an alternative definition of banking crises by Reinhart and Rogoff (2011) and Reinhart (2010). We also consider a separate class of borderline crises

[10] This literature brings supporting evidence for Rajan's (2005) claim that larger, more complex financial systems may be inherently more risky.

[11] Berkmen *et al.* (2009) find that higher aggregate liquidity risk can explain a larger variation in the growth forecast revisions during the global crisis period, also a possible indicator of macrofinancial stability.

identified by Laeven and Valencia (2013). For an alternative construction of our explanatory variable of interest, we average the annual 1/0 dummies indicating whether bank supervision was or was not in the central bank over different time spans. In addition, we test the robustness of our baseline results against the assumed curvature of the cumulative distribution function in the logit model by estimating a probit model. All robustness tests support and, on occasions, reinforce our baseline results. Interestingly, when we use the Reinhart and Rogoff (2011) definition *of banking crises*, placing bank supervision in the central bank appears to mitigate the likelihood of crises irrespective of the country context.

9.3. CONCLUSION

The global financial crisis prompted a wave of changes in institutional structures of banking supervision, with more countries giving the central banks the authority for banking supervision. This contrasted the 2000-10 trend of prudential integration in agencies outside of the central banks, which led to diminished involvement of central bank in banking supervision. Our analysis provides evidence that countries with deeper financial markets and countries undergoing rapid financial deepening can benefit from having bank supervision in the central bank to maintain financial stability. This results hold regardless of whether rapid financial deepening occurs because of domestic credit policies influenced by the risk appetite of domestic policy makers for taking systemic risk or because of exogenous factors such as capital inflows after liberalization of external financial accounts. Especially in these circumstances, our results suggest that policy makers can benefit from having a good knowledge of the financial system's microstructure when safeguarding the stability of the financial system as a whole. Indeed, countries like the Netherlands, Hungary or the UK, have moved bank supervision into the central bank to reap these benefits. Other countries, such as Poland, Turkey, and several countries in Latin America, could find support in our results to implement similar reforms.

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10. Central Bank Governance: Evolution, Goals, and Crises

Forrest Capie and Geoffrey Wood[1,2]

10.1. Governance: What and Why?

Corporate governance was discussed before the financial crises of earlier this century, but attention to it has increased dramatically since that crisis. What is governance, and why did it suddenly become so interesting?

The *Oxford English Dictionary* gives a comprehensive definition. It tells us governance has six meanings: the action or manner of governing; the state of being governed; the office, function, or power of governing; method of management, system of regulations; mode of living, behaviour, demeanour; wise self command.

Does any part of this general definition need to be changed for central banks, whose governance is the subject of this paper? Surely it does not; the only feature that differentiates them from the general run of companies for this purpose is their ownership – with some rare exceptions they are government owned. The Bank of England was, indeed, created by the government although not for many years owned by the state.

The first, second, and fourth of these aspects of the definition are particularly relevant here: for the first encompasses what is being controlled and how; the second, who controls the central bank; and the fourth, what the bank does internally and externally. The last is of course taken for granted for central banks.

Why did this subject become so popular after the crisis? The answer is in the subject's origins.

The problem it tries to address was identified by Adam Smith in 1776. How can a firm's owner ensure that the firm is being run in his or her interests, rather than in those of the management? It is believed by some that poor governance – management (and others) out of the control of shareholders and not operating to advance their interests – led to 'excessive risk taking' and that in turn to the crisis. The diagnosis may be incorrect; it does not for example fit the case of Lehmann

1 Cass Business School.

2 A paper prepared for the proceedings of "Central Banking and Monetary Policy: which will be the new normal?" A conference held at Baffi Carefin Centre, Bocconi University, on 14th April, 2016.
We are grateful for the most useful comments of our discussant, Charles Goodhart, and also for those of other participants at the conference.

Brothers, where most employees, from top to bottom of the firm, had substantial shareholdings in the company. Nonetheless, that explanation for the crisis is popular, and is indeed a recurrent theme in financial history. Every major corporate failure and every major financial crash is followed by a burst of activity designed to improve governance and better align the interests of shareholders and managers.

10.2. A ROUTE TO IMPROVED GOVERNANCE?

One route to improved governance concerns itself explicitly with the appointment of directors and with how they should behave. These recommendations are embodied in a code.

In the UK there are several 'corporate governance codes'. There is one for the general run of companies; then there is one for a particular corporate form, investment trusts; and then there is one for investing organisations, primarily public sector bodies such as pension funds, but applicable for all such bodies. We start with the code for companies in general and then simply note that for investment trusts, as that is conceived as a specialised version of the general one. That for bodies such as pension funds is essentially an extension of that for investment trusts. We focus on the UK as codes across the English-speaking world are all very similar, differing only because of differences in law as between countries.

The first version of the UK corporate governance code was produced in 1992, by the Cadbury Committee[3]. This code has endured. All work on UK corporate governance appears to contain the following quotation from that report.

"Corporate governance is the system by which companies are directed and controlled. Boards of directors are responsible for the governance of their companies. The shareholders' role in governance is to appoint the directors and the auditors and to satisfy themselves that an appropriate governance structure is in place. The responsibilities of the board include setting the company's strategic aims, providing the leadership to put them into effect, supervising the management of the business and reporting to the shareholders on their stewardship. The board's actions are subject to laws, regulations, and the shareholders in general meeting." (para. 2.5 of the *Cadbury Report*)

[3] The chairman of the committee was Adrian Cadbury.

Various amendments have been made since that first code, and the other UK codes are all variations on the Cadbury one, modified to the minimum necessary to adapt them to particular sectors of industry[4].

10.3. AN ALTERNATIVE TO PRESCRIPTION

Improving governance by this prescriptive means is not, however, the only way to go about it. Indeed, Adam Smith in his pioneering discussion suggested another approach, which can broadly be termed "Improvement by Contract".

Smith did not set this out explicitly. Rather he opened up the discussion, by arguing that no route then existed to ensure that someone running a business on behalf of another would run it in the owner's interests rather than his own.

Many economists have worked on this, under the term coined by Steve Ross in 1973, the Principal – Agent Problem. Smith himself discussed it in various particular cases. Other notable names who addressed the problem are Hume (1740), Pantaleoni (1882), Wicksell (1896) de Viti de Marco (1934), Vickrey (1960) and Loeb and Marget (1979). This literature, and there are numerous other contributors to it, can be summarised as saying that three types of information problem impede contract design: adverse selection, moral hazard and non-verifiability. The first is when the agent has private knowledge (about cost or valuation) that is not available to the principal. The second is when the agent can take action (of a type the principal would not wish) unknown to the principal. The third is when both principal and agent have the same information after the event, but no third party can observe it – so even after the event the information can not be used for contract enforcement in, for example, a court of law. None of these problems seems likely to inhibit a central bank contract of the sort usually embodied in what is called central bank independence. Central bank governance is apparently straightforward[5].

But is it really? A few words on legal systems are necessary by way of a preliminary, as these systems are fundamental to our interpretation of how central bank governance has evolved, and to our conclusions. There is a major difference

[4] For example, the Association of Investment Companies writes, "Investment companies have special factors which have an impact on their governance arrangements. These special factors arise principally from two features. First, the customers and shareholders of an investment company are the same, thus simplifying shareholder considerations while magnifying the importance of this group's concerns. Second, an investment company typically has no employees, and the roles of CEO (unofficially), portfolio management, administration, accounting and company secretarial tend to be provided by a third party fund manager (or delegated to it by others) who may have created the company at the outset and have an important voice in the original appointments to the board.)" (2015, p. 4).

[5] An examination of the application to normal company governance of the principal-agent tools can be found in Wood (2013). We observe too that the usual discussion is concerned with ensuring agents act in the interests of shareholders. Who the shareholders of the central bank are is an interesting matter, discussed below.

between common and civil (or Roman) law systems. The former, as is well known, works on precedent; the latter strictly on what has been written in the statutes. The former is the system of all countries which were British colonies, with some which were not having at least elements of the system. Notable is that pure common law system countries (with the striking and interesting exception of the USA) do not have constitutional courts which can over-rule governments. In Britain, for example, the Supreme Court can eventually decide that a law was written so that it did not produce the result the government intended; the only thing the government can then do is change the law. But the court can not say "This law is inconsistent with the constitution as written" – simply because there is no written constitution.

Now, bearing that in mind, we turn to a brief review of governance in two central banks, the Bank of England and the Reserve Bank of New Zealand. These two are chosen because though fundamentally similar in many respects, there are differences which highlight major problems in achieving good governance in a central bank.

10.4. TWO CENTRAL BANKS

10.4.1. The Bank of England

After a naval defeat by France in 1690 the government of William III wished to build a strong navy and needed to borrow to do so. The government's credit however was not good. To encourage taking up of the loan, all who did so became members of the Bank of England (formally known as the Governor and Company of the Bank of England), following a scheme devised by William Paterson and carried out by Charles Montagu, 1st Earl of Halifax, in 1694. In addition to simply lending the money and being paid interest (at 8% pa) the subscribers thus incorporated received certain privileges – in particular, they became the government's banker, and were the only limited liability corporation allowed to issue bank notes. There was thus a clear alignment at this point between the interests of those who had established the Bank, the government of the day (who were not the shareholders) and those who ran the Bank.

Beyond that, a very limited amount is known about the governance of the Bank of England in its early years. There was a Court of Directors and a Court of Proprietors. But for most questions on the working of the Bank there are poor answers. How, for example, were governors appointed? Even in the late twentieth century this was far from clear. And what were the rules on the appointment of directors? At what point did government start to play a part in these appoint-

ments? It was before Nationalisation but when exactly? Lack of clarity on all these matters characterised the Bank's history.

At the founding of the Bank in 1694, £1.2 million in capital was raised for the purpose of making a loan to government. There were 1,272 shareholders. A cap of £10,000 was placed on any single subscription. There seems to have been no lower limit although £100 appears to be the smallest subscription. A minimum of £500 was required for voting privileges; £2,000 was required to become a director; and £4,000 to become Governor.

In 1946 the Bank was nationalized. Shareholders, many more in number than at its founding because there had been several share issues, were given government stock in exchange for their shareholding to an extent that left them no worse off in monetary terms. Nothing changed in terms of the organisation of the Bank or in what it did. The Court remained in place and decisions continued to be taken in the same way. The Bank paid a flat rate 'dividend' to the Treasury and retained profits beyond that.

10.5. THE BANK'S EARLY OBJECTIVES AND FUNCTIONING

A bimetallic standard obtained when the Bank was set up. But by the early years of the eighteenth century there was a *de facto* gold standard. The standard in the early part of the period was not strictly defined. That had to await the 1844 Bank Charter Act at which point a fiduciary issue was specified and further note issue was tied to one-to-one relationship with gold.

This standard maintained price stability by linking the note issue to the stock of gold, which, while it could and did change, changed only slowly. There were fluctuations in the price level, but so long as Britain was on the gold standard these fluctuations were modest, and were followed by reversion to the trend[6]. The only departures from that state of affairs were when Britain temporarily left the gold standard – suspended it, to use the technical term.

How was policy to defend the gold standard decided? Who decided what to do, and who acted on the decisions? As the Bank grew steadily to the point where it dominated the financial system a prime responsibility was to maintain the standard, which it did by maintaining the convertibility of its own notes into gold. Other banks had to follow suit.

One could therefore say that from an early date the Bank of England slowly, almost imperceptibly, acquired one of the functions of a modern central bank, the

[6] The fluctuations were the result of factors such as large changes in the price of grain, and changes in the behaviour of the cash holdings of the public and of banks other than the Bank of England.

maintenance of monetary stability. In the first stage that was through preservation of a metallic standard. What is striking and important from the governance point of view was that the Bank can be said to have drifted into the role, and the 1844 Bank Act simply accepted that. The Act did not impose a responsibility on the Bank so much as accept the responsibility it had taken on itself.

It is also of interest from the point of view of an investigation into central bank governance how the Bank acquired its second objective, that known nowadays as the preservation of financial stability.

The banks that comprised the banking system when the Bank of England was founded had changed little since banks emerged from being mediaeval goldsmiths. Whatever other activities they engaged in, their key business was borrowing and lending. When engaged in that business they are crucial in two ways. They supply a part – in modern economies, by far the greater part – of the stock of money. And they transfer funds from lenders to borrowers – they act as financial intermediaries. When engaged in borrowing and lending, banks such as those considered here need both *capital* and *liquidity*.

Capital comprises funds a bank actually owns. It can have been provided by the bank's shareholders, or, depending on the corporate form, the partners in the bank or even by its sole owner. Such funds are needed because however well run a bank is, and regardless of how well it treats its customers and of the extent to which it is aware of its responsibilities to them, now and again it will lose money on a loan. Some or all of what it has lent will not be paid back. But although such capital is necessary, it was at the time of which we are currently writing no concern of the central bank's – it was a matter for a bank's owners and managers[7].

Liquidity can most easily first of all be thought of as cash the bank keeps in its own vaults. Some cash is needed because while most of the time receipts match withdrawals, sometimes they fall short. Again, the bank is obliged to pay out what its customers demand, so to avoid default and consequent closure they need some cash in hand.

There was certainly fractional reserve banking in England before there was a central bank, although cash reserves were a large fraction of deposits. The argument that the system requires what is now called a central bank before it can grow was first articulated by Francis Baring in 1797. He wrote on what happened on the outbreak of war with France. Firms suddenly could not receive the funds they expected from their overseas customers, and turned to their banks for loans.

[7] The Bank took an interest in what the banks in general were doing to the extent that it paid heed to the quality of securities it received, directly and indirectly, for rediscounting. That was however a matter of self-preservation as much as anything, for the Bank was still a private organisation. For discussion of the Bank's concern with the quality of bills, see Sissoko (2015).

These small local banks soon in turn needed to borrow, and ultimately, as Baring pointed out, the Bank of England was the only bank that could still lend. Small banks had turned to bigger banks, these to the big London banks, and these in turn to their banker, the Bank of England, the *dernier resort*"[8].

Very soon after Francis Baring's 1797 coining of the term '*dernier resort*', Henry Thornton (1802) provided a statement of what the lender of last resort was, why it was necessary, and how it should operate. The arguments were developed further by Joplin (1832), and most famously by Walter Bagehot, who in 1873 summarised the arguments.

Nineteenth century practice gradually converged to following this advice, as the Bank in a series of crises moved closer and closer to accepting the 'lender of last resort role'. The decisive step was taken in 1866, with the Overend and Gurney Crisis. By the 1850s that bank's annual turnover of bills of exchange was in value equal to about half the national debt, and its balance sheet was some ten times the size of the next largest bank. It was floated during the stock-market boom of 1865. By early 1866 the boom had ended. A good number of firms were failing. Bank rate had been raised from 3 per cent in July 1865 to 7 per cent in January 1866. After February, bank rate started to ease, but on 11 May Gurney's was declared insolvent.

To quote the *Bankers' Magazine* (in what would now be called its editorial) for June 1866, "a terror and anxiety took possession of men's minds for the remainder of that and the whole following day". The Bank of England for a brief time made matters worse by hesitating to lend even on government debt. The Bank Charter Act (which among other things restricted the note issue to the extent of the gold reserve plus a small fiduciary issue) was then suspended, and the panic gradually subsided.

There was the occasional subsequent failure, but none produced any signs of contagion. The Bank's voluntary acceptance of the role of lender of last resort had stabilized the British banking system

10.6. POST WWII DEVELOPMENTS

Throughout a good part of its history, certainly since the Bank Charter Act of 1844 (as modified in 1847), the Bank had been charged not with price stability but with adherence to a rule, that of keeping sterling on gold. This rule had to change when the standard was suspended, and the consequences had been

[8] That the Bank of England acted as banker to banks makes clear why some central banks, that of New Zealand for example, go by the title "Reserve Bank". Other banks use them as bankers, and, like anyone else, hold the bulk of their cash reserves with their banker.

inflation. But gold was returned to after every suspension, including that of the First World War.

After the Second World War a new international monetary system, the Bretton Woods System, was established. The Bank received from the government the monetary "instruction" to keep sterling within bounds around an exchange rate for the US dollar. The rate was a matter for the government, and the Bank's role in the choice of it was at most advisory. From the point of view of maintaining price stability this system proved inferior to the gold standard. But how big a change was it for the Bank? It was still following a rule for holding sterling pegged to an external target. The difference was that while the gold peg could have been changed by government, it was not; in contrast, the exchange-rate peg was changed by government, and more than once, albeit never willingly.

The really big changes to the 'monetary stability' part of the Bank's task came with the floating of sterling in 1972, after the 1971 breakdown of the Bretton Woods system. There was no longer a clear external target, no longer an obvious descendent of the gold standard rule. This lack of a clear goal was soon followed by sharply rising inflation, peaking at around 27% in 1975; the dangers of the lack of an anchor had been exposed by the 1973 oil crisis. The government of 1976 soon went to the IMF for a loan, one condition of this being a squeeze on public spending and another being limits on domestic credit expansion one of the earliest monetary aggregate targets in the Bank's history[9].

The Callaghan government fell in 1979, and was replaced by a Conservative government with Margaret Thatcher as Prime Minister. This government adopted targets for the growth of a monetary aggregate, Sterling M3[10]. This target was forced on a reluctant Bank by a not particularly enthusiastic Treasury. For a variety of reasons this domestic target was not a success and in 1988 there was a return to an external target – known as 'shadowing the deutschmark'. Sterling was kept within an informal band around the deutschmark. This in turn caused problems, first leading to interest rates so low that inflation accelerated, and then, after German reunification in 1990, interest rates too high for the then state of the British economy.

In that year the government decided that sterling would join the European Exchange Rate Mechanism at an exchange rate of DM2.95 to the pound. Maintaining that then became the Bank's monetary policy objective. But maintaining that proved impossible, at any rate over a politically acceptable time horizon. British inflation did fall as intended, but the squeeze, because of the

[9] This is a concept developed primarily at the IMF, and comprised the domestic components of money supply growth. See Foot (1981) for details.

[10] This was a broad measure of the money supply, and comprised, in addition to notes, coin, and bank deposits at the Bank of England, primarily current and deposit accounts at the clearing banks.

monetary policy of Germany, having to deal with an economy in a different cyclical phase from that of Britain, remaining tight well beyond the time when British inflation had fallen. Other countries in the ERM experienced similar problems, and on September 1992 Britain left the ERM.

This then led to the return of a domestic target for monetary policy. The details involved gradually falling inflation targets until below 2% was achieved. (This last aspiration, it should be noted, was soon given up.) The target was chosen by the government, and interest-rate decisions were taken by the Chancellor in the light of advice given by the Governor at their monthly meetings. This system continued until 1997, with some changes in the intervening years. But until 1997 interest-rate decisions remained a matter for the Chancellor, and the target remained a matter entirely for the government[11].

After this account of a period of what might reasonably be called turmoil, it is useful to pause and reflect on a matter that has been implicit throughout much of this account.

It is not always straightforward to establish the source of an objective. It might come from the state. Apart from the government's adoption in 1844 of the Bank's gold standard target, it appears that most, perhaps all, monetary stability objectives have arisen there. This does not however mean that the Bank objected to the choice, and nor does it mean that the Bank had no input in the choice. Indeed, it may have been suggested by the Bank. There is simply not the information on that, for many such discussions were, and no doubt still are, informal. It is however true that the actual decision lay with government.

In contrast, concern over financial stability seems more often to have originated in the Bank and/or with outside commentators (such as Thornton, Joplin, and so on) who addressed their concerns and recommendations to the Bank.

To summarise, up to almost the late 1990s the Bank had been in charge of the financial stability objective, including how to achieve it. The monetary stability objective in contrast was ever since 1844 formally always the decision of government, although it seems likely that the Bank was involved in deciding it some of the time, and always was in the attempts to achieve it[12].

Until very late in the Bank's history, no conscious thought seems to have been given to corporate governance. Objectives emerged, sometimes but not always being, subsequent to that emergence, refined or clarified by government; but the

[11] How free the Chancellor actually was to decide on interest rates when the advice from the Governor started to be published is not at all clear. It depended in part on personalities and in part on the conditions of the time.

[12] The informality of all these arrangements matches aspects of the Bank's internal affairs. The Bank had a board of directors, the court, but how much they were consulted and on what did not vary in a systematic manner; and the importance of the Court for much of the Bank's history was greatly affected by the Governor's personality.

Bank's internal management seemed to change of its own accord and for no clear reason as time went on. Indeed, the only clear example of deliberate alignment of interests occurred at the very founding of the Bank, when the continuation of its privileges depended on satisfactory performance of the task given to it by its founder, the government.

This changed in 1997. Very soon after the election of a Labour government in May 1997 there were some fundamental and consciously decided changes. The Bank was given responsibility for setting interest rates; to decide on rates, a Monetary Policy Committee was established, comprising both Bank staff and others appointed from outside the Bank. These appointments were by the Chancellor, but were a minority on the committee. What had happened, then, was that responsibility for the *conduct* of policy had shifted entirely to the Bank, while the *choice of objective* remained entirely with the government. From the constitutional point of view, it was very close to the situation under the gold standard.

At the same time the government interfered substantially in the Bank's financial stability responsibilities. Prior to 1997 the Bank had gradually assumed responsibility for financial stability. The Banking Act of 1997 gave the Bank formal responsibility for both monetary and financial stability. Thereafter the Bank spoke of having these two 'core purposes'. But while monetary stability was easily stated and a simple numerical target for inflation laid down, no such definition was available for financial stability. And with the creation of the Financial Services Authority at the same time and the formal removal of supervision from the Bank confusion on the question of where responsibility for financial stability lay prevailed, as well as there being absence of clarity over what the term meant.

Before considering the important consequences of this attention to the hitherto ignored matter of governance, it is useful to turn next to the Reserve Bank of New Zealand (RBNZ), a bank initially on the model of the Bank of England and which in turn became something of a model for the Bank of England.

10.7. THE ESTABLISHMENT AND DEVELOPMENT OF THE RBNZ

The RBNZ was set up in 1934, one of several established at the prompting of Montagu Norman and under the guidance of Otto Niemeyer, then an adviser and subsequently a director of the Bank of England. Not surprisingly the RBNZ was on the same model as the Bank of England. It was incorporated as a legal entity with private shareholders, and it had as its primary duty "... to exercise control... over monetary circulation in New Zealand, to the end that the economic welfare of the dominion may be promoted and maintained". (Reserve Bank of New Zealand Act, 1933, s.12) That situation did not last long. Indeed, a change which

affected the Bank of England some 250 years after its establishment overtook the RBNZ after two years.

In 1936 New Zealand elected its first Labour government, and the RBNZ was nationalised in that year. At the same time its objective was changed, and it was given a "general function... to give effect to... the monetary policy of the Government as communicated to it from time to time by the Minister of Finance". (Reserve bank of New Zealand Act 1933 as substituted by the Reserve Bank of New Zealand Amendment Act 1936 s.10) This Act was changed again, in 1950, and in 1960, and in 1973. On every one of these occasions the objectives (note the plural) were changed and added to. The final list of objectives produced by these changes contains four main paragraphs, the first of which itself contains four sub-headings. In outline, monetary policy is to be as the government says, and it is to be aimed at "the maintenance and promotion of economic and social welfare in New Zealand"; the bank is to regulate monetary, credit, and foreign exchange transactions, and control interest rates; and make loans to the government as the Minister of Finance instructed.

It should be no surprise that not even an approximation to price stability resulted, and given the micro-management approach implied there, that detailed interference in economic life generally took place. The outcome was deterioration in economic circumstances large even after allowing for an at times very unfavourable external economic environment. (See Wood, 1994 for more details.) It became generally accepted in New Zealand that the country was in a state of crisis, and the Labour Government elected in the mid 1980s essentially reversed the economic policies of every government since 1936.

The Reserve Bank Act of 1989 apart from not restoring the Reserve Bank to private hands took it almost back to its situation of 1934-1936, the remaining difference being how the price stability objective was specified; the objective itself was in effect the same as that of the RBNZ's first two years of life.

Passed in 1989 with bipartisan support, the Act became effective in February 1990.

There was a clear statutory objective.

"The Primary function of the Bank is to formulate and implement monetary policy directed to the economic objective of achieving and maintaining stability in the general level of prices." (Reserve Bank Act, 1989 s.8) That was the only macroeconomic objective, as well as the primary objective. The other objectives related to regulatory and supervisory responsibilities. The inflation objective is made measurable (and thus its attainment capable of being judged) in a Policy Target Agreement, which the Governor and the Minister of Finance have to negotiate and publish. The inflation rate has to be consistent with the Bank's

general statutory duty, and is to be measured by the CPI (on the grounds that the CPI measure of inflation was the most generally understood one)[13]. The RBNZ retained responsibility for banking sector supervision and regulation; but it could choose how to do it, and soon chose to do it mainly by insisting on disclosure of key facts about the banks to the general public, and a signed (and publically displayed) declaration by bank directors that each knew, understood, and was happy with, whatever his or her bank was doing[14].

Two points very clearly require to be explored. Did the contract work in the sense of making inflation lower and closer to target than it would have been? And did it affect the process of policy making? An episode speaks to the former: in 1990 policy was tightened in the run up to an election, an action without precedent in the history of the RBNZ; and inflation, which had been rising, was contained within target. The second is answered by a quotation: "The clear target and the announced downward path for inflation have provided a structure for internal discussions and debates within the Reserve Bank about the appropriate stance of policy." There was "... a behavioural change within the policy making machine". ((Nicholl, 1992, p. 13)

We now have two central banks, whose governance we can contrast and thus perhaps see if and how central bank governance matters as much as governance in the private sector. That leads us to a general reflection and conclusion on central bank governance. But it is necessary before that comparison is made to deal a little more with the Bank of England.

10.8. CRISIS AND POST CRISIS

Although in many ways it is fair to say that the RBNZ was like a speeded up Bank of England – it started from the same place but a lot later, and then overtook the Bank in its changes – it never suffered from the lack of clarity which afflicted the Bank of England and its mandate after the 1997 Act.

This lack of clarity led to problems when Northern Rock ran into difficulties in 2007.

The Bank no longer supervised banks either formally or informally, so, unless someone told them, which the FSA did not, they had no way of knowing the

[13] If the Governor and the Minister of Finance can not agree on an inflation range which they can accept as both consistent with the price stability mandate and as a suitable operational target for the RBNZ, this has to be resolved in public, in parliament. There is thus explicit provision for public disagreement, which has indeed occasionally occurred.

[14] It is sometimes claimed this was only possible because a large part of the banking system was foreign owned. This is not persuasive, as all foreign-owned banks in New Zealand had to take the form of separately capitalised subsidiaries, sufficiently free- standing as to be able to withstand the collapse of their parent. It certainly concentrated the minds of bank directors, though, as they were now open to law suits should their bank fail.

peculiar nature and high risk of Northern Rock's business model. In addition, their eye was off the 'financial stability ball'. Inflation had been the primary concern for some time, and there had been no financial stability problems for many years. And finally, even had other banks been willing to support Northern Rock (which their behaviour in markets had clearly indicated they would not be enthusiastic about) events happened so quickly that there was no time to ask, and the call had to be on the government. The Bank had to go to its owner and ask for funds, and this had to be done in an *ad hoc* manner, and in haste[15]. As the report of the Treasury Select Committee of the House of Commons made clear, there was plenty scope for things going wrong and a serious banking run starting at many stages in the process. Indeed, some have argued that the behaviour of the Bank made this much more likely. (Congdon, 2015)

The crisis not only made it necessary for the Bank to call on Government support. It also brought to light inadequacies in the previous set of instructions laid down by the Government. It became necessary to reconsider central bank mandates[16].

Nothing was changed in the UK so far as the inflation mandate was concerned. It was however recognised after the crisis that it was clearly necessary to ensure that market information and financial stability are *both* recognised as important. This can follow in part from the Bank's mandate, but internal structure and the system in which the Bank operates also matter.

The crisis exposed weaknesses in the mandate given to the Bank of England, and in addition there were defects in how the Bank (and the FSA) responded to the crisis. This inevitably required not only action from the government to deal with the crisis, but also changes in the mandate. The changes have concentrated authority in the Bank. At the same time, regulation of the banking sector became (still more) detailed, with still higher capital ratios and instructions on the risk weights that should attach to various assets.

One point and one implication leap out of that survey of the years after 1997. That was the first period that the government had interfered in the Bank's financial stability responsibilities, and it was the first time since 1866 that something had gone seriously wrong in that area of responsibility.

[15] Why it was decided to support Northern Rock rather than follow the 19th century course and let it fail, and then providing liquidity to the market as needed to prevent a contagious run, is examined in detail in Milne and Wood (2009).

[16] The implications for the conduct of monetary policy with regard to inflation are obvious. Central banks should not rely exclusively or primarily on measures of the output gap and of inflation expectations in making their forecasts and the subsequent policy decisions. How to get them to do so is a different matter.

10.9. COMPARISONS, CONSTITUTIONS, AND CONCLUSIONS

Comparison with the private sector shows that certain aspects of desirable governance apply very clearly across both. Objectives should be clearly defined, and it should be clear who should be responsible for what. Further, those responsible should have the information and the tools they need.

All of these points are easy to agree, indeed obviously sensible. But they do not always require conscious decision so long as the objective is clear, along with accountability. That is a notable implication of the Bank of England's history. It is also notable that a conscious consideration of what went wrong, as happened in the case of the RBNZ, is capable of producing a clear and sensible governance framework. It should be observed, however, that it took things going rather badly wrong before that consideration took place. As was remarked by Lindsey Knight, deputy governor of the RBNZ in the years immediately after its reform, when he was asked to explain the thorough nature of these changes, "Maybe it is not essential to have a crisis, but it helps" (Knight, 1991).

An obvious implication for other central banks is that they must consider whether they have achievable objectives, and the information necessary to achieve them. There is, for example, clear danger in separating responsibility for stability of the banking system from day to day contact with that system. And so far as monetary stability goes, the objective needs to be clear, and defined in a way which is observable and which the central bank has the instruments to attain[17].

This leaves unconsidered a rather important matter, and it is that with which we conclude. Normal corporate governance seeks to ensure that, subject of course to the law, the management of the firm pursues the long-term interests of the shareholders. Who are the shareholders of the central bank? The legal (maybe actually legalistic) answer is, in almost every case where the constitution of the bank allows the question, that the government owns the shares. But does it *really* own them? It owns them because it has been elected to govern – it has been given delegated authority by the citizens. It is thus closer perhaps to someone who holds a proxy at a company's annual general meeting. That person can exercise the voting rights of the owner of the shares, but does not own the shares. They may have been given specific instructions, or just told to do what seems best. This right is usually given annually. But there is nothing to prevent its being given for some other period. That is exactly the situation a government is in. It holds delegated authority.

[17] This is actually a generalised version of Milton Friedman's (1962) criticism of inflation targeting, which he observed was not satisfactory because, among other reasons, it did not satisfy these conditions.

Is an appropriate governance framework, then, sufficient to ensure that the government, through its delegated authority, serves the long-term interests of the shareholders? It is usually accepted that low and stable inflation is an acceptable approximation for price stability, and that should be the target for a central bank. In addition, it also appears to be widely accepted that 'central bank independence' is sufficient to achieve that – although one can imagine circumstances where it is not necessary. Here we come to the importance of law. Unless that independence is somehow protected it can be tinkered with by government, and not necessarily for electoral advantage but rather just because of the pressure of events. It is argued in Capie and Wood (2015) that just this happened in the UK and some other countries in the wake of the financial crisis, and there are precedents also in the USA, where the Federal Reserve has been tinkered with (most recently, its capital raided to pay for road building), and in New Zealand before the reforming act.

But can that independence be protected? By law, not at all, unless the country has a constitution which somehow accords inviolable status to the central bank. Such are hard to find.

The lesson of this paper is that good governance, close to that set out in the UK's 'Cadbury Code' of good governance for private sector companies, is essential, but it is not enough. Maybe a crisis is sufficient. It did the job for New Zealand, and helped entrench Germany's concern for price stability. But a crisis is a high price to pay. More work on the boundary of law and economics is necessary before we can have hope of long term monetary and financial stability – and it can be no more than a hope that such work will have a satisfactory outcome.

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11. Discussant to Capie and Wood, on "The Governance of Central Banks"

Charles Goodhart

The authors were kind enough to send me a first draft of their paper earlier, so I had an opportunity to comment on most matters of substance in their paper then. So I shall take this opportunity to use my time for two purposes. The first is to make three short comments on Geoffrey Wood's oral presentation; and the second is to comment briefly on my understanding of key features of the governance of the Bank of England since the 19th century, some aspects of which in the post-World War II decades I had the privilege of observing directly.

So, first, let me turn to Geoffrey's presentation. He suggested that a potential form of bad behaviour by bankers was that they might undertake activities which were riskier than shareholders would have wanted. My own assessment, however, is that an even greater danger has probably been that shareholders would have been encouraging bankers to take on riskier activities than either their (fixed-interest) creditors, or society as a whole, would have preferred. Shareholders have limited liability, and can diversify over many equity holdings. As is well known, their pay-off structure is equivalent to a call option on the underlying assets of the firm. This means that shareholders benefit when there is an increase in the expected volatility of the future pay-outs of the firm. Banks which were undertaking a particularly risky policy, such as Northern Rock, were often the darlings of their stock exchange, until a relatively short period before their collapse. Given the crucial function of large banks in our economy, there is, to my mind, a question whether those in a position to control the decision of banks should continue to benefit from limited liability.

Second, Geoffrey seemed to me to distinguish between the advent of the Bank of England's role as the bankers' bank in the UK, and its adoption of the function of Lender of Last Resort. To me these two roles are virtually synonymous. When the ordinary person runs into cash flow difficulties, and has a liquidity problem, they would tend to go to their bank for assistance. In exactly the same way, a small country bank, running into cash flow difficulties, would go to its banker, i.e. the Bank of England, for help. If a major bank becomes the bankers' bank to a penumbra of small banks elsewhere, it will almost automatically find that it will necessarily take up an LOLR role for those banks as well.

Third, in his spoken presentation, Geoffrey suggested that a Minister of Finance, Chancellor of the Exchequer, would find it very hard to overrule the Central Bank Governor, when the latter's advice was made publicly known. But, as is, I think,

now in the written text, this was not true when Ken Clarke was Chancellor and Eddie George's written statement of advice was published. Clarke felt confident enough to overrule Eddie George's suggestions on a couple of occasions. And I have little doubt that Nigel Lawson would have been equally prepared to stand by his own judgement.

Let me turn next to some commentary on the governance structure of the Bank of England. In the 19th century, it was generally organised rather in the same way as the British army has been traditionally managed. Thus there was an 'officer class' drawn primarily from upper-class, rich, but relatively clever, men (there were no women then), who had gone into the City, particularly into Merchant Banks. These were selected, largely through self-appointment, to join the Court of Directors, often brought into the Court at a relatively early age, say around 40. Commercial bankers were not among the elect, partly because they were in competition with the Bank, and partly because commercial banking was perceived as more a trade than a profession. Anyhow, once you entered Court, you might stay there for up to 20 years. After about 10 or 12 years, and you were both keen to do so, and your judgement was seen as good by your colleagues, you would become Deputy Governor for two years, which was followed, almost automatically, by being Governor for the next two years. And you then stayed on afterwards for a period of time in a state that was known as having 'passed the Chair'; when your advice would be regarded as particularly weighty. The effect of this was to make the Court effectively take decisions on a committee-like basis, and to restrict the power of the individual currently holding the position of Governor, at least somewhat.

In contrast, the ordinary officials in the rest of the Bank came from a different, middle class. They were regarded as clerks. They would, over time, with good conduct and attention to duty, plus experience and age, rise through the ranks, rather like non-commissioned-officers (NCO) in the army. So at the peak of their careers, they would become departmental heads. But they were always strictly subsidiary to the officer class in the Court. A particular example of this is given by the case of the (best-known official that has ever served in the Bank of England), Kenneth Grahame, the author of *The Wind and the Willows*, who rose to be Secretary in the Bank. He had a falling out with the then Deputy Governor, Walter Cunliffe, and Cunliffe effectively had him sacked. There is some suggestion, though I cannot verify it, that Grahame got his revenge by basing the character of Mr Toad in *The Wind in the Willows* on the personality of Cunliffe. In his history of the Bank of England, Richard Sayers remarked that Cunliffe "had the advantage of knowing his own mind, perhaps not a very difficult mind to know", page 66; and refers to him as 'autocratic' and 'aggressive'.

Anyhow, the onset of WWI meant that the regular succession of two year stints as Deputy and then full Governor fell by the wayside. Montagu Norman then took over in difficult conditions toward the end of the War, and his command over the necessary details of post-war restoration was such that he became a fixture. Indeed, Norman continued unchanged as Governor from 1920 to 1944. Relatively little has been documented about how this first came to be, but it had a dramatic change on the governance of the Bank of England. Rather than being effectively run by a committee, i.e. the Court, it became dominated by the person of the Governor, and therefore much more hierarchical than in the past, though the Governors then, and subsequently, have always sought the support of Court. Indeed, until the 1950s, my guess is that Court was probably as important in the determination of policy decisions, as were the Departmental officials, who remained then largely regarded as clerks.

This latter again changed in the 1950s, when the Bank Rate Tribunal was established in 1957. There had been an accusation that one of the external members of Court had been forewarned of a change in Bank Rate, and had used this inside knowledge to undertake profitable transactions. Although this accusation was never proven, it subsequently became conventional that the Governor, and the internal Executive Directors, who are also members of Court, could and would never discuss future policy intentions and proposals with Court, at least not in any specific manner. This change drastically reduced the influence and power of Court as a key part of the Bank.

So, after that date, the Governor, and his Deputy, would rely on the advice of the internal Executive Directors, who became, in a sense, free-floating, combined with advice and suggestions from the various operating Departments of the Bank, each headed by a Head of Department. These HoDs then became increasingly important, since they had access to much more information and staff. The *primus inter pares* was the Chief Cashier; to use the military simile again, the equivalent of the Regimental Sergeant Major (RSM). The Executive Directors could request support from their relevant Department, but it was the HoD who managed the Department, decided on promotion and pay, etc. So the Executive Directors swam above the Departments in a slightly disembodied fashion.

All this changed in about 1974 when Gordon Richardson, the then Governor, reformed the structure of the Bank, making the internal Executive Directors effectively in charge of their own Department, and downgrading the position formally held by HoDs; the Chief Cashier was the big loser; from having once been a key position in the Bank, it is now a relatively minor official position.

Change, or course, continues, for example with a multiplication of the number of Deputy Governors, so that the current Deputy Governors, are almost akin to previous Executive Directors; a form of grade inflation to which modern society

seems unfortunately prone. And with the growing independence of the Bank of England, and hence need for greater accountability, the role of Court, which had diminished exponentially from 1914 until the current century, is now making something of a comeback. And no doubt the governance structure of the Bank will continue to go on changing.

12. How Development and Liberalisation of the Financial Sector is Related to Income Inequality: Some New Evidence[1]

Jakob de Haan[2] and Jan-Egbert Sturm[3]

12.1. Introduction

Bumann and Lensink (2016) suggest that the impact of financial liberalization on inequality is conditioned by financial development. Besides presenting a theoretical model that explains the underlying channels, they report empirical results in which capital account liberalisation (as a relatively narrow measure of financial liberalisation) only tends to lower income inequality if the level of financial depth is high enough.

This contribution looks into the robustness of their results and, more in general, empirically analyses the impact of both financial development and financial liberalisation on income inequality. We examine the relationship between these two finance-related dimensions and income inequality using panel fixed effects regressions for a large sample of countries. Using both a broader measure of financial liberalisation and the narrower definition used by Bumann and Lensink (2016) focusing on capital account liberalisation, we find that both financial development and financial liberalization are associated with increases in income inequality. The positive impact of financial liberalization on the Gini coefficient is significantly higher if financial development is higher.

The next section summarizes some literature on the relationship between financial development and income inequality and financial liberalisation and income inequality. Before summarizing our own empirical analysis, we will first describe the data and empirical method we apply. This contribution ends with some concluding remarks.

[1] This contribution is based on De Haan and Sturm (2016), a somewhat broader and more comprehensive paper which is forthcoming in the *European Journal of Political Economy*. The views expressed do not necessarily reflect the views of DNB.

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12.2. LITERATURE REVIEW

There is an extensive literature on the relationship between financial development and income inequality. Theoretically, the impact of financial development is ambiguous. On the one hand, more finance may make it easier for poorer individuals to borrow for viable projects, which may reduce income inequality (Galor and Moav, 2004). Financial imperfections, such as information and transactions costs, may be especially binding on the poor who lack collateral and credit histories so that relaxation of these credit constraints may benefit the poor (Beck *et al.*, 2007). On the other hand, improvements in the formal financial sector could be more likely to benefit the well-off who rely less on informal connections for capital (Greenwood and Jovanovic, 1990). As discussed in more detail in De Haan and Sturm (2016), the empirical evidence on the relationship between financial development and income inequality is very mixed.

In recent decades there has been a global push to liberalize the financial sector. A small, but growing line of literature examines the impact of financial liberalization on income inequality. For instance, Beck *et al.* (2010) assesses the impact of U.S. bank deregulation of the 1970s to the 1990s on the distribution of income and find that deregulation significantly reduces inequality by boosting incomes in the lower part of the income distribution but has little impact on incomes above the median. Likewise, some recent studies (Agnello *et al.*, 2012; Delis *et al.*, 2014; Li and Yu, 2014) based on cross-country data report that financial liberalization reduces income inequality but Jaumotte and Osuorio Buitron (2015) and Naceur and Zhang (2016) conclude that financial liberalization increases inequality (see De Haan and Sturm, 2016 for more details).

Bumann and Lensink (2016) have recently argued that financial liberalization will improve income distribution in countries where financial depth is high. In their theoretical model, financial liberalization increases bank efficiency and thereby reduces borrowing costs. To restore equilibrium in the financial market, deposit rates will increase. An increase in the deposit rate improves the income of savers – who on average have lower income levels than investors – and thereby reduces income inequality. However, the interest rate elasticity of loan demand increases with the financial depth of a country. As a consequence, loan demand will increase more in those countries where financial depth is high implying a stronger reduction in inequality. While using the capital account openness index (KAOPEN) developed by Chinn and Ito (2008) to proxy financial liberalisation, their empirical estimates confirm this theoretically derived conditional effect. Their results suggests that capital account liberalization only tends to lower income inequality if the level of financial depth, as measured by private credit over GDP, exceeds 25 per cent.

We will therefore examine whether financial development conditions the impact of financial liberalisation on income inequality.

12.3. DATA AND METHOD

Our left-hand side variable is the Gini coefficient based on households' income from Solt's (2009) Standardized World Income Inequality Database (SWIID). We use the index that represents household income before taxes, as this shows inequality exclusive of fiscal policy. As pointed out by Delis *et al.* (2014), the SWIID database is the most comprehensive database and allows comparison across countries, because it standardizes income. The Gini coefficient is derived from the Lorenz curve and ranges between 0 (perfect equality) and 100 (perfect inequality). We acknowledge that the Gini coefficient is less than perfect and that other measures, such as the share of income of the lowest quintile, may sometimes be more appropriate. Data availability, however, dictates the choice. We construct averages of the Gini coefficients across 5 years where the Gini coefficients are centred at the middle of the five-year period.

We measure financial development by private credit divided by GDP. This measure excludes credit to the central bank, development banks, the public sector, credit to state-owned enterprises, and cross claims of one group of intermediaries on another. Thus, it captures the amount of credit channelled from savers, through financial intermediaries, to private firms.

We use two measures for financial sector liberalization. First, following previous studies we employ the data of Abiad *et al.* (2010) that is based on several sub-indices mostly pertaining to banking regulatory practices measured on a scale from 0 to 3 (fully repressed to fully liberalized). This database covers 91 economies over the 1973-2005 period and consists of seven indices of financial sector liberalization. Our first measure of financial liberalization is the sum of six sub-indices. As the sub-index on banking supervision is not about financial sector liberalization we exclude it. Our sample for which we use this proxy for financial liberalization consists of 89 countries and runs from 1975 to 2005.

As an alternative and in particular to make our results more comparable to Buman and Lensink (2016), we employ the Chinn-Ito index for capital account openness as a more narrow measure of financial liberalisation. Chinn and Ito (2006, 2008) base this index on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. It thereby can be seen as a de jure measure of capital account liberalisation. This index covers 182 countries with annual data relevant for this paper being available for approximately 141 countries as far back as 1975.

As we are interested in the within country relationship between finance and income inequality, we use a dynamic panel model instead of OLS cross-section regressions. As pointed out by Beck *et al.* (2007), a dynamic panel model has several advantages compared to cross-country regressions as the latter do not fully control for unobserved country-specific effects and do not exploit the time-series dimension of the data. The model estimated is:

$$Ineq_{i,t} = \alpha_i + \alpha_1 FD_{i,t-1} + \alpha_2 FL_{i,t-1} + \alpha_3 FD_{i,t-1} * FL_{i,t-1} + \alpha_4 X_{i,t} + u_{i,t}$$

Where *Ineq* is income inequality, *FD* is financial development, *FL* is financial liberalization and *X* is a vector of control variables, while *u* denotes the error term. Time lags are used to avoid endogeneity issues. For *FD* and *FL* we take values at the end of the five-year period preceding the period covered by the Gini coefficient (which is a five-year average), while the banking crisis dummy is one when a banking crisis started in any of the five years preceding the five-year period used for calculating the Gini coefficient. We have used a very long list of control variables based on previous studies and refer to De Haan and Sturm (2016) for details and Appendix A for an overview.

As pointed out in the Introduction, we focus on the interaction between *FD* and *FL* and examine whether the impact of financial liberalization on income inequality depends on the level of financial sector development.

12.4. ESTIMATION RESULTS

Tables 1 and 2 present the results where we proceed as follows. First, we show the results if we do not include control variables. As our two finance measures may be related (e.g. a low level of financial development may be an incentive for countries to introduce financial liberalization), we first show simple bivariate regressions before including both finance measures simultaneously. In the next step we add the interaction term. To interpret the interaction effect, we use graphs as suggested by Brambor *et al.* (2006). Finally, we add control variables that turn out to be significant. In Table 1 the measure for financial liberalization based on Abiad *et al.* (2008) (finreform_cor) is used, while in Table 2 we proxy financial liberalization by the Chinn-Ito index (kaopen) measuring a country's degree of capital account openness.

Table 1: Explaining income inequality using financial development and financial liberalisation (Abiad et al. data)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	no interaction			+interaction	+dumsysbankcr	+civlib	+glob_pol	+sign.var.	gen-to-spec
Domestic credit to private sector (% of GDP)	0.0652***		0.0524***	-0.0189	-0.0168	-0.00945	-0.00108	0.00276	-0.00777
	(5.089)		(4.251)	(-0.564)	(-0.507)	(-0.296)	(-0.0323)	(0.0879)	(-0.246)
Financial liberalisation: Abiad et al. index (corrected)		0.256***	0.146***	0.00456	0.0186	0.0278	0.106	0.124*	0.0394
		(4.153)	(2.891)	(0.0584)	(0.245)	(0.361)	(1.336)	(1.675)	(0.525)
c.domcredgdp#*c.finreform_cor				0.00420**	0.00404**	0.00384**	0.00340*	0.00323*	0.00370**
				(2.364)	(2.325)	(2.309)	(1.880)	(1.960)	(2.266)
Start of a Systemic Banking Crisis during t-7 and t-3					0.976**			0.955**	0.888**
					(2.387)			(2.356)	(2.171)
Freedom in the World: Civil Liberties						0.564**		0.480**	0.524**
						(2.251)		(2.073)	(2.070)
Political Globalization							-0.0525*	-0.0463*	
							(-1.953)	(-1.794)	
Constant	41.86***	42.22***	40.86***	43.28***	42.96***	41.09***	45.51***	43.19***	40.94***
	(66.15)	(61.45)	(52.32)	(32.88)	(32.64)	(27.15)	(21.73)	(19.27)	(27.57)
Observations	426	426	426	426	426	422	418	418	422
R-squared	0.173	0.111	0.202	0.229	0.242	0.249	0.251	0.278	0.260
Number of cntid	89	89	89	89	89	88	88	88	88
Hausman test (p-value)	0.0955	0.484	0.195	0.0295	0.0779	0.00124	0.0317	0.000347	0.00380
F-test on domcredgdp (p-value)				0.00001	0.00001	0.000001	0.000004	0.0000005	0.0000005
F-test on finreform_cor (p-value)				0.00163	0.00115	0.00053	0.00009	0.00003	0.00042

Robust t-statistics in parentheses. Country-fixed effects are included. Standard errors clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Explaining income inequality using financial development and financial liberalisation (Chinn-Ito data)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	no interaction			+interaction	+dumsysbankcr	+grrgdp	+finreform_cor	+civlib	+glob_act_flows	+glob_pol	+sign.var.	gen-to-spec
Domestic credit to private sector (% of GDP)	0.0585***		0.0510***	0.0372***	0.0349**	0.0356***	0.0271*	0.0412***	0.0301**	0.0459***	0.0346**	0.0365***
	(4.785)		(4.390)	(2.790)	(2.507)	(2.669)	(1.740)	(3.312)	(2.346)	(3.381)	(2.588)	(2.646)
Chinn-Ito index		0.804***	0.436***	0.0807	-0.0108	0.00288	-0.636**	0.127	-0.0452	0.273	-0.422	-0.374
		(3.768)	(2.642)	(0.322)	(-0.0433)	(0.0114)	(-2.157)	(0.513)	(-0.187)	(1.012)	(-1.427)	(-1.266)
c.domcredgdp#*c.kaopen				0.00897**	0.0116**	0.00943**	0.0162***	0.00768*	0.00801*	0.00710	0.0108*	0.0103*
				(1.984)	(2.195)	(2.097)	(2.824)	(1.669)	(1.720)	(1.579)	(1.887)	(1.801)
Start of a Systemic Banking Crisis during t-7 and t-3					1.312***						0.844**	0.875**
					(3.297)						(2.226)	(2.305)
GDP growth (annual %)						0.0731*					0.00936	
						(1.855)					(0.213)	
Financial liberalisation: Abiad et al. index (corrected)							0.155***				0.149**	0.160***
							(2.633)				(2.530)	(2.687)
Freedom in the World: Civil Liberties								0.611*			0.463**	0.475**
								(1.854)			(2.470)	(2.530)
Economic Globalization: Actual Flows									0.0578***		0.0551**	0.0552**
									(2.731)		(2.148)	(2.155)
Political Globalization										-0.0419*	-0.0443*	-0.0467*
										(-1.687)	(-1.863)	(-1.957)
Constant	42.87***	45.41***	43.14***	43.51***	43.47***	43.26***	41.64***	41.51***	40.89***	45.89***	40.26***	40.24***
	(77.07)	(1,396)	(81.77)	(80.53)	(79.53)	(78.72)	(49.29)	(31.92)	(34.18)	(30.06)	(18.32)	(18.17)
Observations	569	569	569	569	534	562	411	538	560	560	400	403
R-squared	0.139	0.062	0.155	0.166	0.174	0.161	0.257	0.171	0.191	0.186	0.308	0.321
Number of cntid	141	141	141	141	138	139	89	140	140	140	87	88
Hausman test (p-value)	0.00755	0.123	0.0157	0.0017	0.00429	0.00108	0.00286	0.0000007	0.000008	0.00002	0.000000009	0.000008
F-test on domcredgdp (p-value)				0.000002	0.000001	0.000002	0.000001	0.000009	0.00026	0.000002	0.00001	0.00002
F-test on kaopen (p-value)				0.00327	0.00212	0.00693	0.022	0.00441	0.0827	0.00118	0.173	0.195

Robust t-statistics in parentheses. Country-fixed effects are included. Standard errors clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1

In the first two columns of Tables 1 and 2 the financial sector variables are included separately, while column (3) shows the results if both finance measures are included simultaneously. In the regressions in these columns we do not include interaction terms and control variables. The results suggest that financial development and financial liberalization increase income inequality, also if they are included simultaneously.

Next we turn to the interaction of financial liberalization and financial development. The line in Figure 1 shows the marginal impact of financial liberalization on income inequality for different levels of financial development. The whiskers show the confidence band and the grey bars show the distribution of the observations. The graphs are based on the estimates reported in column (4) of both tables. The graphs in Figure 1 suggest that the level of financial development conditions the impact of financial liberalization on income inequality: the positive impact of financial liberalization on the Gini coefficient is higher if financial development is higher. This conclusion holds for both measures of financial liberalization.

Figure 1: Effect of financial liberalisation on income inequality conditional on financial development (without controls)

Table 1, column (4)

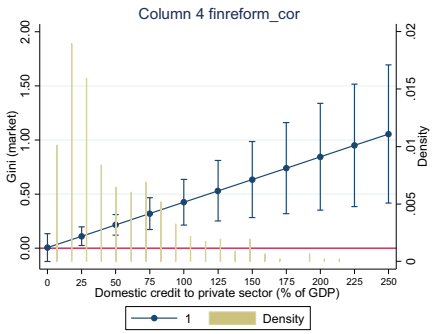
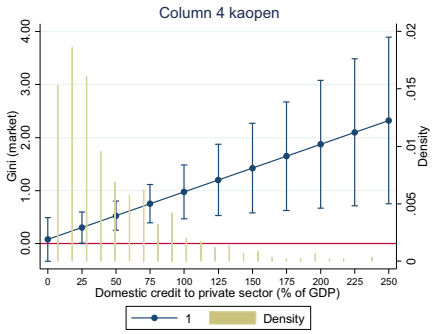


Table 2, column (4)



The next columns in both tables show the results if we add control variables to the model. Out of the long list of control variables (see Appendix A), we only report those cases in which the control variable turned out significant. Most of them are not significant. Only a dummy variable indicating whether a systemic banking crisis started in the preceding 5-year period, an index measuring civil liberties and the degree of political globalisation turn out to be significant in both tables. Adding controls does not change our conclusions.

The penultimate columns in both tables include all control variables that turned out to be significant individually. The final column in both tables uses a general-

to-specific modelling algorithm: it starts with estimating a model including all controls and then stepwise deletes those variables that turn out to be in significant (using a t-value of 1.96). Again, and as in particular also shown by the margin plots in Figure 2 that are associated to the final columns of these tables, the finding that the effect of financial liberalisation on income inequality is conditional on the level of financial development remains significant. The major difference is that the overall impact of capital account liberalisation (as shown by the F-tests in the last row of Table 2 and the right-hand-side panel of Figure 2) is no longer statistically different from zero. When using the broader measure of financial liberalisation, the null hypothesis that it does not affect income inequality can clearly be rejected.

Figure 2: Effect of financial liberalisation on income inequality conditional on financial development (with controls)

Table 1, column (9)

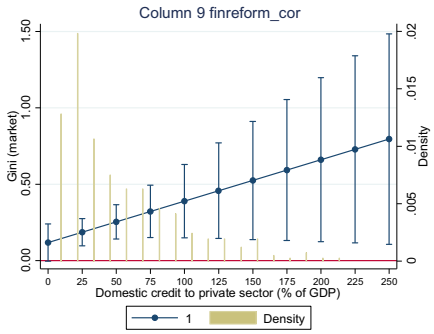
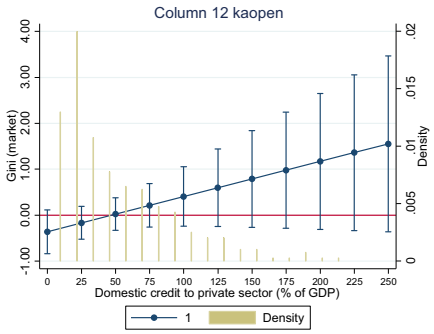


Table 2, column (12)



As discussed in De Haan and Sturm (2016), we have carried out several sensitivity tests that have two purposes. First, as our results deviate from those of several previous studies, we examine to what extent our findings change if different empirical set-ups are used. Second, we further analyse whether our results are robust for endogeneity. Overall, this is not changing our conclusions.

12.5. CONCLUDING REMARKS

In conclusion, the impact of financial liberalization on inequality seems to be conditioned by the level of financial development, i.e. financial development strengthens the impact of financial liberalization on income inequality. Our findings are in contrast to several previous studies that examined the relationship between financial development and income inequality.

In theory is not clear whether financial development will increase or decrease income inequality. Our results suggest that financial development increases inequality, which is in line with the model of Greenwood and Jovanovic (1990). It is important, however, to stress that our results do not imply that financial development is necessarily bad for the poor because there is a large literature showing that finance plays a positive role in promoting economic development. Our finding that the impact of financial liberalization on income inequality is conditioned by financial development is not in line with the model of Bumann and Lensink (2016): instead of finding a negative relationship, we find a robust positive one.

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APPENDIX A

Variable	Description	Source
Main variables		
gini	Gini coefficient using (pre-tax, pre-transfer) household income	SWIID
dumsysbankcr	Start of a Systemic Banking Crisis	Laeven and Valencia
domcredgdp	Domestic credit to private sector (% of GDP)	WDI
finreform_corr	Financial liberalisation: Abiad et al. index (corrected)	Abiad et al.
kaopen	Chinn-Ito index	Chinn and Ito
Additional variables		
govconsgdp	General government final consumption expenditure (% of GDP)	WDI
lrgdppc	Log(GDP per capita - constant 2005 US$)	WDI
tradegdp	Trade (% of GDP)	WDI
lpop	Log(Population)	WDI
inflation	Inflation, consumer prices (annual %)	WDI
grrgdp	GDP growth (annual %)	WDI
agrshare	Agriculture, value added (% of GDP)	WDI
indshare	Industry, value added (% of GDP)	WDI
natresshare	Total natural resources rents (% of GDP)	WDI
efw_avg	Average of non-financial EFW-areas	EFW
ffw_avg	Average of EFW-areas 3D, 4C, 4D and 5A	EFW
left	Orientation of the Chief Executive Party is left-wing	DPI
civlib	Freedom in the World: Civil Liberties	Freedom House
eduexpgni	Adjusted savings: education expenditure (% of GNI)	WDI
schoolenrprim	School enrollment, primary (% gross)	WDI
schoolenrsec	School enrollment, secondary (% gross)	WDI
schoolenrtert	School enrollment, tertiary (% gross)	WDI
glob_act_flows	Economic Globalization: Actual Flows	KOF
glob_restr	Economic Globalization: Restrictions	KOF
glob_soc	Social Globalization	KOF
glob_pol	Political Globalization	KOF
polrel	Ethnic Polarization (relevant groups), EPR	EPR-ETH
elfrel	Ethnic Fractionalization (relevant groups), EPR	EPR-ETH
lifeexpect	Life expectancy at birth, total (years)	WDI
termsoftrade	Net barter terms of trade index (2000 = 100)	WDI
fdigdp	Foreign direct investment, net inflows (% of GDP)	WDI
gfcfgdp	Gross fixed capital formation (% of GDP)	WDI
instqual	Institutional Quality (corru burea law_a democ)	ICRG
democ	Democratic Accountability	ICRG
dumcurcr	Start of a Currency Crisis	Laeven and Valencia
dumsovdebtcr	Sovereign Debt Crisis (default date)	Laeven and Valencia
dumsovdebtrestruct	Sovereign Debt Restructuring year	Laeven and Valencia

13. "Finance and Income Inequality Revisited", Jakob de Haan and Jan-Egbert Sturm

Pierre Siklos

The global financial crisis and the reactions of central banks in the most systemically important economies of the industrial world have produced financial conditions that are unprecedented. As a result, financial markets have been distorted as monetary authorities try their best to create conditions for a return to growth rates that were last seen a decade ago. Whereas pre-crisis monetary policy was supposed to do no harm post-crisis policies have, for example, favored borrowers and penalized lenders. If these conditions persist then even long-term returns will soon reach unheard of historic lows, if they have not already, and savers will truly be pitted against borrowers. Of course, this turn of events also has implications for inter-generational economic conditions. The bottom line is that there is the potential for monetary policy to have serious distributional effects.

Not surprisingly then a literature has emerged that seeks to identify and measure the costs associated with ultra-loose monetary policies, the tremendous growth in the financial sector that preceded the fall, and the resulting impact on inequality. Inequality, of course, is on the minds of policy makers and others and is seen as one of the most important policy questions of the current decade. De Haan and Sturm consider this topic from an empirical perspective and find that the extant literature offers insufficient guidance. Therefore, they pose the following question in relation to existing studies of the nexus between finance and inequality: "… why studies reach different conclusion" [?]. Unfortunately, the answers are not yet sufficiently clear. However, a study that seeks to sort out the similarities and differences in existing empirical perspectives so far is welcome.

The authors begin by asking to what extent does economic theory offer guidance to help us understand the issues. Perhaps unsurprisingly, the answer is a confusing mix of different approaches. Theory at first apparently highlights the role of information and transactions costs, together with the influence of the regulation of the financial sector, as the principal determinants of how developments in this sector impact inequality. Later, theory evolves into asking whether the quality of institutions plays a central role in influencing how finance can enhance or reduce income inequality. As a macroeconomist, who also does some research in finance, I am not well versed in the area but it appears to me that the theoretical connection between inequality and finance is also about other things, including finance, monetary policy, and the overall state of the economy. This is because drawing a direct line between changes in the financial sector and the amount of

inequality is likely impossible. Inequality is then collateral damage, as it were, and dependent on a host of other factors that impact the financial sector directly and income inequality subsequently.

If theory offers insufficient guidance the authors then make clear that extant empirical work is equally in a confused state. Part of the problem is that it is only fairly recently that serious empirical work in the area has been underway. Across the various studies surveyed samples used by various researchers differ widely, as do the groups of countries included in various data sets, not to mention the conditioning variables used to identify the empirical link between the state of the financial sector and the resulting income inequality. The only glimmer of hope comes from the realization that a proper study of the problem requires using panel data even if the estimation methods applied can be then differ.

With the theory and the extant empirical analysis reviewed the authors then set out to comprehensively test the relationship between finance and inequality in a manner that seeks to encompass all existing approaches to date. In particular the authors also ask whether financial crises act as a separate determinant of inequality. Nevertheless, the paper resorts to using a fairly blunt variable, namely a crisis dummy variable to identify financial crises. Unfortunately, a brief survey of the literature also suggests that different authors have come up with somewhat different dating schemes for financial crises. Moreover, all financial crises are not alike. Hence, treating them more or less the same may either exaggerate or bias the estimate of any statistical relationship between financial crises and inequality.

Indeed, not only are all financial crises not the same not all financial crises are exclusively of the banking variety. However, the paper only considers this form. Clearly, sovereign debt, inflation, even stock market crises may have equally important implications for inequality. Yet, the paper ignores other forms that financial crises take.

Perhaps more surprising are the conditioning variables that do not appear in the de Haan and Sturm study. For example, deposit insurance is surely a social program that has implications for the preservation of financial wealth and, therefore, has a potential impact on inequality. However, this variable does not appear in the estimation specification.

Next, while it is certainly interesting to know what drives the *level* of inequality policy makes might also want to know how fast inequality changes over time. After all, the impact of the global financial crisis on real GDP growth differed substantially across the world and it is conceivable that the effects on inequality were much more short-lived in some countries than in others. If this is the case then corrective policies might be different when a recession is deep, but brief, compared with a longer lasting but shallower downturn.

Finally, while the paper conditions the estimates on financial openness it is interesting that it seems to matter little in influencing inequality. I found this surprising especially since the strong economic growth experienced in emerging markets, even throughout much of the global financial crisis, was supposed to have been explained in part by their welcoming financial globalization. This result surely needs more explanation and study.

In spite of any flaws the attempt to sort out what we know or don't know about the relationship between inequality and the performance of the financial sector is welcome. We should also be comforted by some of the main findings reported by the authors. The fact that better political institutions, and indeed the quality of institutions more generally, are critical factors that can explain levels of inequality is not only intuitively pleasing but it is helpful to have some solid statistical evidence to support this conclusion.

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