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Central Bank Reforms and Institutions

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"Monetary policy independence remains of the highest importance, and it is important that we preserve monetary policy independence to help foster desirable macroeconomic outcomes and financial stability."
Stanley Fisher (November 2015)

"The only problem our economy has is the Fed. They don't have a feel for the market." Donald Trump (December 2018)

Prior to the global financial crisis, there had been much agreement about the optimal institutional design of monetary policy authorities. Economists and policy observers alike would have acknowledged that monetary policy is best left in the hands of independent central banks with a clear mandate of price stability. These inflation-targeting central banks were seen as the solution to the problem of high inflation and were credited with the period of great moderation that saw low levels of inflation and moderate output fluctuations (Alesina and Stella 2010).

Yet, since the global financial crisis, the pillar of central banks' institutional design—their autonomy from the legislative branch—has come under increasing pressure. A growing number of central banks around the world are facing political pressures that have called their operational independence into question. For example, in July 2018, US President Donald Trump complained that the US Federal Reserve had gone "crazy" by tightening monetary policy. In December 2018, the governor of the Reserve Bank of India resigned after the government moved to exert more control over the bank's regulatory powers and the distribution of its dividends. In Argentina, an attempt in 2010 by the government led by Cristina Fernández to transfer USD 6.6 billion of central bank reserves to the national treasury led to the resignation of its central bank governor and sparked the country's worst institutional crisis since its financial meltdown in 2001. In Turkey, President Recep Erdogan repeatedly attacked the independence of the country's central bank during his reelection campaign. Similar attempts by the executive branch to undermine the independence of monetary policy institutions have been seen in Hungary, Nigeria, Pakistan, Russia, South Africa, and Thailand, to name a few.

While many still agree that the case for central bank independence is as powerful as it was three decades ago, these frictions between politicians and central bankers cannot be simply wished away and could result in a wave of reforms to central bank institutional design. In this brief report, we provide an overview of the evolution of central banks' institutional design and discuss how reforms that led to central banks' increased operational independence over the past four decades came about. We then highlight the present and future challenges faced by monetary policy institutions around the world, which could shape their functioning for decades to come.

FORTY YEARS OF CENTRAL BANK INDEPENDENCE

The concept of independent central banks began receiving enormous attention starting with the 1970s, with the development of theories on the optimal design of monetary policy institutions. In this context, Kydland and Prescott (1977) and Rogoff (1985) have argued that only an independent policymaker can implement credible monetary policies that will favor lower inflation rates and thus eliminate the time inconsistency problem of governments that are tempted to use ever-higher inflation to decrease unemployment. These ideas have led to the implementation of central bank reforms across the world, which have resulted in more independent and transparent central banks with a mandate of price stability that generally takes the form of a numerical nominal anchor.

Whether these newly created independent central banks have been successful in achieving lower inflation rates and greater macroeconomic stability has also received a lot of academic attention. A first step in this endeavor was the creation of indices that measured the degree of independence of central banks. Grilli et al. (1991) and Cukierman et al. (1992) were the first to develop such indices of central bank independence (hereafter, CBI) by focusing on the legal statutes of central banks. Employing these measures, an extensive empirical literature began examining the relationship between CBI and inflation, economic growth, and other macroeconomic variables (see for example Arnone et al. 2009; Crowe and Meade 2008; Arnone and Romelli 2013).

This literature generally tends to support a negative correlation between the level of CBI and inflation rates, suggesting that assigning more independence to central banks is indeed associated with lower and less volatile inflation. For example, in a meta-analysis of 57 empirical studies, Klomp and de Haan (2010) find that this negative relationship is particularly strong during the 1970s and for OECD countries. However, many studies that have revisited this issue by looking at different time frames, samples of countries, or measures of CBI suggest that the CBI-inflation nexus is not always consistent (Posen 1995). Several empirical challenges are generally emphasized. First, various measures of CBI assign different degrees of importance to certain characteristics of central bank design, which can result in varying levels of CBI from the executive power. Second, measuring CBI based on legal statutes provides a measure of de jure independence, which might differ from de facto independence, especially in developing countries. Lastly, the correlation between CBI and inflation is generally assessed using static indices of independence, i.e., measured at a given point in time. Most studies generally compute a measure of CBI at two different, often distant, points in time, which may mask important dynamics regarding the evolution of the institutional design of central banks and how this relates to economic outcomes (Crowe and Meade 2008).

Aside from the robustness of the correlation between CBI and inflation, the issue of causality is also important. Institutions such as independent central banks are rarely imposed exogenously on a country and generally evolve as a result of endogenous internal and external factors (Aghion et al. 2004). As such, understanding the process through which central banks become more or less removed from politics and how their institutional design evolves over time is of the utmost importance, not only for economic efficiency, but also for democratic and institutional theory, given the political pressures central banks are increasingly facing nowadays. In the following, we will review recent works that aim to understand this process by investigating the evolution of reforms in central bank design over time.

REFORMS IN CENTRAL BANK INDEPENDENCE OVER THE PAST FOUR DECADES

What accounts for the worldwide changes in central bank design over the past four decades? How can we explain the timing and pace of reforms in central banking across countries? Romelli (2018) tries to answer these questions by introducing a large cross-country database on the timing of legislative changes in central banking for a set of 154 countries during the 1972–2017 period. He constructs a dynamic measure of CBI (dubbed ECBI index) that allows for a precise determination of the timing and magnitude of reforms in central bank design. This dynamic index builds on the two most common measures of de jure central bank independence in Grilli et al. (1991) and Cukierman et al. (1992). However, given that the role of central banks has evolved considerably since the early 1990s, the new measure of CBI proposed extends previous ones by capturing new characteristics that can affect the conduct of monetary policy, such as financial independence and accountability. This new index of central bank institutional design captures the most important characteristics that define the institution's political and economic independence along six dimensions: 1) governor and central bank board appointment and dismissal, 2) conduct of monetary policy and conflict resolution, 3) objectives of the central bank, 4) limitations on lending to the government, 5) financial independence, and 6) reporting and accountability.

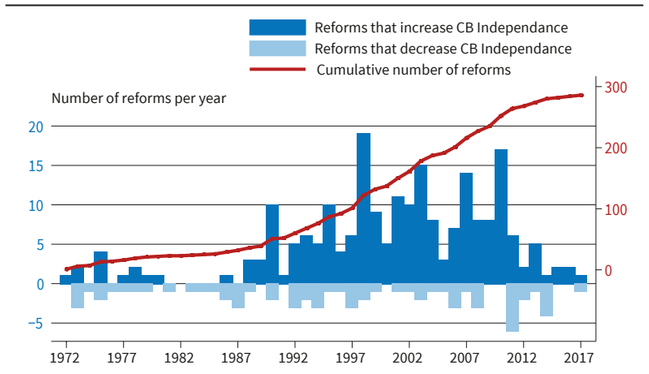
Several important stylized facts about the evolution of central bank design emerge from this new dataset. First, reforms in central bank legislation happen quite often, but not all changes have an actual impact on central bank design. The legislation of the analyzed countries has changed 2,490 times over the 1972–2017 period, with 1,303 reforms in the form of complete changes to statutes or reprints of central bank charters, and 1,187 in the form of legislative amendments. However, only 286 of these legislative changes brought about a significant change in the functioning of these institutions, which is captured by a change in the degree of their economic or political independence from the executive branch.

Figure 1 shows the distribution of reforms over time in the sample of 154 countries. Most reforms undertaken were in the direction of increasing the central bank's level of independence. A large number of reforms occurred during the 1990s, with a peak in 1998, when the countries joining the euro area adopted a unique monetary policy authority. Yet, a new reform wave can also be observed following the 2007–2008 financial crisis, with a significantly higher number of reforms that decrease the level of CBI in this later period. These reforms are mainly related to an increased level of central bank involvement in financial supervision, which is associated with less independence, as financial stability concerns might impede the implementation of optimal monetary policies (Masciandaro and Romelli 2018).

Figure 2 compares the level of CBI proxied by the ECBI index in 1972 (or the first year available) and in 2017. As most countries cluster above the 45 degree

Figure 1

Central Bank Legislative Reforms (1972–2017)



Source: Romelli (2018).

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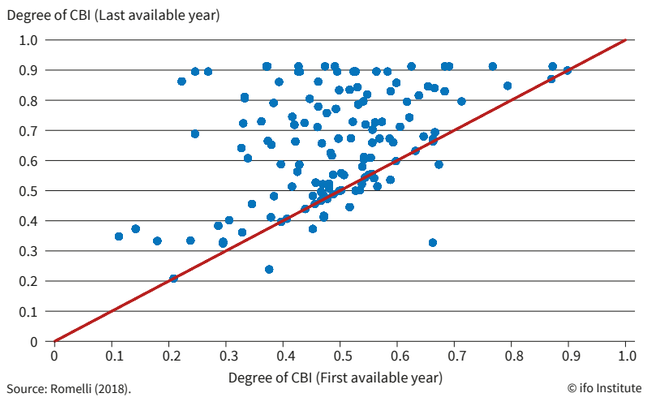
Figure 2

Evolution of Central Bank Independence



Source: Romelli (2018). © ifo Institute

line, there is a clear tendency toward adopting higher levels of CBI. A country with one of the highest levels of independence is Finland, while the lowest is in Macao. The largest drop in independence was recorded in Vietnam, after a reform that took place in 1997.

Similarly, Figure 3 shows the evolution of the average index of CBI by regional clusters. Several regions appear to lag behind in the reform process, such as South and East Asia, the Middle East, and North Africa. This figure indicates an overall increase in the degree of CBI, but it also highlights the heterogenous distribution of the degree of CBI across space and time.

These differences in the level and pace of reforms suggest that, while most countries have converged toward a higher level of independence, the institutional path towards this convergence is still shaped by factors endogenous to each country. The political economy literature has suggested several drivers of reform processes, which could also be useful in understanding the determinants of the magnitude and timing of reforms in central banking. These politico-economic country characteristics can be classified into three broad categories: (i) learning, (ii) crisis, and (iii) external inducement (Abiad and Mody 2005).

Reform processes are usually multistage and highly path dependent. As such, reforms undertaken in the past can lead to a better understanding of the costs and benefits of CBI and, as such, spur further reforms. This "learning" from past experiences can take different forms. For instance, countries might converge to an ideal level of CBI, say full independence. If so, policy changes might be driven by how far countries are from this desired level, i.e., the distance between the status quo and the desired level of independence. But learning can also be influenced by foreign factors. Evidence of spatial or regional clustering is often found for various reform processes such as democratic and liberal economic policies. As such, countries might also reform their central bank design when other countries in their region are adopting higher levels of independence. In this case, a proxy for regional learning could be captured by the difference between the average level of independence of neighboring countries and a country's own degree of independence.

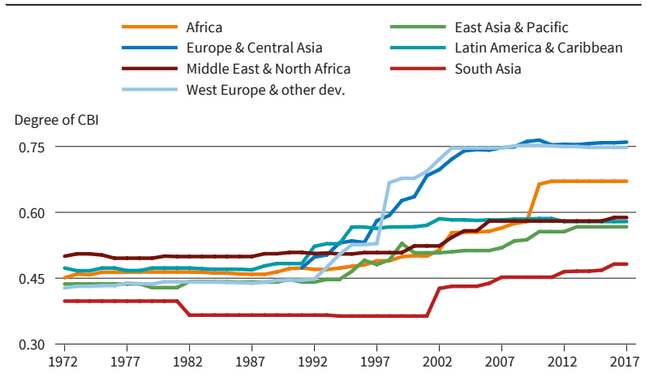
Conventional wisdom also suggests that "it takes a crisis to reform." If so, various types of economic or financial crises, such as a systemic banking crisis, hyperinflation episodes, or deep recessions, could effectively contribute to boosting reforms in central bank institutional design.

Finally, reform processes could also be driven by external pressures from international institutions. For instance, agreements with international lenders like the IMF or the World Bank often require countries to commit to a set of policies, which include granting more independence to their central bank.

The results presented in Romelli (2018) provide support for the view that most of these political economy factors matter to various degrees. Learning and external inducements have the strongest effect on the likelihood of reforms in central banking. In particular, a non-linear relationship is highlighted between past levels of CBI and the probability of reforms. This suggests that countries are less likely to reform at very low or very high levels of CBI, where they exhibit a strong status quo bias. Regional convergence is also an important driver of reforms, as countries farther away from the average level of independence in their region are more likely to reform. External pressure to reform also comes from international institutions, as countries receiving an IMF loan or becoming a member of a currency union are also more likely to increase the independence of their monetary policy institutions. Finally, there is also some evidence that financial crises influence the reform process, as the occurrence of a systemic banking crisis is likely to be followed by reforms that decrease the level of CBI. This result is also echoed in Masciandaro and Romelli (2018), who document an increase in supervisory roles for central banks following financial crises, which is generally associated with lesser independence as financial and price stability objectives can sometimes lead to competing policy responses.

Figure 3

Evolution of CBI by Regions



Source: Romelli (2018). © ifo Institute

Overall, the analysis in Romelli (2018) points to some important drivers that have shaped the institutional design of central banks over the past few decades. Yet, as the level and volatility of inflation has seen a downward trend in many countries around the world, one could expect that the reform process of central banks is coming to a halt. However, this might not be the case. Masciandaro and Romelli (2019) investigate the reform process in a restricted sample of 65 countries that experienced low inflation during the 2000–2014 period. They find that macroeconomic shocks such as political, labor market, or currency shocks are still associated with an increased likelihood of central bank reforms.

Furthermore, several important trends in banking supervision and macroprudential policies that have mainly been the result of the 2008 financial meltdown suggest that the institutional design of central banks is likely to continue evolving. In the following section, we highlight the new roles of banking and macroprudential supervision that central banks have taken on in recent years and discuss how these interact with their independence.

CENTRAL BANKS AS FINANCIAL SECTOR GATEKEEPERS

In 2017, 96 percent of central banks around the world had a clear objective of price stability. However, as we saw during the run-up to the global financial crisis, price stability did not necessarily guarantee financial stability. Historically, many central banks have also been involved, to various degrees, in the regulation and supervision of the banking sector. However, as they gained more independence, the supervisory responsibilities were generally assigned to separate bodies outside the central bank. Economic theory does not provide a clear answer as to whether assigning supervisory roles to central banks or other independent institutions is socially optimal. Masciandaro and Quintyn (2015) highlight two conflicting views regarding the merging of monetary and supervisory functions inside the central bank. An integration view underscores the informational advantages and economies of scale derived from bringing all functions under the authority of the central bank (Peek et al. 1999; Bernanke 2007). Alternatively, a separation argument highlights the higher risk of policy failure, as financial stability concerns might impede the implementation of optimal monetary policies (Goodhart and Schoenmaker 1995; Ioannidou 2005; Berger and Kißmer 2013). The empirical literature that has investigated the relative merits of putting banking sector supervision in the hands of central banks also yields mixed results.

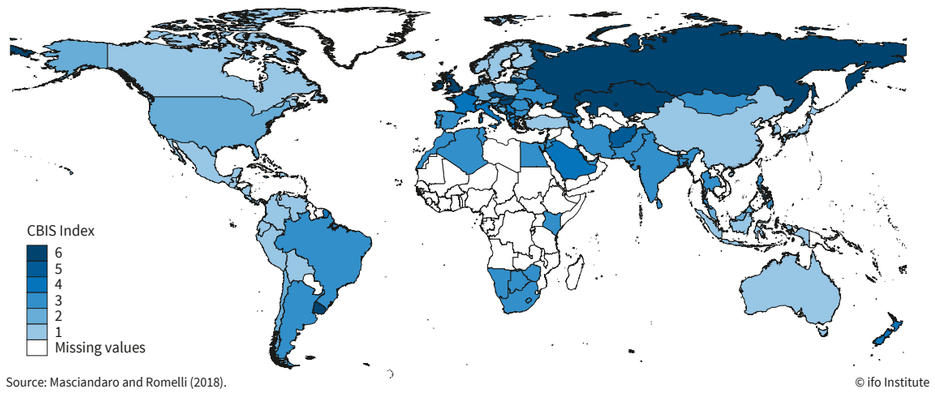
Yet, following the 2008 global financial crisis, many countries have actually increased the involvement of central banks in financial sector supervision, suggesting a sort of "great reversal" towards putting prudential supervision in the hands of central banks (Masciandaro and Romelli 2018). A classic example of this reversal is the evolution of the supervisory architecture in the United Kingdom between 1997 and 2013. In 1997, when the UK parliament voted to give its central bank operational independence with a clear objective of price stability, the responsibility for banking supervision was transferred from the Bank of England to the Financial Services Authority. However, the supervisory failure of this authority during the recent crisis led to its dismissal in 2013, with the supervisory powers being assigned to the newly established Prudential Regulation Authority, as a part of the Bank of England. Within the euro area, the creation of the single supervisory mechanism (SSM) in 2014 assigned banking supervisory responsibility to the ECB. However, the microprudential supervision of other financial intermediaries, such as investment funds, insurance companies, and financial markets, is still conducted outside the central bank.

An overview of how the role of central banks in financial sector supervision has evolved over the past few decades is provided in Masciandaro and Romelli (2018). They create a new dataset containing information on the authorities responsible for the oversight of the financial sector (banking, insurance, and financial markets) in a large sample of 105 countries over the 1996–2013 period. Using this data, they develop a new index of Central Bank Involvement in Supervision (CBIS Index) that captures the degree of central bank involvement in supervising all, some, or none of the various financial sectors.

Figure 4 shows the level of this index in 2013, with darker colors corresponding to a higher number of sectors that fall under the central bank's supervisory responsibility. A closer look at how this index has evolved over time reveals a clear tendency towards

Figure 4

Degree of Central Bank Involvement in Financial Sector Supervision in 2013



Source: Masciandaro and Romelli (2018). © ifo Institute

assigning more supervisory powers to central banks, in particular since the global financial crisis.

Masciandaro and Romelli (2018) also try to understand the determinants of reforms that increase the involvement of central banks in supervision of the entire financial sector. They find that past systemic banking crises significantly increase the probability that a country will reform its supervisory structure. This result is specific to financial sector turmoil and not to other types of crises, such as currency crises or economic recessions. They also show that crises are followed by reforms that generally increase the involvement of central banks in financial sector supervision, but not by those that decrease it.

Given this result, a natural question arises: in the absence of random shocks to the financial sector or an optimal institutional setting, what shapes the supervisory architecture of a country? Their study also documents an important "peer" effect among countries that explains the evolution of financial sector supervision. In particular, they show that countries are more likely to change their supervisory architecture when there is a larger share of countries undertaking reforms around the world or on the same continent. The degree of CBI also influences the decision to concentrate financial sector supervision in the hands of monetary policy authorities. Specifically, greater CBI is associated with less central bank involvement in supervision. This is also shown in Melecky and Podpiera (2013), who investigate the determinants of unified financial sector supervision, albeit not necessarily in the hands of the central bank. Thus, greater independence not only suggests more decentralized supervision as Melecky and Podpiera (2013) find, but it also suggests less involvement of central banks in oversight of the financial sector. This is in line with the view that granting unified supervisory power to an already highly independent central bank might increase the risk of bureaucratic misconduct. This is because increased oversight of financial institutions, i.e., greater microprudential regulation and supervision, might put a different type of pressure on a central bank's goals (Reis 2013). For instance, if central banks lack a clear policy rule forbidding the bailout of systemically important financial institutions, it will always be optimal to do so to avoid larger crises. However, if banks expect to be bailed out, this will increase their ex ante incentive to become larger, take on more risk, and correlate their exposure, making themselves systemically important. As a result, recent attention has also been directed towards the role of central banks in macroprudential oversight that aims at reducing systemic risk arising from excessive financial procyclicality (Cerruti et al. 2017).

Cerruti et al. (2017) are among the first to document the use of macroprudential policies in a set of 119 countries over the 2000–2013 period. Their paper shows that these policies are widespread; however, emerging economies tend to implement macroprudential policies more related to foreign exchange, while advanced economies focus on borrower-based policies (such as loan-to-value and debt-to-income ratios). One important point they found is that macroprudential policies are generally associated with reductions in the growth rate in credit, but this effect is less evident in more developed and financially open economies. Finally, they highlight an asymmetric impact of these policies, which seem to work better in booms as opposed to the burst phase of a financial cycle.

Bruno et al. (2017) also analyze the effect of macroprudential and capital flow management policies for a sample of 12 Asia-Pacific economies over the 2004–2013 period. Their findings suggest that capital flow management policies are effective in slowing down banking and bond inflows. They also find a certain degree of interaction between monetary policies and macroprudential policies, suggesting that macroprudential policies are a better complement to monetary policy tightening than to its loosening.

CONCLUSIONS

Following the 2008 global financial crisis, central bankers have not only extensively used unconventional monetary policy tools, but have also acquired deeper regulatory and supervisory powers over banking and financial intermediaries. Monetary activism coupled with a higher degree of involvement in financial regulation and supervision has reopened the debate on the optimal design of central banks. Going forward, central banks might face a number of pitfalls associated with the increased tasks and responsibilities they have received since the beginning of the global financial crisis. The coordination between monetary policy and either micro- or macroprudential policies might indeed threaten the credibility of central banks.

In this context, central bank transparency and accountability can sometimes be powerful tools for managing expectations and improving central banks' ability to effectively pursue their mandate. Yet how this information should be communicated and its impact on expectation is not perfectly understood. An active research agenda is investigating whether enhanced central bank communication is actually benefitting the public (Haldane and McMahon 2018). A recent illustrative example is the gradual unwinding of the USD 4.5 trillion balance sheet that the US Federal Reserve has accumulated through quantitative easing since 2008. The process was supposed to be automatic and, as former chair of the Fed Janet Yellen described it, as dull as "watching paint dry" (The Economist 2019). Yet communications about the process from Jerome Powell, the current Fed chair, have spooked the markets, which interpreted such messages as a signal of broader monetary policy.

What challenges does the institutional design of central banks face in the future? The first is increased political pressure due to the rise of populist movements across the world, which could threaten the hard-won independence of these policy institutions. Second, the benefits of CBI might be questioned in times of low and stable inflation. Third, the increased supervisory roles that central banks have recently adopted, as well as the myriad of unconventional policies that followed the global financial crisis, might challenge their credibility in pursuing their mandate of price stability. All these challenges have brought the issue of central bank institutional design to the forefront of academic and policy debate and might still trigger significant reforms to central banking in the near future.

REFERENCES

Abiad, A., E. Detragiache and T. Tressel (2010), "A new database of financial reforms", *IMF Staff Papers* 57 (2), 281–302.

Alesina, A. and A. Stella (2010), "The politics of monetary policy", in *Handbook of monetary economics*, vol. 3, Elsevier, pp. 1001–54.

Aghion, P., A. Alesina and F. Trebbi (2004), "Endogenous political institutions", *The Quarterly Journal of Economics* 119 (2), 565–611.

Arnone, M., B. J. Laurens, J.-F. Segalotto and M. Sommer (2009), "Central bank autonomy: lessons from global trends", *IMF Staff Papers* 56 (2), 263–96.

Arnone, M. and D. Romelli (2013), "Dynamic central bank independence indices and inflation rate: a new empirical exploration", *Journal of Financial Stability* 9 (3), 385–98.

Berger, W. and F. Kißmer (2013), "Central bank independence and financial stability: A tale of perfect harmony?" *European Journal of Political Economy* 31, 109–18.

Bernanke, B. S. (2007), Central banking and bank supervision in the united states. Remarks made at the Allied Social Science Association annual meeting, Chicago, Illinois.

Bruno, V., I., Shim and H. S. Shin (2017), "Comparative assessment of macroprudential policies", *Journal of Financial Stability* 28, pp.183-202.

Cerutti, E., S. Claessens and L. Laeven, (2017), "The use and effectiveness of macroprudential policies: New evidence", *Journal of Financial Stability* 28, pp.203–24.

Crowe, C. and E. E. Meade (2008), "Central bank independence and transparency: evolution and effectiveness", *European Journal of Political Economy* 24 (4), 763–77.

Cukierman, A., S. B. Webb, and B. Neyapti (1992), "Measuring the independence of central banks and its effect on policy outcomes", *The World Bank Economic Review* 6 (3), 353–98.

Goodhart, C. and D. Schoenmaker (1995), "Should the functions of monetary policy and banking supervision be separated?", *Oxford Economic Papers* 47 (4), 539–60.

Grilli, V., D. Masciandaro, and G. Tabellini (1991), "Political and monetary institutions and public financial policies in the industrial countries", *Economic Policy* 6 (13), 342–92.

Haldane, A. and M. McMahon (2018), "Central Bank communication and the general public", *AER Papers and Proceedings* 108, pp. 578–83.

Klomp, J. and J. de Haan (2010), "Inflation and central bank independence: a meta-regression analysis", *Journal of Economic Surveys* 24 (4), 593–621.

Kydland, F. E. and E. C. Prescott (1977), "Rules rather than discretion: the inconsistency of optimal plans", *Journal of Political Economy* 85 (3), 473–92.

Ioannidou, V. P. (2005), "Does monetary policy affect the central bank's role in bank supervision?" *Journal of Financial Intermediation* 14 (1), 58–85.

Masciandaro, D. and Quintyn, M. (2015), "The governance of financial supervision: recent developments", *Journal of Economic Surveys*, 30(5), 982–1006.

Masciandaro, D. and D. Romelli (2018), "Central bankers as supervisors: do crises matter?" *European Journal of Political Economy* 52, 120–140.

Masciandaro, D. and D. Romelli (2019), "Peaks and troughs: economics and political economy of central bank independence cycles", in *The Oxford Handbook of the Economics of Central Banking*, Oxford University Press, Oxford.

Melecky, M. and A. M. Podpiera (2013), "Institutional structures of financial sector supervision, their drivers and historical benchmarks", *Journal of Financial Stability* 9 (3), 428–44.

Peek, J., E. S. Rosengren and G. M. B. Tootell (1999), "Is bank supervision central to central banking?", *The Quarterly Journal of Economics* 114 (2), pp. 629–53.

Posen, A. S. (1995), "Declarations are not enough: financial sector sources of central bank independence", in *NBER Macroeconomics Annual 1995, vol. 10*, NBER Chapters, pp. 253–74. National Bureau of Economic Research, Inc.

Reis, R. (2013), "Central bank design", *Journal of Economic Perspectives* 27 (4), 17–44.

Rogoff, K. (1985), "The optimal degree of commitment to an intermediate monetary target", *Quarterly Journal of Economics* 100 (4), 1169–89.

Romelli, D. (2018), "The political economy of reforms in central bank design: evidence from a new dataset" (No. tep0918). Trinity College Dublin, Department of Economics.

The Economist (2019), *"Investors fear that the unwinding of QE is causing market turbulence"*, retrieved on March, 7th, 2019.