PEAKS AND TROUGHS: ECONOMICS AND POLITICAL ECONOMY OF CENTRAL BANK INDEPENDENCE CYCLES

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March, 2017

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1 I N T R O D U C T I O N

In 1824 David Ricardo wrote that:

"*It is said that Government could not be safely entrusted with the power of issuing paper money; that it would most certainly abuse it ... There would, I confess, be great danger of this if Government – that is to say, the Ministers – were themselves to be entrusted with the power of issuing paper money.*"

David Ricardo's ideas represent, nowadays, a closer representation of the functioning of monetary policy institutions than ever before in history. Central bankers can implement their policies with a degree of autonomy that their predecessors would have only dreamed of. Yet, the history of central banks is rich in modifications to their role and functions (Goodhart, 1988; Lastra, 1996; Goodhart, 2011). In particular, over the past four decades, central banks around the world have seen their mandates progressively narrowed and zoomed on the goal of price stability. At the same time, this narrowing mandate has been accompanied by changes in their governance arrangements, the main focus of which became an increasing degree of independence of monetary policy authorities from the executive power.

This evolution, prompted by Kydland and Prescott's well-known time inconsistency problem, has attracted a significant interest from the economic profession starting with the 1990s, when the first indices of *central bank independence* (CBI) have been developed. Figure 1 displays this growing interest in central bank independence, by showing the number of academic papers and research published with a title containing these key words between 1991 and 2015.[1] During the

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[1] Data was obtained from a SSRN and JSTOR search on papers containing "central bank independence" in their titles. If we further expand our focus on all the academic research

period 1991-1998, 64 research and policy articles have been published, peaking in 1998 with 33

publications. The 2000s saw a new wave of research in the field (253 published articles) with a new

peak of 46 published articles in 2008. Recent years have, once again, seen a renewed interest in

studying central bank independence, with an increasing trend in the number of publications on the

topic.

Figure 1: Research and policy articles with a "Central Bank Independence" title (1991-

2015)
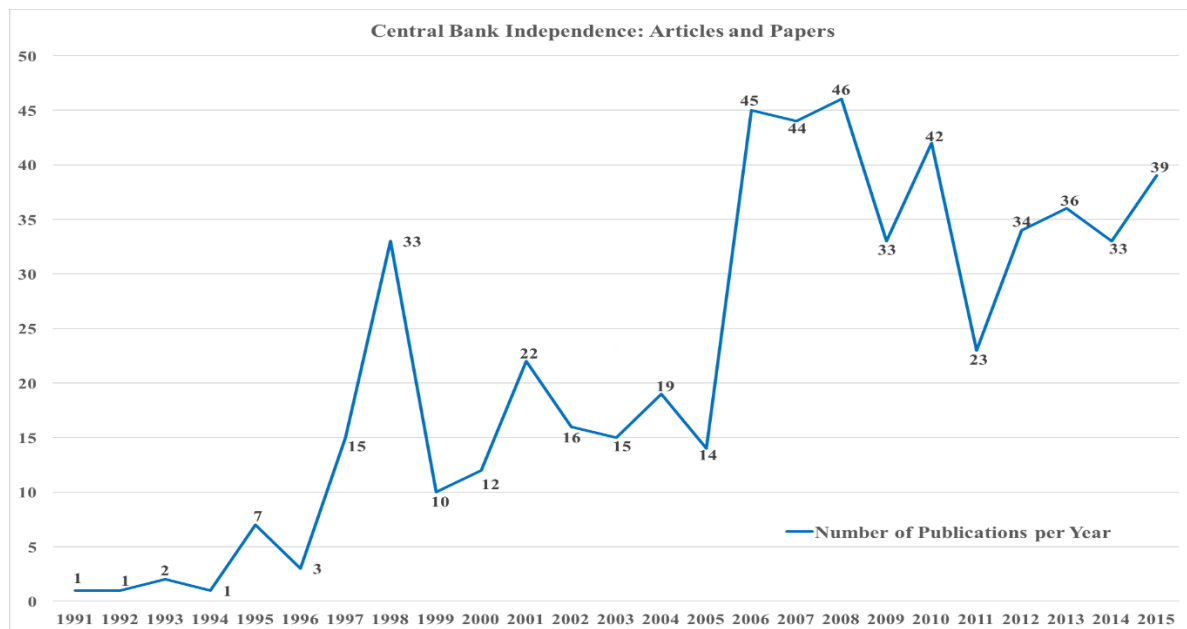
Notes: Figure 1 presents the evolution of the number of academic papers and research
published with a title containing the words "Central Bank Independence", between 1991 and
2015. Data obtained from SSRN and JSTOR.

This evolution of research on central bank independence has followed closely the pace of reforms in

central bank institutional design. For example, throughout the 1990s, a large wave of reforms that

increased the degree of independence of monetary policy institutions was observed in both developed and

developing countries. Similarly, the increased interest in recent years was brought about by the

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containing the heading "central bank independence" in their text using Google Scholar, we find
around 16,000 works between 1991 and 2015.

debate on the optimal design of central banks that sparkled after the 2008 Global Financial Crisis (hereafter the Crisis).

The Crisis has posed new challenges to modern central banking models, in which monetary policy is conducted by an independent central bank that follows an interest rate rule-based approach to stabilize inflation and output gaps (Goodhart et al., 2009; Alesina and Stella, 2010; Aydin and Volkan, 2011; Curdia and Woodford, 2011; Giavazzi and Giovannini, 2011; Gertler and Karadi, 2011; Issing, 2012; Woodford, 2012; Cohen-Cole and Morse, 2013; Cukierman, 2013). In the aftermath of the Crisis, there has been a large number of important reforms to central bank governance, in particular regarding the involvement of central banks in banking and financial supervision (Masciandaro and Romelli, 2015a). For example, the Dodd-Frank Act of 2010 increased the responsibilities of the Fed as prudential supervisor (Komai and Richardson, 2011; Gorton and Metrick, 2013).[2] In Europe, the European Systemic Risk Board (ESRC), established in 2010, provides macro-prudential supervision of the European Union's financial system under the guidance of the European Central Bank (ECB), while the European Single Supervisory Mechanism (SSM), which started operating in November 2014, assigns banking sector supervision responsibilities to the ECB together with national supervisory authorities. These reforms indicate a reversal in central bank governance, since granting more supervisory power to the central bank is generally associated with a lower degrees of central bank independence (Masciandaro and Quintyn, 2009; Orphanides, 2011; Eichengreen and Dincer, 2011; Masciandaro, 2012a,b; Masciandaro and Quintyn, 2015).[3]

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[2] While the Dodd-Frank Act increased the Fed's responsibilities in supervision, it nonetheless kept unchanged the number of regulators in the US system and limited the Fed's freedom to use section 13(3) by requiring it to obtain approval from the Treasury Secretary prior to extending emergency credit to financial institutions.

[3] Economic theory does not have a clear answer on the optimality of assigning supervisory roles to central banks or other independent institutions. For instance, Masciandaro and Quintyn (2015) discuss two conflicting views regarding the merger of monetary and supervisory functions inside the central bank. The view that favors the integration of the two functions highlights the informational advantages and economies of scale derived from bringing all

In this chapter, we provide an overview of this evolution in central bank independence over the past four decades. We investigate the *endogenous* determination of central bank institutional design from both a theoretical and empirical perspective. Theoretically, we build a small, stylized political economy model in which citizens delegate to policymakers the optimal design of central bank governance. This toy model is used to highlight some key determinants that can explain the evolution of central bank independence as a function of macroeconomic shocks and political economy characteristics of countries. We then employ recently developed dynamic indices of central bank independence to highlight the peaks and troughs of CBI over the period 1972-2014. Using the recomputed Grilli et al. (1991) index in Arnone and Romelli (2013) and Romelli (2017), we highlight several interesting trends in central bank design. In a sample of 65 countries, we show that the increasing trend in central bank independence over the period 1972-2007, has been reversing after the Crisis, mainly due to the significant changes to the roles of central banks in banking supervision.

We then provide a systematic investigation of the political economy and macroeconomic characteristics that are associated with central bank independence over time. Employing a dynamic index of CBI, we analyze the evolution of CBI across a large sample of countries and over time and highlight some new interesting determinants of the endogenous evolution of central bank design. We find that legacy matters, i.e., past levels of central bank independence are highly correlated to future ones. We also show that past episodes of high inflation are positively correlated with high levels of

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functions under the authority of the central bank (Peek et al., 1999; Bernanke, 2007). Alternatively, a separation argument highlights the higher risk of policy failures if central banks have supervisory responsibilities, as financial stability concerns might impede the implementation of optimal monetary policies (Goodhart and Schoenmaker, 1995; Ioannidou, 2005). The empirical literature that has investigated the relative merits of assigning banking sector supervision to central banks is also mixed. As a consequence, throughout this chapter, we adopt a prudential approach by supporting the separation view and assuming that supervisory roles can, at time, be in conflict with the goal of price stability, hence lowering the independence of monetary policy authorities. This is also in line with the Grilli et al. (1991) index of CBI employed in this chapter.

CBI in the following periods. This corroborates the findings in Crowe and Meade (2008) and suggests that high inflation aversion does, indeed, constrain governments to assign higher degrees of independence to their central banks. However, taking stock of our richer panel data, we show that the effect of inflation aversion vanishes in recent years (2000-2014), when the degree of CBI tends to be more closely related to other types of macroeconomic shocks such as fiscal and exchange rate shocks.

The remainder of this chapter is as follows. Section 2 provides a systematic overview the literature in central bank independence over the past decades. Section 3 presents a stylized model that can explain the drivers of the optimal level of central bank independence. Section 4 discusses the data employed and some descriptive statistics, while section 5 presents the empirical strategy and results. Finally, the last section concludes.

2 THE DESIGN OF CENTRAL BANK INDEPENDENCE: THE STATE OF THE ART

Starting with the New Classical Revolution, a large literature has been concerned with the optimal institutional design of monetary policy authorities and how this impacts macroeconomic outcomes. The main theoretical argument is that policymakers tend to use monetary tools with a short-sighted perspective, by using an inflation tax to smooth different kinds of macroeconomic shocks, in an attempt to exploit the short-term tradeoff between real economic gains and nominal (inflationary) costs.[4] Moreover, the more efficient markets are, the greater is the risk that the short-sighted monetary policies just produce inflationary distortions, as rational agents will anticipate the political incentives of using an inflation tax and will fully adjust their expectations. In this framework, the Friedman-Lucas proposition on monetary policy neutrality holds (Friedman, 1968; Lucas, 1973). Furthermore, this political inflation bias can generate even greater negative externalities, such as a

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[4] See Bernanke (2013a) on the gains in having a long-sighted independent central banker versus a short-sighted politician.

moral hazard among politicians (if the inflation tax is used for public finance accommodation) or bankers (if the monetary laxity is motivated by bank bailout needs) (Nolivos and Vuletin, 2014).

As a result, in the late 1970s/early 1980s, the idea of banning the use of monetary policy for inflation tax purposes received a broad consensus among policymakers and the academic community. Consequently, as soon as this institutional setting gained momentum, the relationship (governance) between the policymakers (responsible for the design of policies) and the central bank (in charge of monetary policy) became crucial in avoiding the inflation bias. In this context, Rogoff (1985) argues that only an independent central bank is able to implement credible monetary policies that will favor lower inflation rates and thus eliminate the time inconsistency problem of government policies (Kydland and Prescott, 1977).[5] Walsh (1995a) proposes an alternative way to model central bank independence using a principal-agent framework that underlines the importance of assigning stronger incentives to central bankers in order to reach the socially optimal policy. For example, the Reserve Bank of New Zealand Act of 1989 establishes a contract between the central bank and the government that is close in spirit to Walsh's optimal central bank contract (Walsh, 1995b).

The optimal design of central bank governance is essentially a two-sided medal. On one side, the central banker has to be independent, i.e., implement its policies without any external (political) short-sighted interference. Therefore, the central banker becomes a veto player against inflationary monetary policies. On the other side, the central banker has to be conservative, where

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[5] See Cukerman (1998); Cukierman (2008), Eijffinger and de Haan (1996), Alesina and Stella (2010) and de Haan and Eijffinger (2016) for excellent reviews of the time-inconsistency literature. Furthermore, Goodfriend (2007) reviews how consensus on monetary policy was reached, while Goodfriend (2012) discusses how the concept of central bank independence has emerged first under the gold standard and later with fiat money. Barro and Gordon (1983), Backus and Driffill (1985) and Lohmann (1997) focus on how the "rules of the game" influence the outcomes of the overall macroeconomic policy, while Sargent and Wallace (1984), Niemann (2011), Niemann et al. (2013), Martin (2015), Burdekin and Laney (2016) and Reis (2016) focus their attention on fiscal policy.

conservativeness refers to the importance that he/she assigns to medium-term price stability in its relation to other macroeconomic objectives. Thus, conservativeness is a necessary condition to avoid that the central banker himself/herself becomes a source of inflation bias and independence is often considered as the premise to conservative monetary policies. Moreover, independent and conservative central banks are credible if and only if the institutional setting in which they operate guarantees the accountability and transparency of their policies.

Given these key characteristics of monetary policy settings, a large literature has developed a set of indices that attempt to capture the institutional features of central banks and gauge their degree of independence, conservatism and transparency. Seminal works include Bade and Parkin (1982), Grilli et al. (1991), Cukierman (1992) and Masciandaro and Spinelli (1994).[6] Most of these indices develop de jure indices of independence based on central bank charters. One exception is Cukierman (1992) who firstly distinguishes between legal and de facto indicators of independence. These classical indices of independence have been updated by, among others, Cukierman et al. (2002) and Jacome and Vazquez (2008) for the Cukierman index, and Arnone et al. (2009) and Arnone and Romelli (2013) for the Grilli, Masciandaro and Tabellini index. Moreover, several recent works extend previous measures of CBI by looking at other central bank characteristics. For example, Crowe and Meade (2008) and Dincer and Eichengreen (2014) develop measures of central bank independence and transparency. Vuletin and Zhu (2011) propose a new de facto index of independence, identifying two different mechanisms embedded in the measure of the turnover rate of central bank governors (see also Dreher, Sturm, and de Haan, 2008; 2010)

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[6] See Berger et al. (2001) and Arnone et al. (2006) for an overview. On the historical alternative models of independent and dependent monetary authorities, see Vicarelli et al. (1988) and Wood (2008). Country studies include Waller (2011), Bernanke (2013b), Gorton and Metrick (2013), on the US FED; Goodfriend (2012) on the Bank of England; Issing (2005b) and Beyer et al. (2008) on the Bundesbank; and Gaiotti and Secchi (2012) on the Bank of Italy.

Together with the construction of these indices of central independence, a large literature has attempted to determine whether the degree of independence is associated with important macroeconomic indicators such as inflation rates, public debt and interest rates, as well as income and growth. The assumption was to verify if the existence of a monetary veto player reduces the intended and unintended effects of the misuse of the inflation tax and produces positive spillovers on other macroeconomic variables. By and large, this literature has produced mixed results (de Haan, and Sturm, 1992; Alesina and Summers, 1993; Alesina and Gatti, 1995; Posen, 1995; Forder, 1996; Campillo and Miron, 1997; Sturm and de Haan, 2001; Gutierrez, 2003; Jacome and Vazquez, 2008; Siklos, 2008; Ftiti et al., 2017). For example, Klomp and de Haan (2010b) perform a meta regression analysis of 59 studies, examining the relationship between inflation and CBI and confirm the existence of a negative and significant relation between inflation and CBI in OECD countries, although the results are sensitive to the indicator used and the estimation period chosen. More recent studies nonetheless confirm the importance of the legal CBI in explaining inflation rates (Cukierman, 2008; de Haan et al., 2008; Carlstrom and Fuerst, 2009; Down, 2009; Alpanda and Honig, 2009; Alesina and Stella, 2010; Klomp and de Haan, 2010a; Maslowska, 2011; Arnone and Romelli, 2013), government deficits (Bodea, 2013) and financial stability (Cihak, 2007; Klomp and de Haan, 2009; Ueda and Valencia, 2014).[7]

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[7] Other analyses include Eijffinger and Hoeberichts (1998, 2008), McCallum (1995) and Fisher (1995) on the relationship between CBI and central banker conservativeness and Niemann (2011) on monetary conservativeness and fiscal policy. Furthermore, Eijffinger and Geraats (2006) and Hughes Hallett and Libich (2006) focus on transparency and Cukierman and Meltzer (1986), Goodfriend (1986), Issing (2005a) and Blinder et al. (2008) discuss central bank communication. Over time, the relationship between independence and accountability has become the core focus of the so-called central bank governance (Briault et al., 1996; Morris and Lybek, 2004; Frisell et al., 2008; Crowe and Meade, 2008; Hasan and Mester, 2008; Ashraf, 2016). Central bank governance became the institutional setting for implementing the day-by-day monetary policy: given the long-run goal of avoiding the risk of inflation, the modern central banker can also smooth the real business cycles using monetary policy rules (Henderson and McKibbin, 1993; Persson and Tabellini, 1993; Taylor, 1993; Bernanke and Gertler, 1995; Walsh, 1995a; Svensson, 1997; Gertler et al., 1999; Gali and

Despite this growing consensus, the Crisis has once again brought central banks at the core of

policy and academic debate by highlighting the need to reconsider, among others, their role in

banking supervision (Masciandaro, 2012c) and financial stability. Central banks around the world are

now perceived as policy institutions with the goal of promoting monetary *and* financial stability, a

double mandate that might bring a new form of time inconsistency problem (Erlend, 2009; Ingves,

2011; Ueda and Valencia, 2014). Yet, empirical investigations on the interplay between CBI and

financial stability have led to confounding results. For instance, Cihak (2007) and Klomp and de Haan

(2009) find that CBI fosters financial stability, while Berger and Kißmer's (2013) analysis suggests

that more independent central banks are less willing to prevent financial crises. Finally, it is also

important to notice how, starting from 2008, central banks such as the Federal Reserve and the Bank

of England, have implemented large scale quantitative easing (QE) policies. Despite the little

evidence of significant side effects of these policies, the potential losses that could result from these

non-conventional operations might threaten central bank independence in the future (Goodfriend,

2011, Ball et al., 2016).[8]

The large majority of these empirical studies essentially considers central bank independence as an

exogenous (independent) variable that can be useful to explain macroeconomic trends. Yet successive

research has argued that political institutions such as central banks evolve endogenously as a response

to a set of macroeconomic factors (Farvaque, 2002; Aghion et al., 2004; Polillo and Guillen, 2005;

Brumm, 2006, 2011; Bodea and Hicks, 2015; Romelli, 2017). The step forward in this line of

research is then to consider the degree of CBI as an endogenous (dependent) variable that has to be

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Monacelli, 2005). Therefore, monetary policy becomes the final outcome of a complex interaction
between three main components: monetary institutions, central banker preferences and policy rules.
[8] Other recent contributions and policy debates that discuss the issue of CBI after the global
financial crisis include: Cecchetti (2013), Bayoumi et al. (2014), Buiter (2014), Kireyev
(2015), Fischer (2015), Williams (2015), Balls (2016), Aklin, and Kern (2016), den Haan et al.
(2017), de Haan and Eijffinger (2017).

explained.[9] Which are the drivers that can motivate the decision of a country to adopt a certain degree of independence of the central bank? Why and how policymakers are forced to implement reforms that reduce their powers in using the inflation tax, increasing the degree of independence of the central bank? Various hypotheses have been advanced to explain the genesis of the political process that leads a monetary policy regime to assume a given set of characteristics. Developments in endogenizing central bank independence have been the subject of analysis in both economics and political science. One argument relates to the possibility that the degree of CBI depends on the presence of constituencies that are strongly averse to the use of the inflation tax, which drives policymakers to bolster the status of the central bank (the *constituency view*).[10] Other views argue that the aversion to the use of the inflation tax is structurally written in the features of the overall legislative and/or political system, which influence policymakers' decision on whether to have a more or less independent central bank (the *institutional view*).[11] Yet another view stresses the role of culture and traditions of monetary stability in a country in influencing policymakers' choices (the *culture view*).[12]

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[9] Excellent references on how central banks policies and their institutional settings have changed, as well as on the causes of these changes are Siklos (2002) and Siklos et al. (2010).

[10] See Maxfield (1997). Posen (1995), stressing the distributive consequences in the choice of a monetary regime, notes that there is no reason to assume that the adoption of central bank independence is self-enforcing; that choice requires political support, and the financial sector is positioned to provide that support (see also de Haan and van't Hag, 1995). On the relationships between financial sector preferences, low inflation and central bank independence, see also Miller (1998), who provides an interest group theory of CBI.

[11] On these issues see Moser (1999). Vaubel (1997) suggests that central banks, even if formally independent, can be captured, while Sieg (1997) proposes a formal model of a captured independent central bank. Bernhard (1998) claims that information asymmetries of the monetary policy process can create conflicts between government ministers, their backbench legislators and, in multiparty government, their coalition partners; an independent central bank can help overcome these conflicts. See also Alesina and Sachs (1988), Alesina (1989), Goodman (1991), Milesi-Ferretti (1995), Lohmann (1997), Bagheri and Habibi (1998), Banaian and Luksetich (2001), Keefer and Stasavage (2003).

[12] See Berger (1997) and Berger et al. (2001). Hayo (1998) claim that people's preferences with respect to price stability matter in explaining low inflation rates, and that the central bank

These three views share the role of the preferences of citizens in determining the degree of CBI (Masciandaro and Romelli, 2015b). In the constituency view, the present preferences against the use of the inflation tax are relevant; in the institutional and culture views, the past anti-inflationary preferences influence the present policymakers' decisions. It is also evident that these preferences might change following periods of economic turmoil, prompting a wave of reforms in the design of the central bank governance.

Overall, whatever the adopted view in explaining the evolution of CBI, our attention should focus on two crucial elements: social preferences and the incentives and constraints that shape the behaviour of the agent responsible for the monetary setting design, i.e., the incumbent policymaker. Motivated by these arguments, the next section of this chapter uses a political economy framework to show how the optimal monetary policy design can evolve as a function of these two elements.

3 CITIZENS, POLITICIANS AND CYCLES IN CENTRAL BANK INDEPENDENCE

In this section, we study the optimal design of central bank governance using a delegation framework in which a policymaker's choice depends on the economic and institutional environment existing at a given time, which, in turn, determines the political weights put on the pros and cons of assigning the central bank a certain level of independence. Our framework is based on two main assumptions. First, we assume that incumbent politicians weight the gains and losses of adopting a central bank

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independence is just one aspect of a stability regime, with two competing interpretation on the role of the institutional design: preference – instrument interpretation versus historical-feedback interpretation. Franzese (1999) claims that the effectiveness of central bank independence depends on every variable in the broader political – economic environment. In Eggertsson and Le Borgne (2010) the society – with all agents having homogeneous preferences – determines the CBI solving a delegation problem with a trade-off between costs and benefits. Recently, Crowe (2008) demonstrated that CBI is more likely to occur in societies where preferences over different policy dimensions, one of which is monetary policy, are heterogeneous. See also Eijffinger and Stadhouders (2003), Quintyn and Gollwitzer (2010), Hielscher and Markwardt (2012), Berggren et al. (2014).

governance setting following his/her own preferences. Second, policymakers are politicians, and, as such, they are held accountable at elections for how they have managed to please voters. As a result, the policymaker also weights the costs and benefits of setting a level of central bank independence given the median voter's preferences.[13]

We consider an economy with rational agents (citizens) who dislike the short-sighted use of inflation tax and prefer monetary stability. These rational citizens will then fully anticipate the government's incentive to use inflation to address different kinds of macroeconomic shocks.[14] Hence, our setting is that of a democracy where citizens dislike the political inflationary biases and prefer to have independent and credible central banks as monetary actors. The degree of CBI then becomes a possible institutional device to face political bias whereby citizens acknowledge that the definition of an optimal level of CBI means to exploit a tradeoff between avoiding the inflationary bias in normal times and using stabilization devices in crisis times.

We assume that this concern about the effectiveness of a central bank regime takes the form of a simple utility function in which social welfare is linearly increasing in the level of CBI, as follows:
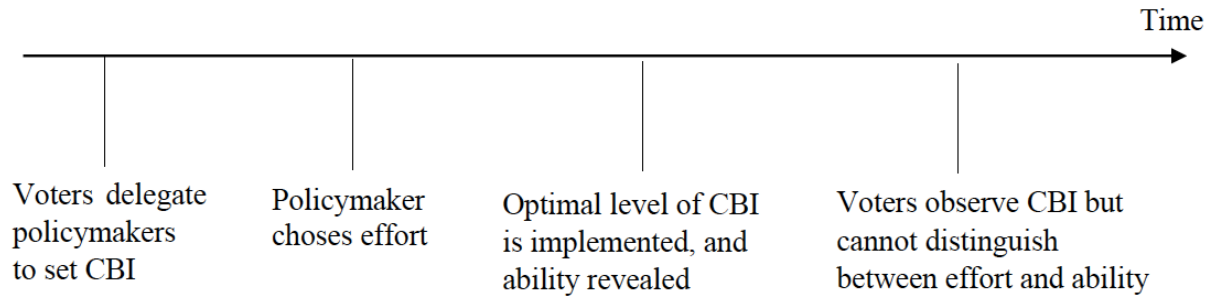
$$U(\theta) = \theta, \tag{1}$$

where θ denotes the level of central bank independence. In a democracy, citizens assign to the elected policymaker the task of designing the optimal level of CBI. This policymaker is a politician who aims to

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[13] This model is a simplified version of the model presented in Masciandaro and Romelli (2015b).

[14] The government's use of this inflation tax, or political bias, can stem from many different factors including the advantages brought by an inflationary policy (partisan bias) such as increase the employment level (employment bias); an incentive to use monetary policy to make the costs of fiscal policies less onerous in economic or political terms (fiscal bias); a temptation to bail out banks through monetization (banking bias); or incentive to use accommodative monetary policy when facing balance of payment imbalances

please the voter and whose reward is based on how he/she (hereafter she) carries out her job, i.e. defining and implementing an optimal level of CBI.[15]

Figure 2: Timing of the delegation framework

Time

Voters delegate
policymakers
to set CBI

Policymaker
choses effort

Optimal level of CBI
is implemented, and
ability revealed

Voters observe CBI but
cannot distinguish
between effort and ability

Notes: Figure 2 shows the timing of the delegation framework of the model.

The outcome of policy making, i.e., the level of CBI, θ, is the result of two factors: the policymaker's effort and her ability, as follows:

$$\theta = e + \Omega, \tag{2}$$

where e denotes the policymakers' effort and Ω her ability. The delegation framework of the model is depicted in Figure 2. The following sequence of events is assumed. First, society chooses to delegate to the policymaker the task of implementing the optimal level of CBI. This policymaker chooses a level of effort e, before knowing her ability Ω in implementing this particular task. After the regime is implemented, the policymaker learns its ability, however, citizens only observe the level of CBI, θ, and cannot distinguish between the effort and ability. Finally, the policymaker is rewarded for the task

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[15] This implies a helping hand (Pigou, 1938) view of policy making in which the policy maker aims to please citizens. The alternative assumption, i.e., the grabbing hand view (Shleifer and Vishny, 2002), implies the policymaker is aiming to please specific constituencies, i.e. the lobbies (see also Masciandaro, 2009). This second modeling choice is not of interest in our framework, as inflation developments are a wide concern for the whole population of voters and is unlikely that powerful constituencies would systematically advocate for the use of an inflationary tax.

based on the observed level of CBI, and not her effort since citizens cannot distinguish between the two.

The policymaker acts with the goal of maximizing her utility function, denoted by Z, defined as follows:

$$Z(\theta, e) = R\big(U(\theta)\big) - C(e), \tag{3}$$

where $R\big(U(\theta)\big)$ is a reward function and $C(e)$ is the cost function. The politician's reward is a function of the social utility, itself a function of the level of CBI, while the political costs are a function of the effort in implementing the task.[16] Political reward is related to the possibility to be re-elected, which is an increasing function of the utility of voters, i.e., the social welfare function, $U(\theta)$. Hence, in aiming to please voters, the policymaker's goal becomes aligned with the interest of the citizens. Moreover, it is natural to assume that each delegated task that the politician has to fulfill can be more or less convenient from the policymaker's point of view in terms of political gains. We denote the political value she assigns to fulfill the specific task of implementing an optimal level of CBI by β. Therefore, the reward function can assume the specific form:

$$R\big(U(\theta)\big) = \beta U(\theta), \tag{4}$$

with $\beta \in [0, 1]$. The coefficient β can also be interpreted as a measure of aversion towards inflation of the population. As a result, the more the median voter values an independent monetary policy's ability to safeguard inflation, the higher the political benefits of the policymaker from implementing such a

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[16] The idea that the degree of CBI enters directly the utility function is in line with the results of the empirical literature on the effect of CBI. Indeed, this literature shows how central bank independence can be considered a "free lunch" able to guarantee price stability at no costs for real economic growth (see, among others, Grilli et al., 1991, Alesina and Summers, 1993 and Cukierman, 2008).

policy. The incentives alignment between the policymaker and citizens is a necessary and sufficient condition to characterize the optimal behaviour of the policymaker.

Our main interest lies in the factors that might impact the political cost function, $C(e)$. The policymaker knows that if monetary policy is delegated to an independent bureaucracy committed to a monetary stability goal, she will face certain rigidities in implementing accommodative and stabilizing policies when the economy is hit by certain shocks. In other words, we assume that the political costs are related to a series of macroeconomic events that call for a lax monetary policy that cannot be implemented if the central banker is given a certain degree of independence. We consider five such macroeconomic shocks, as follows:

- Political shocks (*Pol*);

- Unemployment shocks (*U*);

- Fiscal shocks (*F*);

- Financial shocks (*Fin*);

- Foreign Exchanges shocks (*FEx*).

Given these shocks, we assume a simple form of the political cost function, as follows:

$$C(e) = ce^2, \tag{5}$$

where parameter $c = c(Pol, U, F, Fin, FEx)$ is linearly increasing in the probability that the country will experience a political (*Pol*), unemployment (*U*), fiscal (*F*), financial (*Fin*) or foreign exchange (*FEx*) shock.[17] The exact relationship between these political costs and macroeconomic

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[17] Bodea (2010) brings a first contribution to the small research investigating the complementarity between exchange rate regimes and central bank independence (see also de Haan, Klaas and Sturm, 1993). She shows that governments will prefer both a fixed, but adjustable, exchange rate regime and an independent central bank that is not completely transparent.

conditions will depend on an array of country characteristics, which we will address in the empirical section of this chapter.

Given these assumptions, the policymaker's optimal decision can be written as:

$$\text{Max}_e \, Z = \beta\theta - ce^2$$

$$\text{s.t.} \quad \theta = e + \Omega$$

The first order condition yields a straightforward solution for the optimal level of effort of the policymaker:

$$e = \frac{\beta}{2c}. \tag{6}$$

Thus, in this simple framework, the level of effort does not depend on political ability. Once the level of effort is set, the policymaker's ability is revealed and the optimal level of central bank independence is set as follows:

$$\hat{\theta} = \frac{\beta}{2c} + \widehat{\Omega}, \tag{7}$$

where $\widehat{\Omega}$ is the revealed level of ability of the policymaker.

This simple framework gives us an easily testable empirical framework that can explain the different levels of central bank independence implemented across countries and what can lead to increases or decreases in CBI across countries and time. The main testable implication of the model is summarized in Hypothesis 1:

Hypothesis 1 : The level of central bank independence in a given country is likely to increase with a society's aversion towards inflation (higher β) and the ability of the policymaker ($\widehat{\Omega}$), while it is likely to decrease with the likelihood that the country has experienced a series of shocks that bear political costs (c).

In the next sections of this chapter we provide an empirical framework to test this hypothesis using recently updated indices of central bank independence.

4 PEAKS AND TROUGHS IN CBI: DATA

In this section, we discuss the construction of the index of CBI used to document the evolution of central bank independence over the past four decades, as well as the set of explanatory variables used in our empirical investigation. We focus our analysis on the evolution of central bank independence in the post Bretton Woods period. Prior to 1972, countries participating to this system were required to maintain the parity of their national currencies with their currency reserves, limiting the set of actions available to monetary policymakers. The collapse of this international monetary system led to the return to floating exchange rates, reintroducing room for the discretionary conduct of domestic monetary policies. We thus expect a higher number of central bank legislative reforms after 1972, when central banks started to move from being simple public agencies acting on behalf of the government to a potential veto player against any inflationary pressure triggered by politicians.

4.1 DEPENDENT VARIABLE

The literature on central bank independence generally uses two different strategies to capture the degree of independence of a central bank: (a) indices based on central bank legislation (de jure), or (b) on the turnover rate of the central bank governor (de facto).

In this chapter, we focus on a legal measure of central bank independence for a series of reasons. First, economists argue that the mere adoption of a legal statute guaranteeing central bank independence dampens inflationary expectations in the economy (Polillo and Guillen, 2005). Therefore, the adoption of a new law might have practical implications on the perceived level of independence and on the credibility of a country's central bank. Second, these indices are preferred because they focus on specific claims contained in central bank statutes and, for this reason, they are

less biased by the presence of possible subjective judgments. Third, even if de facto measures might be able to explain how CBI affects macroeconomics variables such as inflation or economics growth, their ability to explain how independence evolves over time is not clear. Finally, indices of legislative independence are favored to de facto measures, which associate the independence of the central bank to the autonomy of its governor, since the latter does not consider the independence of the other members of the board of directors and might thus over or underestimate the degree of CBI. Indeed, nowadays the large majority of central banks implement their monetary policy using committees (Blinder, 2004; Morris and Lybek, 2004). Moreover, it is important to notice that, to obtain a more accurate turnover rate index, it might be necessary to analyze the reasons of the departure, before the end of his/her term, of the central bank governor.

The measure of central bank independence employed in this chapter is the Grilli et al. (1991, GMT index). This index is calculated as the sum of central banks' fulfillment of 15 different criteria and ranges from zero (least independent) to 16 (most independent). Despite the wealth of research on central bank independence indices, the GMT index is still the only measure of de jure CBI that differentiates between political and economic CBI, as well as providing information on the involvement of the central bank in banking supervision. Moreover, the inclusion in the GMT index of non-statutory factors that influence the degree of de facto independence, such as information on supervision, has been shown to strengthen its explanatory power (Maslowska, 2011).[18]

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[18] We are aware that no single definition of CBI is "right" for all countries, but we consider de jure indices, in particular, the GMT one, as the most appropriate for our analysis, since legislative changes might signal a stronger change in the relationship between the central bank and the government. One drawback of de jure indices is that legislative reforms might require a long legislative process with a possible, temporary decoupling between the degree of de jure and the effective level of independence of the central bank. Yet de facto indices also suffer a similar drawback in situations where the central bank governor satisfies all the wants and needs of the government and is not be replaced, resulting in a high level of independence measured by the turnover rate.

The political independence index of Grilli et al. (1991) is based on a binary code assigned to eight different characteristics that sum up the ability of monetary authorities to independently achieve the final goals of their policy. This index captures three main aspects of monetary policy institutions: the procedure for appointing the members of the central bank governing bodies, the relationship between these bodies and the government, and the formal responsibilities of the central bank. The economic independence index, on the other hand, summarizes the degree of independence of the central bank in choosing the set of instruments consistent with monetary policy. Its three main aspects concern: the influence of the government in determining how much it can borrow from the central bank, the nature of the monetary instruments under the control of the central bank and the degree of central bank involvement in banking supervision (See Appendix A for the detailed structure of the index).

We thus use this index to evaluate the evolution of CBI over the past decades. To that end, we need to compute the evolution of the level of central bank independence over time. Most research that studies CBI simply updates the information of the most commonly used indices at a particular point in time (Acemoglu et al., 2008). For example, the GMT index, first computed to capture the degree of CBI at the end of the 1980s, has been updated by Arnone et al. (2009) with the level of independence as of 2003. However, measuring the degree of CBI only at specific points in time limits our understanding of how central bank design has evolved over time.

Since our interest rests in capturing these particular dynamics, we use the data presented in Romelli (2017), who re-computes the GMT index in each year in which a reform in the legislation of the central bank took place over the period 1972 and 2014, for a sample of 65 countries. The list of countries and information on data availability are presented in Appendix Table B.I. Figure 3 presents the evolution of the average degree of political and economic independence for our sample of countries.

Figure 3: The evolution of the GMT political and economic independence indices (1972-2014)
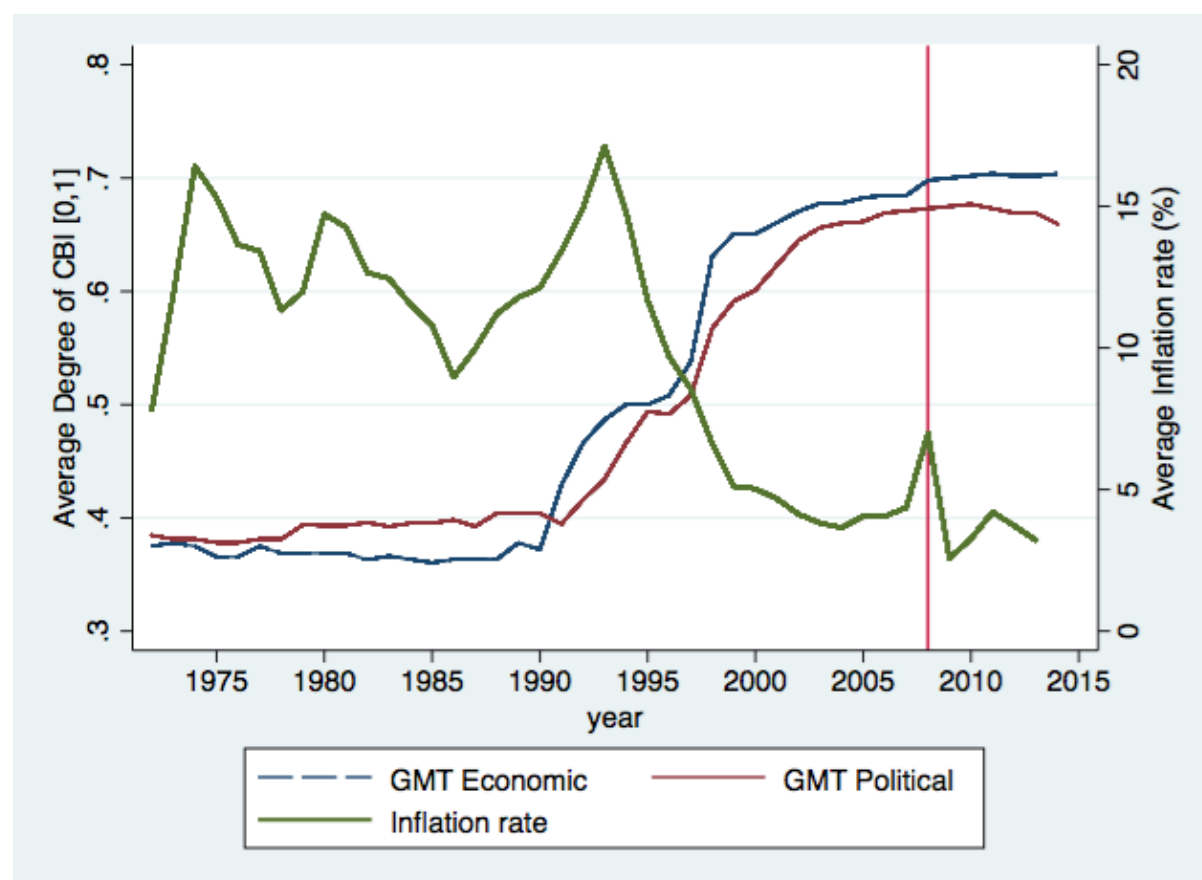
Notes: Figure 3 shows the evolution of the average political and economic indices of central bank independence (left vertical axis) and inflation rate (right vertical axis) for the 65 analyzed countries, over the period 1972-2014.

Figure 3 highlights several important trends. During the 1990s and early 2000s a clear trend towards an increase in the level of both the political and economic CBI is observed. The most striking feature is present in the early 1990s where, together with a spike in the average inflation rate, we see a significant rise in the level of CBI. This period coincides with the break-up of the USSR, which resulted in the inclusion in the sample of several economies experiencing high inflation. At the same time, these Eastern European and former Soviet Union countries implemented significant reforms in their monetary policy institutions between 1989 and 1995. This period also coincides with the European Union integration process and the creation of the ECB, which required members to implement legislative reforms aimed at assigning their central banks a level of independence similar

to that of the Bundesbank, the highest at the time. Further, in this period the establishment of an independent central bank became an external prerequisite for maintaining or gaining access to the financial markets, i.e. the political gains in changing the CBI level increased. It is interesting to notice how these reforms in central bank institutional design took place in the years in which the academic literature began to look at central bank independence as a relevant research topic, as we have already noted in Figure 1.

From this point on, transition to a period of more stable and low inflation followed. This, as clearly depicted in Figure 3, corresponded to a levelling in the degree of CBI. This is in line with the theoretical arguments presented in Section 3, where we have argued that periods of low inflation aversion will correspond to a lower level of CBI.

Furthermore, a clear reversal in the level of independence is noticeable following the Crisis. This trend is, in fact, captured by the degree of economic independence (GMT Economic in Figure 3), since this index is the one capturing the evolution of central bank involvement in banking supervision, where most of the changes in central bank design took place. Interestingly, during the period 2008-2015, also the number of articles and policy papers published on CBI firstly dropped, and then it started to increase again. Similar trends are presents while looking at the subsamples of OECD (Appendix Figure B.1) and non OECD countries (Appendix Figure B.2).

Table I adds further relevant details on the evolution of these indices of CBI. We present the average level of the GMT across the last four decades up to the start of the Crisis. Looking at the mean of the GMT index (column 4), we clearly observe a systematic increase in its average level in every decade analyzed. This pattern is consistent whether we look separately at the political or economic GMT measures or whether we split the sample of countries into OECD or non-OECD members. Yet this increasing trend is reversed after 2007 for the non-OECD countries for the level of economic independence, which also includes information on the involvement of the central bank in banking

supervision.[19] Similar evidence can be found while splitting the sample between inflation and non-inflation targeting countries, where the trend is reverted after 2007 for the second group of countries (see Appendix Table B.II).

Table I: Summary statistics on the evolution of the GMT independence index

Period	# of Ctys	# of Obs	GMT			GMT Political			GMT Economic		
			Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
1972-1979	40	319	0.377	0.125	0.750	0.371	0	0.875	0.382	0	1
1980-1989	43	425	0.381	0.063	0.750	0.366	0	0.875	0.396	0	1
1990-1999	63	575	0.499	0.063	1.000	0.515	0	1	0.482	0	1
2000-2006	65	447	0.659	0.125	1.000	0.672	0.125	1	0.645	0.125	1
2007	65	65	0.678	0.125	1.000	0.685	0.125	1	0.671	0.125	1
2008-2014	65	455	0.686	0.125	1.000	0.702	0.125	1	0.671	0.125	1
OECD Countries											
1972-1979	23	183	0.432	0.125	0.750	0.433	0	0.875	0.430	0	1
1980-1989	24	237	0.427	0.063	0.750	0.432	0	0.875	0.422	0	1
1990-1999	29	262	0.534	0.063	1.000	0.536	0	1	0.533	0	1
2000-2006	30	210	0.751	0.125	1.000	0.776	0.125	1	0.726	0.125	1
2007	30	30	0.763	0.125	1.000	0.783	0.125	1	0.742	0.125	1
2008-2014	33	225	0.768	0.125	1.000	0.791	0.125	1	0.746	0.125	1
Non OECD Countries											
1972-1979	18	136	0.303	0.125	0.500	0.289	0.125	0.625	0.318	0	1
1980-1989	19	188	0.323	0.125	0.688	0.283	0.125	0.625	0.364	0	1
1990-1999	38	313	0.469	0.125	0.938	0.498	0.125	1	0.440	0.125	1
2000-2006	35	237	0.578	0.188	0.938	0.581	0.125	1	0.574	0.125	1
2007	35	35	0.605	0.188	0.938	0.600	0.125	1	0.611	0.125	1
2008-2014	32	230	0.606	0.188	1	0.614	0.125	1	**0.598**	0.125	1

Notes: Table I provides summary statistics information for the aggregated GMT index of central bank independence (GMT), as well as for the sub-indices of political (GMT Political) and economic (GMT Economic) independence. The sample of OECD and non-OECD member countries varies over time, based on the year in which a specific country joins the OECD group.

4.2 EXPLANATORY VARIABLES

The choice of the main explanatory variables reflects the theoretical model presented in Section 3. The empirical implication of this model, summarized in Hypothesis 1, relates the optimal level of CBI to the population's inflation aversion, the ability of the policymakers and the likelihood that the country has experienced a series of shocks that bear political costs. The empirical proxies of these variables are the following. First, to capture the inflationary pressures present in a country,

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[19] Given that the number of OECD member countries evolves over the time (it increased from 18 at its creation in the 1960's until 35 countries in 2014), we group countries inside the OECD subsample starting from the year in which they officially become member of the Organisation for Economic Co-operation and Development (OECD).

we consider an indicator variable that signals whether an episode of hyperinflation (inflation rates higher than 40%) has occurred in a country in the previous five years. Second, we consider five types of shocks which might influence the policymaker's cost function and hence the level of CBI: a) political, b) unemployment, c) fiscal, d) financial and e) foreign exchange.

a) Political shocks. We assume that countries with a higher probability of political shocks or more unstable politically will tend to be characterized by a lower degree of independence. For example, Cukierman and Webb (1995) show that less independent central banks tend to experience higher turnover rates of the central bank governor just after government changes, indicating, therefore, that de facto independence is lower in less stable political systems. In our case, we measure the level of political instability by looking at the Government Stability variable proposed by the International Country Risk Guide (ICRG) rating of the Political Risk Services (PRS) group. This variable measures both the government's ability to carry out its declared program(s), and its ability to stay in office and is also included among the indicators of the Worldwide Governance Indicators (WGI) project of the World Bank.

b) Unemployment shocks. Eijffinger and Schaling (1995) study the link between un-employment and CBI, and show that a higher natural rate of unemployment is associated with a higher degree of central bank independence. In this chapter, we are interested in possible unemployment shocks, which we capture by looking at the five year volatility of unemployment rate. This reflects any pressure policymakers face to reduce and stabilize unemployment in the country by using the inflation tax.

c) Fiscal shocks. In the aftermath of the Crisis, and particularly in the Euro area countries, significant research has been devoted to the link between fiscal shocks and the level of debt to GDP. For example, Nickel and Tudyka (2014) suggest that the cumulative effect of fiscal stimulus on real GDP is positive at moderate debt to GDP ratios, but turns negative as the ratio increases. Given that sovereign debt crisis will influence the government's ability to react to fiscal shocks and

monetize debt, we use a sovereign debt crisis dummy that signals the occurrence of a systemic debt crisis in the country in the last five years. The date of the crisis comes from Laeven and Valencia (2013).

d) Financial shocks. Concerning financial shocks, we look at the occurrence of past financial crises to assess the potential effect of instability in the financial sector on the level of central bank independence adopted in a country. We proxy this through a crisis dummy that signals the presence of a systemic banking crisis in the last two years. The date of the crisis comes from Laeven and Valencia (2013).

e) Exchange Rate shock. Finally, we capture the occurrence of exchange rate shocks by looking at a dummy that signals the presence of a systemic currency crisis in the last two years. This data is also obtained from Laeven and Valencia (2013). The authors define a currency crisis as a nominal depreciation of the currency vis-a-vis the U.S. dollar of at least 30 percent, which is also at least 10 percentage points higher than the rate of depreciation in the previous year.

Thirdly, conceptualizing policymakers' ability is a challenging empirical endeavor. However, it is innocuous to assume that this ability is exogenous to the other set of independent variables, as the policymaker that sets the optimal level of CBI is likely to be different to the one that has experienced the past shocks discussed above. This implies that this exogenous variable will be captured in the error term of the econometric model, with limited concerns about the validity of the specification.[20]

Finally, we also include, in all estimations, a set of additional control variables. In particular, given the evolution of CBI indices towards higher levels of independence as depicted in Figure 3, we expect a path dependence and control for previous levels of CBI. In addition, we include a dummy variable that takes value equal one for all the countries adopting an inflation targeting regime, as the adoption

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[20] Note also that policymaker's effort, which might be correlated to the other independent variables, does not enter directly in the optimal determination of CBI. The effort is nonetheless implicitly considered, as the policymaker's effort will naturally depend on the presence of shocks in the economy.

of an inflation targeting regime might induce further increases in the level of independence of the central bank from the executive branch. Given that institutional characteristics might also influence the degree of CBI of a country, we also include a dummy variable able to capture the country's legal origin as well as the participation to a monetary union, such as the euro area. Finally, we include two measures able to capture the degree of a country's openness to trade and its level of development, as measure by its real GDP per capita.

5 PEAKS AND TROUGHS IN CBI: EMPIRICS

This section tests empirically the main implication of the stylized model presented in Section 3, by providing evidence on the factors that can influence the endogenous determination of the level of central bank independence on a large set of countries. Given the dynamic index of CBI employed, we perform a series of panel, as well as cross-sectional estimations.

The first set of results are presented in Table II. Column (1) presents the panel estimations for the entire sample of 65 countries during the period 1972-2014 for which the evolution of the GMT index is computed in Romelli (2017). While in Columns (2) and (3), we split the full sample by focusing on the set of OECD and non-OECD countries, respectively. Our results first confirm the high correlation between current and past levels of CBI suggested also in Figure 3. The coefficient of the lagged value of central bank independence is always statistically significant at 1%, and it ranges from 0.94 to 0.98. This suggests that countries with high levels of CBI in the past are likely to maintain it. Next, the coefficients of the proxy of inflation aversion is significant over the entire sample and, in particular, for the set of non-OECD countries. The positive sign of this coefficient indicates how countries that experienced high periods of inflation rate in the past will be characterized by a higher inflation aversion that will constrain the government to assign a higher degree of independence to its central bank.

Table II: Endogenous Central Bank Independence

Analyzed period:	1972-2014			2000-2014		
	(1)	(2)	(3)	(4)	(5)	(6)
GMT(t-1)	0.9564***	0.9453***	0.9679***	0.9916***	0.9830***	0.9947***
	(0.012)	(0.017)	(0.018)	(0.006)	(0.011)	(0.008)
Inflation Crises Dummy	0.0173*	0.0085	0.0276**	0.0194	0.0623***	0.0013
	(0.010)	(0.006)	(0.014)	(0.015)	(0.010)	(0.009)
Government Stability(t-1)	0.0032***	0.0053***	0.0007	0.0023***	0.0024**	0.0023*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Unemployment Rate Volatility	0.0042***	0.0040*	0.0037*	0.0023*	0.0049**	0.0009
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Systemic Debt Crises Dymmy	-0.0178***	0.0001	-0.0317***	-0.0126	0.0001	-0.0151
	(0.006)	(0.001)	(0.011)	(0.009)	(0.001)	(0.010)
Financial Crises Dummy	0.0018	0.0010	0.0096	0.0004	-0.0013	0.0025
	(0.005)	(0.007)	(0.009)	(0.003)	(0.004)	(0.007)
Currency Crises Dummy	-0.0055	-0.0204**	0.0042	-0.0151**	-0.0529***	-0.0062
	(0.008)	(0.009)	(0.012)	(0.007)	(0.016)	(0.004)
Common Law Legal System	-0.0170***	-0.0180***	-0.0190*	-0.0096**	-0.0133**	-0.0113*
	(0.005)	(0.006)	(0.012)	(0.004)	(0.006)	(0.006)
Euro Area Dummy	0.0289***	0.0320***	0.0057	-0.0034	-0.0041	-0.0035
	(0.008)	(0.011)	(0.008)	(0.003)	(0.004)	(0.005)
Inflation Targeting Regime	0.0041	0.0057	0.0030	0.0040	0.0035	0.0015
	(0.003)	(0.005)	(0.005)	(0.003)	(0.005)	(0.004)
Real GDP per capita(t-1)	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Openness to Trade(t-1)	0.0001	0.0001	0.0001*	0.0001*	0.0001	0.0001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	1,196	768	428	681	397	284
Number of countries	55	33	28	55	33	25

Notes: The dependent variable is the level of the GMT index. GMT(t-1) is the lagged value of the GMT index of CBI. Inflation Crisis Dummy, Systemic Debt Crisis Dummy, Financial Crises Dummy and Crises Dummy are dummy variables that take the value one if a country has experienced an inflation, fiscal, financial or currency crises respectively, in the previous two years. Government Stability is the measure of the lagged value of the Government Stability variable from the International Country Risk Guide (ICRG). Unemployment Rate Volatility measure the standard deviation of unemployment rate in the previous years. Controls include a dummies for the country's legal origin, euro area and inflation targeting countries, as well as the lagged value of real GDP per capita and openness to trade. Decades dummies and constant terms are included, but not reported. Columns (1) and (4) provide information for the full set of countries, Columns (2) and (5) focus on the subsample of OECD countries, while Columns (3) and (6) analyze the set on non-OECD countries. Robust standard errors in parentheses. *** denotes significance at a 1% level, ** denotes significance at a 5% level, * denotes significance at a 10% level.

Turning to the set of variables that aims to capture the different shocks discussed in our stylized model, we highlight several interesting patterns. First, Columns (1) and (2) show a positive

correlation between government stability and legal CBI. Therefore, more developed and politically stable countries are characterized by a higher degree of CBI. These results are in line with the ones of Cukierman and Webb (1995), who look at the turnover rate of the central bank governor and find that the independence of the central bank is lower during political changes.

Second, while inflation crises did not have a statistically significant impact on the set of OECD countries, we do find a positive and statistically significant coefficient for the measure of unemployment rate volatility across all specifications. Thus, similar to previous studies such as Cukierman (1994), these results suggest that governments in countries experiencing more volatile unemployment rates will have an higher incentive to introduce inflationary surprises. Since the public is well aware of this, the benefit for granting a higher CBI will be higher for these countries. Moreover, we find a negative and statistically significant coefficient for the dummy capturing systemic debt crisis in the entire sample and in the subsample of non OECD countries. These results suggest that countries that experienced episodes of government debt crisis are associated with a lower degree in central bank independence. Indeed, in these countries the incentive to monetize the sovereign debt might be higher, therefore policymakers might assign a lower level of independence to their central bank. Interestingly, past financial crisis have no statistically significant impact on current levels of CBI, while currency crises are only statistically significant in the subsample of OECD countries.

As already shown in Figure 3, the 1970s until the late 1990s, have been characterized by high average levels of inflation. During this period, it is reasonable to assume that the inflation aversion in a society was the main driver of reforms towards higher levels of central bank independence. Yet, the second half of our sample period was generally characterized by lower and more stable inflation rate which would suggest a lesser effect of this driver of central bank design. This motivates our strategy to focus our attention to a more recent period. Indeed, when we restrict our sample period to the years

2000-2014, the significance of the inflation crisis dummy vanishes. However, in the absence of inflation aversion, governments might be more concerned about other types of shocks. In columns (4)-(5), the coefficient of unemployment rate volatility is positive and significant, suggesting that countries characterized by an higher probability of unemployment rate shocks tend to be characterized by higher levels of independence of their central banks. Furthermore, for this restricted time frame, we also find a strongly significant and negative impact of currency crises episodes. This indicates that governments facing exchange rate shocks will be more likely to favor a lower level of central bank independence. Previous research has considered the pegged exchange rates as an alternative to central bank independence (Crowe and Meade, 2008). Therefore, these results might suggest that countries experiencing an exchange rate crisis might have to abandon their fixed exchange rate regime and, as a consequence, revert the degree of central bank independence of the country.

In addition to these main results, we also find evidence that countries members of the Euro area currency union enjoy a greater degree of independence. Indeed, since its creation, the ECB has been characterized by one of the highest degree of legal independence and this effect is mainly captured over the full sample period, i.e., Columns (1)-(2). Furthermore, we also find evidence that structural characteristics such as the legal origin of countries seem to matter. The negative relationship between the Common-law dummy and CBI suggests that countries in Common-law jurisdictions have a lower degree of independence. This result is mainly driven by the fact that common law system countries, such as the United States and the United Kingdom, tend to have central banks that are less independent with respect to their freedom to lend to the government. As a matter of fact, the less binding constraints on allowing lending to the government facilitated the adoption of quantitative easing policies immediately after the unset of the global financial crisis.

Table III: Endogenous Central Bank Independence (robustness)

Analyzed period:	1972-2014			2000-2014		
	(1)	(2)	(3)	(4)	(5)	(6)
GMT(t-1)	0.9282***	0.9598***	0.9770***	0.9539***	0.9984***	0.9947***
	(0.027)	(0.018)	(0.011)	(0.024)	(0.004)	(0.007)
Inflation Crises Dummy	0.0001	0.0246	0.0256**	0.0260	0.0202	0.0347***
	(0.001)	(0.018)	(0.012)	(0.025)	(0.014)	(0.010)
Government Stability(t-1)	0.0050**	0.0035**	0.0017**	0.0027*	0.0025**	0.0019*
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
Unemployment Rate Volatility	0.0022	0.0030*	0.0033	0.0048*	0.0013	-0.0010
	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
Systemic Debt Crises Dymmy	0.0001	-0.0223***	-0.0205**	0.0069	-0.0235**	-0.0124
	(0.001)	(0.008)	(0.009)	(0.011)	(0.011)	(0.008)
Financial Crises Dummy	-0.0050	-0.0012	0.0076	0.0022	-0.0003	-0.0020
	(0.009)	(0.005)	(0.008)	(0.010)	(0.003)	(0.005)
Currency Crises Dummy	0.0048	-0.0099	-0.0056	-0.0338**	-0.0053	-0.0117
	(0.015)	(0.009)	(0.009)	(0.017)	(0.003)	(0.009)
Common Law Legal System	-0.0130*	-0.0126**	-0.0058**	-0.0266*	-0.0050*	-0.0079*
	(0.007)	(0.006)	(0.003)	(0.015)	(0.003)	(0.005)
Euro Area Dummy	0.0501***	0.0325***		-0.0005	-0.0039*	
	(0.019)	(0.012)		(0.007)	(0.002)	
Inflation Targeting Regime			0.0051*			0.0020
			(0.003)			(0.003)
Real GDP per capita(t-1)	0.0001**	-0.0001	0.0001	0.0001	0.0001	0.0001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Openness to Trade(t-1)	0.0001	0.0001	0.0001	0.0002**	0.0001	0.0001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Observations	588	700	630	265	416	351
Number of countries	21	34	29	21	34	29

Notes: The dependent variable is the level of the GMT index. GMT(t-1) is the lagged value of the GMT index of CBI. Inflation Crisis Dummy, Systemic Debt Crisis Dummy, Financial Crises Dummy and Crises Dummy are dummy variables that take the value one if a country has experienced an inflation, fiscal, financial or currency crises respectively, in the previous two years. Government Stability is the measure of the lagged value of the Government Stability variable from the International Country Risk Guide (ICRG). Unemployment Rate Volatility measure the standard deviation of unemployment rate in the previous years. Controls include a dummies for the country's legal origin, euro area and inflation targeting countries, as well as the lagged value of real GDP per capita and openness to trade. Decades dummies and constant terms are included, but not reported. Columns (1) and (4) provide information for the full set of countries, Columns (2) and (5) focus on the subsample of inflation targeting countries, while Columns (3) and (6) analyze the set on non-inflation targeting countries. Robust standard errors in parentheses. *** denotes significance at a 1% level, ** denotes significance at a 5% level, * denotes significance at a 10% level.

Interestingly, the inflation targeting indicator is not statistically different from zero. This result

might be influenced by the sample of countries included in our sample. To investigate this issue more

in detail, in Table III we replicate our analysis by focusing on the subsample of inflation (Columns 1 and 4) and non-inflation targeting countries (Columns 2 and 5), as well as on a sample of countries not belonging to the European Union. The results presented in Table III show, once again, a positive and statistically significant coefficient for both the previous degree of central bank independence and the measure of political stability. This confirms the idea that central bank independence is path-dependent and that more stable government are associated with higher levels of CBI. Interestingly, the dummy capturing the occurrence of inflation crises in the previous period is positively and statistically significant in Columns (3) and (6), i.e., the sample of non-European Union countries. For this subsample of countries, we also find that inflation targeting countries are characterized by a higher degree of central bank independence.

Insofar, in line with the theoretical arguments in Section 3, our analysis has been focused on the determinants of the level of CBI of a country. However, the shocks that might influence the degree of central bank independence, might also drive the *magnitude* of reforms in central bank institutional design. For example, Crowe and Meade (2008) show that, over the period 1990-2003, greater changes in independence have occurred in countries originally characterized by lower levels of independence and higher inflation. Similarly, Masciandaro and Romelli (2015b) show that changes in CBI during the period 2007-12 are associated with the occurrence of macroeconomic shocks following the Crisis.

Table IV: Determinants of the changes in central bank independence

Analyzed period:	1972-2012		2000-2012	
	(1)	(2)	(4)	(5)
GMT0	-11.5522*	-11.4878*	-15.0613*	-14.9129*
	(6.750)	(6.743)	(8.763)	(8.891)
Inflation0	-0.2556	3.4116	-0.7591	-2.9706
	(0.956)	(9.486)	(1.361)	(8.269)
Inflation Crises Dummy	-5.4796	-6.0456	-6.7206	-6.1219
	(11.510)	(11.441)	(13.049)	(13.007)
Unemployment Rate Volatility	1.3225	1.2772	1.8917	1.9425
	(1.230)	(1.266)	(1.162)	(1.209)
Political Shock (Change in Polity)	0.0092*	0.0100*	0.0128**	0.0121*
	(0.005)	(0.006)	(0.006)	(0.007)
Systemic Debt Crises Dymmy	-3.7055	-3.8407	-9.0799	-9.7496
	(10.900)	(10.322)	(10.305)	(10.529)
Financial Crises Dummy	-6.4894*	-6.6892*	-9.7100*	-9.6002*
	(3.707)	(3.640)	(5.532)	(5.416)
Currency Crises Dummy	-0.9901	-1.4321	-0.9911	-0.5329
	(7.300)	(7.450)	(11.374)	(12.292)
Real GDP per capita0	0.0002	0.0002*	0.0002	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
Openness to Trade0	-0.0255	-0.0258	-0.0306	-0.0301
	(0.024)	(0.024)	(0.030)	(0.030)
Inflation0*Polity0		-0.2376		0.1404
		(0.568)		(0.458)
Observations	119	119	90	90
Number of countries	52	52	52	52

Notes: The dependent variable is the change in the level of the GMT index in a decade. GMT0 is the value of the GMT index of CBI at the beginning of the decade. Inflation0 is the value of inflation rate at the beginning of the decade. Inflation Crisis Dummy, Systemic Debt Crisis Dummy, Financial Crises Dummy and Crises Dummy are dummy variables that take the value one if a country has experienced an inflation, fiscal, financial or currency crises respectively, in the previous ten years. Political Shock capture the change in the level of democracy in the country in the decade, measure using the Polity index. Unemployment Rate Volatility measure the standard deviation of unemployment rate in the previous 10 years. Controls include the lagged value of real GDP per capita and openness to trade at the beginning of the decade. Decades dummies and constant terms are included, but not reported. Columns (1) and (4) provide information for the full set of countries, Columns (2) and (5) focus on the subsample of inflation targeting countries, while Columns (3) and (6) analyze the set on non-inflation targeting countries. Robust standard errors in parentheses. *** denotes significance at a 1% level, ** denotes significance at a 5% level, * denotes significance at a 10% level.

In Table IV, we extend Crowe and Meade's (2008) analysis by focusing on the determinants of changes in the central bank independence. In particular, taking advantage of the dynamic index of central bank independence, we are able to identify the determinants of changes across different decades. To do so, we compute changes in the degree of CBI in a panel of non-overlapping 10-year period observations over the sample period, i.e., we compute the change in CBI every 10 years, in 1982, 1992, 2002 and 2012. Table IV presents the estimates of the determinants of the change in the GMT index between different decades. Similarly to Crowe and Meade (2008), we assume that changes in CBI might be explained by the independence of the central bank in the previous decade, as well as by the country's level of inflation, openness and GDP per capita. Importantly, we also include the different measures of macroeconomic shocks discussed in the theoretical model and in Tables II and III.

The results presented in Table IV show how, across all specifications, changes in central bank independence are more likely in countries characterized by lower initial degrees of CBI. While, contrary to Crowe and Meade (2008), we do not find evidence on the fact that reforms are associated with lower initial levels of inflation rate (Inflation0).

Given the different time horizon of this cross-sectional analysis, the macroeconomic shocks discussed in Section 3 and 4 are now computed over a 10-year horizon. Therefore, the dummies capturing the different shocks assume a value equal to one if an inflation, fiscal, financial or exchange rate shock took place in the past 10 years. Similarly, the unemployment rate volatility is measured over the same longer horizon, while political shocks are computed by looking at the changes in the level of democracy of the country in the last decade. We find that the coefficients of inflation, unemployment, fiscal and exchange rate shocks are not significantly different from zero, while the ones of political and financial crisis shocks are statistically significant across all specifications. In particular, we provide evidence that changes in CBI are associated with improvements in the level of democracy of the country. Finally, the negative and statistically significant coefficient of the financial crises dummy

suggests that countries experiencing financial crises are more likely to decrease the degree of independence of their central bank. We can therefore conclude that financial crises might not impact the overall level of CBI, but the occurrence of crises might stimulate changes to the degree of CBI, as it happened after the recent crisis.

6 CONCLUSION

Following the 2008 Global financial crisis, central bankers have not only extensively used unconventional monetary policy tools, but also acquired deeper supervisory powers over banking and financial intermediaries. Monetary activism coupled with a higher degree of involvement in banking supervision reopened the debate on the optimal degree of central bank independence and, consequently, the opportunity to reconsider the institutional setting that governs the relationship between incumbent governments and bureaucratic monetary policymakers. Policymakers around the world are considering whether to reshape their central bank institutional design, by amending the degree of independence.

A few recent relevant episodes in this debate include the European Central Bank's high degree of independence in its monetary policy stance, which has been harshly criticized for its hawkish attitude by some and harshly blamed for its dovishness, by others. Similarly, 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 the 2008 financial turmoil and the economic stagnation that followed. Recent debates also include the highly controversial idea of "helicopter money" to finance fiscal stimulus with newly printed money, which undermines the long history of institutionalizing independent monetary policy making (Gali, 2014; The Economist, 2016).

Overall, this crisis has challenged the consolidated setting of central banking. Therefore, a natural questions arises: how to explain these cycles in CBI, i.e. the possibility that peaks and troughs can

occur in the degree of independence of central banks? This chapter proposes a political economy framework of delegation, in which a policymaker's choice of the optimal central bank design is conditional on the economic and institutional environment existing at a given time, which, in turn, determines the political weights put on the pros and cons of assigning the central bank more independence. Our framework is based on two main assumptions. First, we assume that incumbent politicians weight the gains and losses of maintaining or reforming a central bank governance setting following his/her own preferences. Second, policymakers are politicians, and, as such, they are held accountable at elections for how they have managed to please voters. As a result, the policymaker also weights the costs and benefits of setting a level of central bank independence given the preferences of voters.

This simple setup gives us an easily testable empirical framework that can explain the different levels of central bank independence implemented across countries and over time. We argue that the level of central bank independence in a given country is likely to be related with a society's aversion towards inflation, as well as a series of macroeconomic shocks that bear political costs for the incumbent policymaker.

We test the main implications of our framework using recently updated indices of central bank independence for a sample of 65 over the last four decades. First, we find that legacy matters, i.e. high levels of central bank independence are likely to be maintained. Similarly, high levels of social aversion towards the use of an inflation tax reduces the political incentives of the incumbent government to change the central bank regime in order to gain more freedom to address macroeconomic shocks via monetization. At the same time, we show that in periods of low inflation, in particular during 2000-2014, CBI is more closely related to other macroeconomic shocks such as political, labor market or currency shock. In this respect, our analysis can also offer a rule of thumb to evaluate the current debate over the need, or the opportunity, to change central banks' governance. The general suggestion of this chapter is that maintaining the effectiveness of the central bank as a

long-sighted monetary veto player against the political pressures toward a short-sighted accommodation of macroeconomic shocks, can depend on a series of country characteristics and experiences, which can shape the optimal design of central banks over time.

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APPENDICES

A THE GRILLI, MASCIANDARO AND TABELLINI (GMT) INDEX OF CBI

The **political index** is based on a binary code assigned to eight different characteristics that sum up the ability of monetary authorities to independently achieve the final goals of their policy. This index captures three main aspects of monetary regimes: the procedure for appointing the members of the central bank governing bodies, the relationship between these bodies and the government, and the formal responsibilities of the central bank. Starting from these three aspects, one point is assigned for each of the following criteria, if satisfied:

I. Governor and central bank board appointment

- the governor is appointed without government involvement

- the governor is appointed for more than five years

- the other members of the board of directors are appointed without government involvement

- the other board members are appointed for more than five years

II. Relationships with government

- there is no mandatory participation of government representative(s) in the board

- no government approval is required for formulation of monetary policy

III. Objectives and responsibilities of the central bank

- the central bank is legally obliged to pursue monetary stability as one of its primary objectives

- there are legal provisions that strengthen the central bank's position in the event of a conflict with the government

The **economic index** summarizes the degree of independence of central banks in choosing their monetary policy instruments. Its three main aspects concern: the influence of the government in determining how much to borrow from the central bank, the nature of the monetary instruments under the control of the central bank and the degree of central bank involvement in banking supervision. Again, one point is assigned for each of the following satisfied criteria:

I. Monetary Financing of Public Deficits

- there is no automatic procedure for the government to obtain direct credit from the central bank

- when available, direct credit facilities are extended to the government at market interest rates

- direct credit facilities are temporary

- direct credit facilities are for a limited amount

- the central bank does not participate in the primary market for public debt

II. Monetary Instruments

- the central bank is responsible for setting the policy rate

III. Central bank involvement in banking supervision

- the central bank has no responsibility for overseeing the banking sector (two points) or shares its responsibility with another institution (one point)

B APPENDIX TABLES AND FIGURES

*Appendix Table B.I: Country and year of the first analyzed legislation*

Afghanistan	2003	Lithuania	1994
Albania	1992	Luxembourg	1983
Algeria	1972	Malaysia	1982
Argentina	1972	Malta	1994
Australia	1972	Mexico	1972
Austria	1972	Mongolia	1996
Bahrain	1973	Montenegro	2005
Belgium	1972	Morocco	1972
Bosnia and Herzegovina	1997	Netherlands	1972
Brazil	1972	New Zealand	1972
Bulgaria	1991	Norway	1972
Canada	1972	Poland	1997
Chile	1972	Portugal	1972
China	1995	Qatar	1993
Croatia	1991	Romania	1991
Cyprus	1972	Russia	1992
Czech Republic	1991	Saudi Arabia	1972
Denmark	1972	Singapore	1991
Estonia	1993	Slovakia	1992
Finland	1972	Slovenia	1991
France	1972	South Korea	1972
Germany	1972	Spain	1972
Greece	1972	Sweden	1972
Hungary	1991	Switzerland	1972
Iceland	1972	Thailand	1972
India	1972	Trinidad and Tobago	1972
Indonesia	1972	Turkey	1972
Iran	1972	Ukraine	1991
Ireland	1972	United Arab Emirates	1980
Italy	1972	United Kingdom	1972
Japan	1972	United States of America	1972
Kuwait	1972	Venezuela	1972
Latvia	1992		

Appendix Figure B.1: The evolution of the GMT political and economic independence indices

for OECD countries (1972-2014)
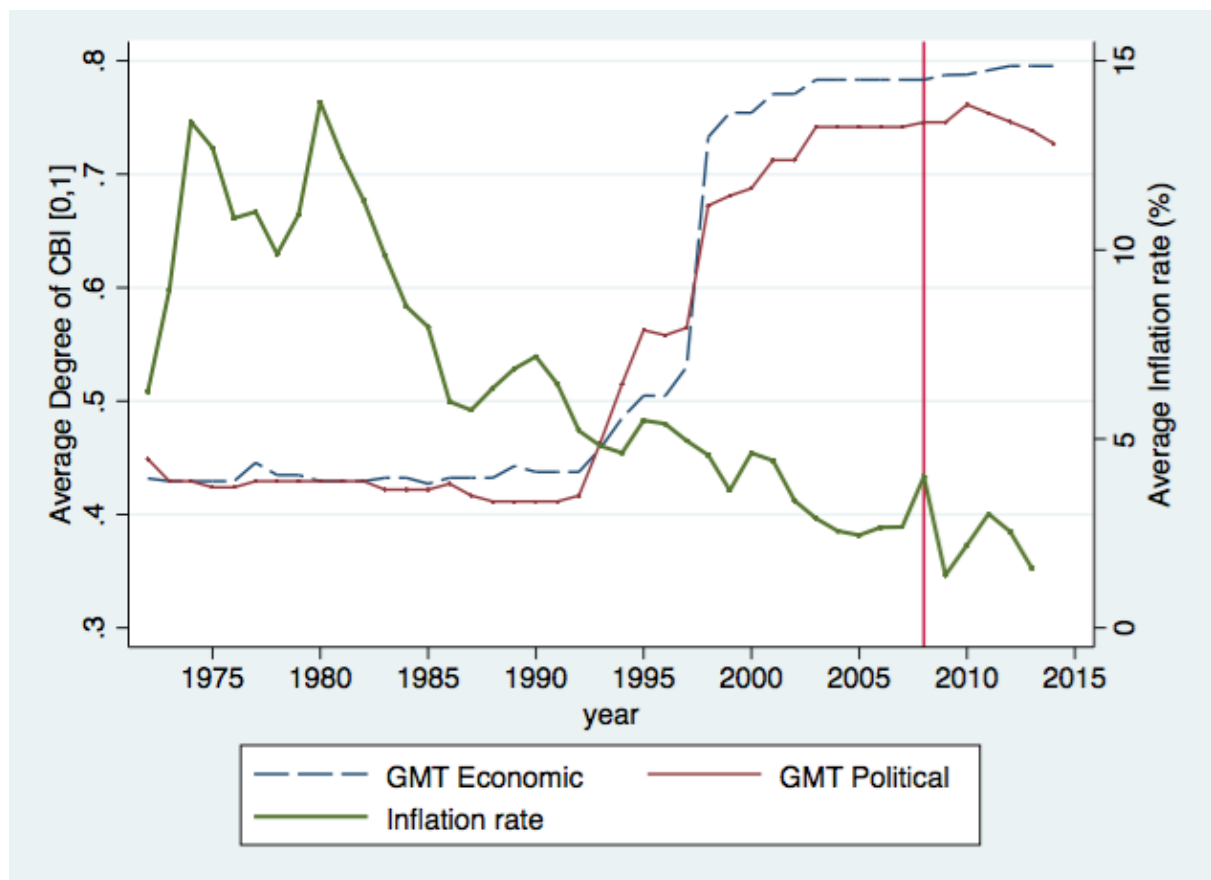
Notes: Figure B.1 show the evolution of the average political and economic indices of central bank independence (left vertical axis) and inflation rate (right vertical axis) for OECD countries, over the period 1972-2014.

Appendix Figure B.2: The evolution of the GMT political and economic independence indices

for non OECD countries (1972-2014)
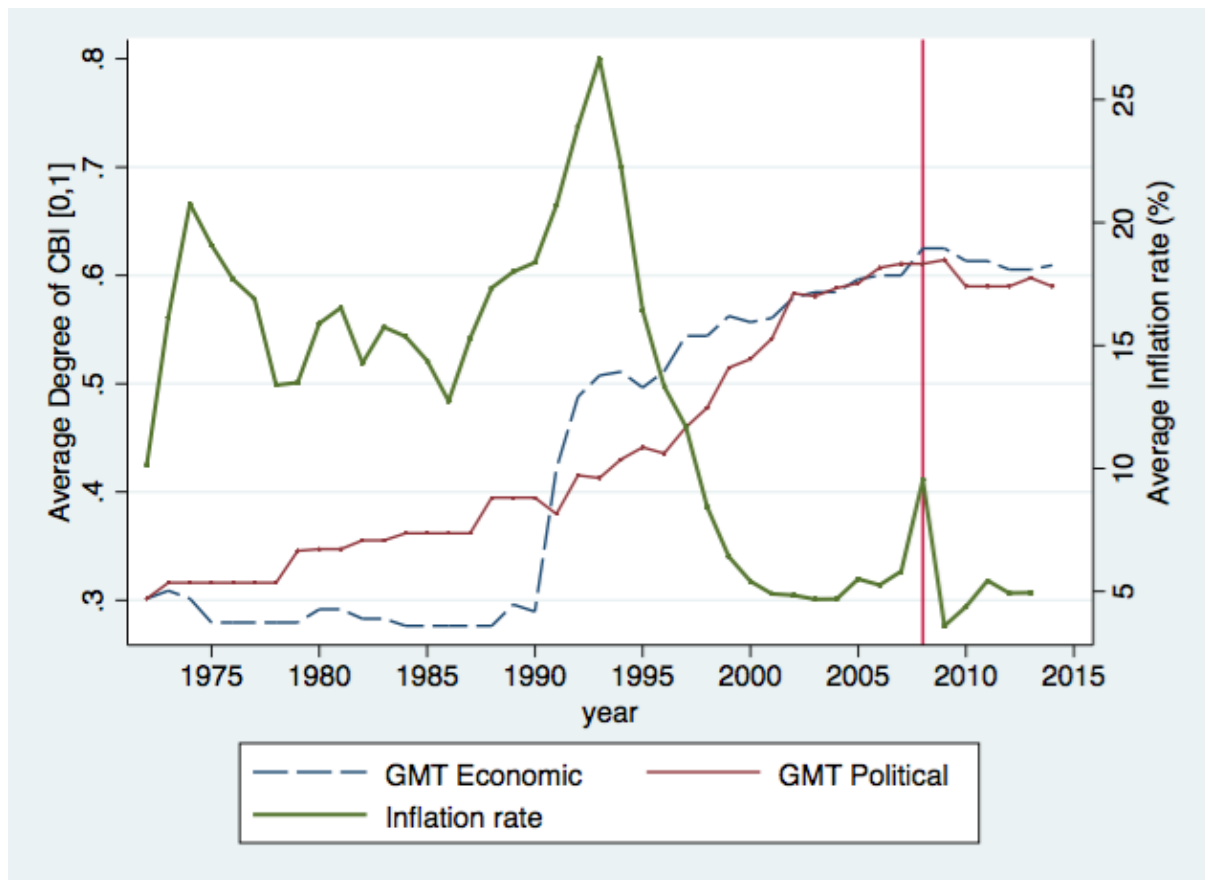
Notes: Figure B.2 shows the evolution of the average political and economic indices of central bank independence (left vertical axis) and inflation rate (right vertical axis) for non OECD countries, over the period 1972-2014.

Appendix Table B.II: Summary statistics on the evolution of the GMT independence index

(Inflation vs non-inflation targeting countries)

Period	# of Ctys	# of Obs	GMT Mean	GMT Min	GMT Max	GMT Political Mean	GMT Political Min	GMT Political Max	GMT Economic Mean	GMT Economic Min	GMT Economic Max
1972-1979	40	319	0.377	0.125	0.750	0.371	0	0.875	0.382	0	1
1980-1989	43	425	0.381	0.063	0.750	0.366	0	0.875	0.396	0	1
1990-1999	63	575	0.499	0.063	1.000	0.515	0	1	0.482	0	1
2000-2006	65	447	0.659	0.125	1.000	0.672	0	1	0.645	0.125	1
2007	65	65	0.678	0.125	1.000	0.685	0	1	0.671	0.125	1
2008-2014	65	455	0.686	0.125	1.000	0.702	0	1	0.671	0.125	1
Inflation Targeting Countries											
1972-1979	16	128	0.327	0.125	0.563	0.345	0.125	0.750	0.309	0	0.875
1980-1989	16	160	0.336	0.063	0.688	0.327	0.125	0.750	0.345	0	0.875
1990-1999	21	198	0.468	0.063	1	0.496	0.125	1	0.440	0	1
2000-2006	21	147	0.653	0.250	1	0.657	0.25	1	0.648	0.125	1
2007	21	21	0.667	0.250	1	0.661	0.25	1	0.673	0.125	1
2008-2014	21	147	0.676	0.250	1	0.668	0.25	1	0.683	0.125	1
Non Inflation Targeting Countries											
1972-1979	24	191	0.411	0.125	0.750	0.389	0	0.875	0.432	0	1
1980-1989	27	265	0.408	0.125	0.750	0.390	0	0.875	0.427	0	1
1990-1999	42	377	0.515	0.125	1	0.526	0	1	0.504	0	1
2000-2006	44	300	0.662	0.125	1	0.680	0.125	1	0.644	0.125	1
2007	44	44	0.683	0.125	1	0.696	0.125	1	0.670	0.125	1
2008-2014	44	308	0.691	0.125	1	0.718	0.125	1	**0.665**	0.125	1

Notes: Table I provides summary statistics information for the aggregated GMT index of central bank independence (GMT), as well as for the sub-indices of political (GMT Political) and economic (GMT Economic) independence. The sample of OECD and non-OECD member countries varies over time, based on the year in which a specific country joins the OECD group.