Research Article

Juan Cristóbal Campoy and Juan Carlos Negrete*

Debt Spillovers in a Monetary Union: A Novel Rationale for Central Bank Independence

https://doi.org/10.1515/econ-2022-0017
received August 19, 2021; accepted January 06, 2022

Abstract: Central bank independence has been championed on the grounds that it avoids political business cycles, the time-inconsistency problem of discretionary monetary policy, and political conflicts. However, after the financial crisis, central banks have resorted to unconventional monetary policies and embraced additional tasks, making monetary authorities more exposed to political interference. This new reality has put into question the long-lasting consensus on the desirability of central bank independence. We add to this debate a new argument in support of that independence, namely, it internalizes the fiscal spillovers that arise in a monetary union, which is not a full fiscal union.

Keywords: Central Bank design, monetary union, fiscal policies, international fiscal spillovers

JEL classification: E52, E58

1 Introduction

Over the last few decades, central banks across the advanced economies have been granted statutory independence from governments. However, in spite of a long-lasting academic consensus on the benefits of delegating monetary policy to independent central banks, this trend may reverse because of the new challenges that monetary authorities are currently facing. After the global financial crisis, two important issues have emerged regarding central banks. On the one hand, they have acquired a more prominent role in financial regulation (Berger & Kibbmer, 2013; Smets, 2014) and have engaged in macroprudential policies (Ueda & Valencia, 2014). These developments have weakened the state control over its financial policies. On the other hand, a second set of concerns is related to central banks' responses to the new scenario where interest rates have approached or even reached the lower bound. Monetary authorities have embarked on unconventional monetary policies such as the provision of liquidity to the financial sector and the so-called quantitative easing, namely, the purchase of assets on a large scale. Some observers have raised the concern that the more a central bank becomes involved in such multiple (and less measurable) objectives and policy instruments, the more they become exposed to political interference (Blejer & Wachtel, 2020; Dell'Ariccia, Rabanal, & Sandri, 2018; Taylor, 2016). Specially, the focus of attention has been placed on that unconventional policy, which allegedly could undermine the independence and credibility of the monetary authorities, particularly if purchases of sovereign debt are viewed primarily as a means of facilitating fiscal deficits or if purchases of risky assets lead to capital losses (Cochrane & Taylor, 2016).

The COVID-19 pandemic has exacerbated these issues. Central banks in most countries have even expanded the monetary tools used during the global financial crisis to support the economy and ease financing constraints in the medium term (see Dall'Orto, Vonessen, Fehlker, & Arnold 2020). The dramatic increase in government spending and debt, not seen since war times, has been followed by unprecedented purchases by central banks of those sovereign bonds. Since this unconventional monetary policy has greater distributional effects than traditional interest rate policy, central bank independence has been criticized on the grounds that these measures should not be taken by unelected officials because they are not accountable to the voters.[1] In fact, there has been an increase in the political

* **Corresponding author: Juan Carlos Negrete,** Department of Economics Analysis, Universidad de Murcia, Facultad de Economía y Empresa, Campus de Espinardo, 30100, Espinardo, Murcia, Spain, e-mail: jcnegret@um.es, tel: +34-868883760; fax: +34-868883758
Juan Cristóbal Campoy: Department of Economics Analysis, Universidad de Murcia, Facultad de Economía y Empresa, Campus de Espinardo, 30100, Espinardo, Murcia, Spain, e-mail: juancris@um.es, tel: +34-868883822; fax: +34-868883758

1 When the central bank decides to increase liquidity by buying assets, it is making decisions whose direct beneficiaries are more restricted than when it simply uses conventional monetary tools

pressures to make monetary authorities less independent from governments (Claeys & Domínguez, 2020; Mersch, 2017). Besides, some international institutions such as the IMF are compelling developing countries to delegate monetary policy to independent central banks as a precondition for loans. In this sense, it could be argued that the aim of such reforms is to make central bankers adopt those international institutions' preferences, namely, to make monetary authorities dependent from them. Having said that, Rau-Goehring, Reinsberg, and Kern (2020) claim that this conditionality has advantages because central bank independence is a signal device for investors, minimizes the risks of government abuse of disbursed funds, and establishes a politically insulated veto player within the borrowing country to constrain excess credit creation. All these recent developments have given rise to a regained interest in the topic of central banks and in the debate on whether they should be independent. The aim of this article is to enter this debate and put forward a novel argument in support of central bank independence in a monetary union, when the common central bank carries out unconventional monetary policy in the form of buying national public debts.

In their seminal article, Alesina and Tabellini (2008) showed that it is optimal for society to delegate certain types of activities to independent institutions, while others are better left in the hands of elected politicians. Regarding central banks, the traditional argument to delegate their functions to independent institutions has rested on countering inflationary biases that may occur for the political pressure to boost output for electoral reasons (Hibbs, 1977; Nordhaus, 1975; Rogoff & Sibert, 1988) and for the time-inconsistency problem of monetary policy making (Barro & Gordon, 1983; Kydland & Prescott, 1977; Rogoff, 1985; Svensson, 1997; Walsh, 1995).[2] In addition, other studies show that governments may also choose to delegate monetary policy in order to detach it from political debates and power struggles (see De Haan & Eijffinger, 2016; Fernández-Albertos, 2015 for recent reviews). All this literature has showed that it is optimal for the society to delegate monetary policy to well-designed independent institutions.

Our article puts forward a new argument in support of central bank independence, namely, it is a credible commitment to internalize the externalities that arise in a monetary union when national governments expect that part of its debt will be bought by the common central bank which, in doing so, creates a risk pool. As a consequence, there is a prisoner's dilemma kind of situation. To wit, national fiscal authorities, will be tempted to spend beyond the limit which is optimal from the point of view of the whole union's joint welfare, because each government will not bear all the risk of its spending. In the absence of a fiscal union that prevents excessive budget deficits, a central bank less willing to buy bonds than governments is a commitment device to achieve more fiscal discipline. In this sense, we show that it is optimal to delegate monetary policy to an independent and conservative (or "hawkish") central bank, that is, one whose monetary policy is less expansionary than the one carried out by government-dependent monetary authorities.

The novelty of our study is that it shows that there is a role for granting independence to central banks even in the absence of the aforementioned issues considered in this literature, namely, business cycles, time inconsistency problem, and political economy conflicts. On the other hand, since we obtain this result in a setup where all the member countries in the union are homogeneous, we respond to a criticism that the European Central Bank (ECB) has frequently faced, which argues that the reason why this monetary institution is so conservative is that it only reflects the preferences of the core countries in the European Monetary Union (EMU) and not those of the periphery countries. That is, the argument goes, the common central bank has been designed by the former with the aim of undemocratically imposing their preferences on the latter (Holtfrerich, 2008). In this sense, our article shows that having a hawkish central bank in a monetary union need not be interpreted as such an unbalanced result of a conflict of interests among heterogeneous member states. For instance, if all countries in the EMU shared Germany's preferences, the common central bank should be more conservative than Germany.

Our analysis also puts into question another common criticism faced by the ECB, namely, its tendency to be less expansionary than the FED (Pronobis, 2014). It has been argued that this behavior is not optimal, unless the Eurozone and the United States had different preferences (the former being less willing to let their central bank buy governments debt). However, we show that, even if

(Mishkin, 2013). On the other hand, it has been argued that quantitative easing has increased the value of financial assets, making their owners better-off. Besides, Lagarde (2020), president of the ECB, has acknowledged the possibility of employing its various asset purchase programs to combat climate change, which is an issue that allegedly should also be dealt with by an agency dependent from the government.

2 Bernanke (2005), former president of the Federal Reserve, labeled the articles by Barro & Gordon (1983), Kydland & Prescott (1977), Rogoff (1985), and Walsh (1995) as the most influential papers in monetary policy in the previous 25 years.

such differences in preferences did not exist, the fiscal externalities that the ECB faces imply that it should be more conservative than the FED.

Our article shows that, because of the debt spillovers, there exists a trade-off between the optimal degree of fiscal discipline in the EMU and the optimal degree of conservatism of the ECB. In doing so, it rationalizes the evolution of monetary and fiscal institutions in the Euro zone. To wit, during the Great Recession, as more legislation was being introduced to support fiscal discipline in the union (The Six Pack in 2011 and The Fiscal Compact and Two Pack in 2013), monetary policy became more expansionary, carrying out quantitative easing. This process has culminated and been made more explicit with the recent official statement of the ECB's Governing Council, which has set its inflation goal to 2% and has allowed room to overshoot it when needed ("ECB's Governing Council approves its new monetary policy strategy," July 8th 2021). This is a significant change from the previous target of "below, but close to, 2%." However, the unconventional monetary policy of the ECB started to be implemented with a lag with respect to the FED because the EMU is still further away than the United States from being a fully fledged fiscal union. This fact also explains why the ECB will continue to be less dovish than the FED, which announced in 2020, after its own review, a policy of average inflation targeting, which implies that inflation will automatically overshoot its 2% objective after periods of undershooting it.

Our article is related to the literature on central bank design pioneered by Rogoff (1985), Svensson (1997), and Walsh (1995). However, we extend the closed-economy framework used in this literature and consider a monetary union with fiscal externalities. In this sense, our article is also related with the vast and fast expanding literature that studies the interactions among national fiscal institutions within a monetary union (see Beetsma & Giuliodori, 2010; Foresti, 2018 for recent reviews and the references therein).[3] However, in contrast with these articles, our article focuses on how the optimal design of the monetary institutions interacts with the implementation of fiscal policy, when the common central bank carries out unconventional monetary policy.

The remainder of this article is organized as follows. Section 2 presents the model. Section 3 characterizes the first best, which serves as a benchmark scenario. Section 4 analyzes the case where the central bank is government dependent and shows the existence of negative fiscal externalities. Section 5 considers a fiscal union. Section 6 shows the role of an independent central bank. Section 7 analyzes the possibility of having an independent central bank in a fiscal union. Section 8 concludes. Finally, the proofs of some of the results are gathered in the Appendix.

2 The Model

We consider a monetary union, which is made up of two symmetric countries, 1 and 2. The working of the economy is given by the following equations:

$$g_i = t_i + b_i + m_i, \tag{1}$$

$$L_i^S = \alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta b_i^2 + \gamma p^2, \tag{2}$$

$$p = m_1 + m_2, \tag{3}$$

where $i = 1, 2$ and $\alpha, \beta, \delta, \overline{g}, \gamma > 0$. Expression (1) is country i's budget constraint. Government spending (g_i) can be financed by taxes (t_i), public debt in the hands of the public (b_i) and public debt bought by the common central bank (m_i). The monetary authorities need not buy sovereign debt directly from the governments, which is forbidden by law in some cases (e.g., the EMU), but in the secondary market.[4]

Equation (2) is country i's loss function, which is assumed to be shared by the government and the public. That is, the government is "benevolent." This function shows that its citizens dislike deviations, from target levels, of government spending, taxes, debt in the hands of the public, and bonds bought by the central bank (quantitative easing). Those target levels are normalized to zero, except for the case of government spending ($\overline{g} > 0$). The first term of this equation takes account of the fact that there is a welfare loss when government spending is below a social target (this target has increased because of the COVID-19 pandemic). To close this gap, public expenditure has to increase. However, the three

3 The COVID pandemic has sparked renewed interest in those interactions (see, e.g., Chadha, Corrado, Meaning, & Schuler, 2021; Panetta, 2021).

4 It is assumed that the budget constraint of member countries includes only one period. As Buiter (2014) has pointed out, when a central bank engages in quantitate easing it exchanges government debt for money, which is a non-redeemable liability. This relaxes the intertemporal government budget constraint. However, extending our model to an intertemporal setting with a present value budget constraint (see Woodford, 1998) would not change the qualitative results. The reason is that in such a model, the international fiscal policy spillovers would still exist.

means that can be used to finance it create distortions, which are referred to by the three last terms in equation (2): (i) taxes change incentives and have a negative effect on output; (ii) public debt in the hands of the private sector imply increases in future distortionary taxes and higher interest rates;[5] and (iii) central bank bond purchases are not free lunch either. To wit, when the monetary authorities buy government debt, they create a "pooled risk," p, measured in equation (3),[6] since it implies that individual countries' risks are passed to the whole union because of the following. On the one hand, as the money supply grows, the risk of future inflation increases. On the other hand, if one member country defaults on its debt, the central bank incurs losses, because the latter's assets fall in value, making worse off not only the defaulting country but also the rest of the states in the union, since ownership of the central bank is shared by all members. That type of risk pooling is clearly referred to by The Economist (2012), which claimed that the quantitative easing policy of the ECB means that it "will be buying low-graded peripheral-government bonds, redistributing risks across Europe. The Bundesbank has two fundamental worries about the ECB buying government bonds. First, it exposes taxpayers in northern countries to risks that belong to those in southern states, but does so opaquely within the Eurosystem rather than openly. Second, it takes monetary policy too close to the realm of fiscal policy and thus compromises the ECB's independence." All this would mean that, when the ECB buys sovereign debt, the member countries would be sharing risks. In fact, as Weidmann (2020) has claimed, government bond purchases in a monetary union, which is not a fiscal union involve the fundamental risk of mutualizing sovereign liability risks. Furthermore, Giavazzi and Tabellini (2016) also point out that this risk pooling exists because thanks to it being a pool, the interest on the debt of the periphery countries has fallen.[7]

Notice that the model sets aside the aforementioned issues considered in this literature to grant independence to central banks. That is, on the one hand, in our setting, monetary surprises cannot increase output, which avoids the traditional time-inconsistency problem in monetary policy (Barro & Gordon, 1983; Kydland & Prescott, 1977; Rogoff, 1985; Svensson, 1997; Walsh, 1995), and, on the other hand, our assumption that governments are benevolent rules out the possibility of conflicts of interests that could give rise to political business cycles (Hibbs, 1977; Nordhaus, 1975; Rogoff & Sibert, 1988) or the need to detach monetary from political debates and power struggles (De Haan & Eijffinger, 2016; Fernández-Albertos, 2015 for recent reviews). In this sense, the novelty of our article is that, even without taking into account those issues, it shows that it is optimal to delegate monetary policy to an independent and conservative central bank.

The model also illustrates the trade-offs faced by the economic authorities in the context of the present COVID pandemic, where governments have dramatically increased their spending not only to stabilize output but also to provide support to those most impacted by the crisis (first term of the loss function in equation (2)). This expenditure has to be financed by (i) distortionary current taxes (second term); (ii) by public debt in the hands of the public, which increases interest rates and implies future distortionary taxes (third term); or (iii) by sovereign debt bought by the common central bank, which creates a risk pool (fourth term).

Our framework takes into account the new challenges that monetary policy is currently facing. Even after the Great Recession, conventional monetary policy had run out of tools because interest rates had approached or even reached the zero bound limit. As a consequence, to take the economy out of recession, governments have had to incur massive budget deficits. The role of monetary

5 As Beetsma and Giuliodori (2010) have pointed out, a national fiscal expansion pushes up the long-run interest rate discouraging investment. This concern has also been expressed by central bankers. For example, Lagarde (2020) has stated that "monetary policy has to minimise any 'crowding-out' effects that might create negative spillovers for households and firms. Otherwise, increasing fiscal interventions could put upward pressure on market interest rates and crowd out private investors, with a detrimental effect on private demand."

6 The use of quadratic loss functions as the one in equation (2) is standard in the literature on the interactions between fiscal and monetary policies. The inclusion of the first three terms in the loss function is common in this literature (see Beetsma & Giuliodori, 2010; Foresti, 2018). We introduce a new term (the fourth one) to take into account the strategic effects of quantitative easing. On the other hand, Dixit and Lambertini (2003) and Woodford (2003, ch. 6) have shown that this type of function can be built on microeconomic foundations, since they can be derived starting from a representative agent that maximizes a utility function. Furthermore, Blinder (1998), former vice-president of the FED, has stated that economic authorities use their policy instruments so that variations in the economic variables are relatively small and, for changes of this size, any convex objective function can be assumed to be approximately quadratic. Therefore, positive or negative deviations from the policy targets can be considered as losses that are represented with a loss function of this type.

7 An alternative risk pooling setting would be the case where Eurobonds are issued. However, including it would not alter the main conclusions because the negative spillovers would also exist in that scenario.

policy has been to accommodate this fiscal expansion so that interest rate do not increase. This narrative has become even less contested with the COVID-19 pandemic.

3 Benchmark Scenario: The First Best

We assume that each government's aim is to minimize the loss of its own country, that its policy actions are not motivated by electoral or partisan objectives and there are no political economy conflicts. These particular issues are set aside in our analysis since they have been studied extensively in the literature (Hibbs, 1977; Nordhaus, 1975; Rogoff & Sibert, 1988).

We begin by obtaining the values of the policy variables (g_i, t_t, b_i,m_i), which minimize the joint social loss of the countries in the union. In the rest of this article, we study whether those first-best values can be obtained with different institutions.

Solving (1) for b_i and substituting it together with equation (2) in equation (3), one can rewrite the country's loss function as follows:

$$L_i^S = \alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i + m_j)^2, \tag{4}$$

where $i, j = 1, 2$; $i \neq j$.

Then, the first best is obtained by solving the following problem:

$$\underset{\{g_i,t_i,m_i\}}{\text{Min}} \sum_{i=1}^{2}(\alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i + m_j)^2). \tag{5}$$

From the first-order conditions (and taking into account expression (1) for b_i), one finds the first best values for the policy variables (g_i, t_t, b_i,m_i):

$$g_i = \frac{\alpha\overline{g}(4\beta\gamma + \beta\delta + 4\gamma\delta)}{4\alpha\beta\gamma + \alpha\beta\delta + 4\alpha\gamma\delta + 4\beta\gamma\delta}, \tag{6}$$

$$t_i = \frac{4\alpha\gamma\delta\overline{g}}{4\alpha\beta\gamma + \alpha\beta\delta + 4\alpha\gamma\delta + 4\beta\gamma\delta}, \tag{7}$$

$$b_i = \frac{4\gamma\beta\alpha\overline{g}}{4\alpha\beta\gamma + \alpha\beta\delta + 4\alpha\gamma\delta + 4\beta\gamma\delta}, \tag{8}$$

$$m_i = \frac{\delta\alpha\beta\overline{g}}{4\alpha\beta\gamma + \alpha\beta\delta + 4\alpha\gamma\delta + 4\beta\gamma\delta}. \tag{9}$$

Remark 1. When more government spending is needed ($\bar{g}$), for example, because of the COVID-19 pandemic, the first best implies that this additional expenditure will be financed by a combination of taxes and debt, and part of his debt has to be bought by the central bank.

Equation (9) shows the optimal level of monetary financing. It has to be emphasized that the literature on central bank independence has not highlighted very often the fact that part of the government expenditure should be financed via debt monetization. This means of financing public expenditure, instead, has been treated rather as a taboo. However, that equation does not imply that, as a result of this monetary financing, it is optimal that the money supply spirals out of control. On the contrary, it should not increase beyond the level characterized by that equation (9).

In the present context of the pandemic and the recession it has caused, there is a widespread consensus that the central bank's purchases of sovereign bonds should be carried out to a greater extent than in other downturns. There are two reasons for this occurrence. On the one hand, to boost the economy, monetary policy has lost its traditional ammunition, namely, interest rates are so low that there is (almost) no room to reduce them further. Therefore, fiscal authorities have been assigned a fundamental role in this crisis, namely, government spending has increased dramatically but without being financed by raising taxes. Having said that, fiscal policy cannot afford to work in isolation from the monetary policy because, to avoid the increase in interest rates stemming from that extraordinary fiscal expansion, central banks are required to carry out unprecedented purchases of sovereign bonds.

Notice that equation (9) shows that, in the presence of a shock, as the COVID-19 pandemic, the level of debt monetization should increase if joint social welfare of the union is to be maximized, and this level depends, among other things, on the size of the negative side effects of the central bank's debt purchases, which is captured by the parameter γ in equation (2). In this scenario, this increase in monetary financing should be greater as the link between inflation and the volume of bond purchases by the central bank becomes weaker (lower γ), which has been a recent trend starting from the Great Recession.

4 A Government Dependent Central Bank

As stated in Section 1, we assume throughout the article that each government is benevolent, in the sense that it

does not pursue electoral nor partisan interests but those of the citizens in its own country. On the other hand, it has to be made clear that each government, when taking its policy actions, only pays attention to the welfare of its own country, but not to that of the other member country. This gives rise to an externality that is a key element in our analysis. As for the common central bank, when we refer to it as being benevolent, we mean that it maximizes not just the welfare of one single country but the joint welfare of all the states in the union.

We begin by assuming that the central bank has this type of social preferences. The interactions among the central bank and the governments are modeled by making use of a two-stage game. In the first stage, governments simultaneously choose their expenditure, taxes, and public debt (taking the other country's fiscal variables as given), and bearing in mind that the central bank, in the second stage, will carry out the unconventional monetary policy consisting in buying a portion of these sovereign debts. Therefore, we assume that the fiscal authorities move before the central bank. This timing is in line with the usual assumption that, in practice, monetary policy decisions to buy bonds can be changed more easily than fiscal policy. The reason is that, while the volume of government debt purchases carried out by the central bank can be adjusted almost instantaneously, fiscal variables take more time to be implemented: they have to be proposed, voted in parliament, and then put into practice. That is why the fiscal authorities are modeled in this literature as first-movers against central banks (see Beetsma & Giuliodori, 2010).

We look for a subgame perfect equilibrium of the two-stage game by applying backward induction. Therefore, we begin by solving the second stage, where the sovereign bond purchases by the central bank take place, once it has observed the values of the public expenditures and taxes decided by the member countries' governments. Thus, the problem that the central bank solves is (from equation (4)):

$$\begin{aligned}\underset{\{m_1,m_2\}}{\text{Min}}\ L^{\text{CB}} = \sum_{i\neq j}^{2}(&\alpha(g_i-\overline{g})^2+\beta t_i^2+\delta(g_i-t_i-m_i)^2\\&+\gamma(m_i+m_j)^2).\end{aligned} \tag{10}$$

The first-order condition yields the central bank's reaction functions:

$$m_i = \frac{g_i(2\gamma+\delta)-2\gamma g_j - t_i(2\gamma+\delta)+2\gamma t_j}{4\gamma+\delta}. \tag{11}$$

From an inspection of equation (11), we conclude that when one country, say country i, increases its government spending (or lowers its taxes) the central bank will purchase more of its public debt increasing the common risk in the union. That is, there is a negative spillover, which is a key element of this article, and can be stated as follows:

Remark 2. In a monetary union with a benevolent central bank, negative fiscal externalities arise, namely, when a country increases its government spending or lower its taxes, the other member country is made worse off because the common risk rises.

In the case where there is no monetary union, the central bank would also buy sovereign bonds. Nonetheless, in this context, that spillover effect is absent, because the country that carries out this type of fiscal policy bears all the costs of its actions. By contrast, in a currency union, if no commitment technology exists that limits government deficits, that negative externality implies that national governments will be more prone to incur fiscal deficits than in the case where there is no single currency.

Remark 3. In a monetary union that is not a fiscal union and where governments and the central bank are benevolent, welfare is not maximized because a deficit bias will arise, causing central bank purchases of sovereign bonds to be suboptimally high.

We prove this result by solving the problem that country i's government faces in the first stage (from equations (4) and (11)):

$$\begin{aligned}\underset{\{g_i,t_i\}}{\text{Min}}\ L_i^S &= \alpha(g_i-\overline{g})^2+\beta t_i^2+\delta(g_i-t_i-m_i)^2\\&\quad+\gamma(m_i+m_j)^2\\ \text{s.t.}\ \ m_i &= \frac{g_i(2\gamma+\delta)-2\gamma g_j - t_i(2\gamma+\delta)+2\gamma t_j}{4\gamma+\delta}.\end{aligned} \tag{12}$$

Solving the first-order conditions one finds:

$$g_i = \frac{\overline{g}\alpha(4\beta\gamma+\beta\delta+2\gamma\delta)}{4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta}, \tag{13}$$

$$t_i = \frac{2\overline{g}\alpha\gamma\delta}{4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta}. \tag{14}$$

Now, substituting into equation (11), equations (13) and (14) (and taking into account expression (1)) yields:

$$m_i = \frac{\overline{g}\alpha\beta\delta}{4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta}, \tag{15}$$

$$b_i = \frac{4\gamma\beta\alpha\overline{g}}{4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta}. \tag{16}$$

Comparing equations (6)–(9) with equations (13)–(16), it can be checked that (see the Appendix) in a monetary

union, that is not a fiscal union and governments are benevolent: (i) government spending, purchases of bonds by the central banks, and the resulting common risk are suboptimally high; and (ii) taxes are suboptimally low. Therefore, the first best is not achieved and the reason is the existence of the fiscal negative externalities claimed in Remark 2.

5 A Fiscal Union

One possible way to solve this fiscal externality problem is to create a fiscal union. This can be done by collectively choosing the taxes and government expenditure levels or by setting penalties on fiscal deficits. We follow the latter route, which is the one followed by the European Monetary Union (EMU). We model this fiscal institution by adding a new (fifth) term to the governments' objective functions in equation (4). This additional component will be modeled by assuming that there is a fine (f) on budget deficits, so that each government does not overlook the effect that its fiscal policy has on the other member country's welfare. That is, the augmented loss function of country i's government (L_i^G) is expressed as follows:

$$L_i^G = \alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i + m_j)^2 + f(g_i - t_i). \tag{17}$$

On the other hand, we depart from the previous game by adding a new stage, where the choice of the fiscal penalty, f, takes place. This design stage will be located at the beginning of the game, because altering the design of a fiscal union is more complex and difficult than changing government expenditures, taxes, or the level of bond purchases by the central bank. Therefore, the timing is now:

(1) Fiscal union design stage: Governments cooperatively select the fine on deficits (f).
(2) Fiscal policy stage: National fiscal authorities decide their expenditure levels and taxes in a noncooperative way (g_i, t_i).
(3) Monetary policy stage: The benevolent central bank buys sovereign bonds (m_i).

We apply backward induction. Therefore, by solving the last stage, we get the central bank's reaction functions, which have been obtained in equation (11), because the central bank was also assumed to be benevolent in the previous section.

Taking into account equation (11), in the second stage, the problem faced by the government in country i is:

$$\begin{aligned} \underset{\{g_i,t_i\}}{\text{Min}} \quad & L_i^G = \alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 \\ & \quad + \gamma(m_i + m_j)^2 + f(g_i - t_i) \\ \text{s.t.} \quad & m_i = \frac{g_i(2\gamma + \delta) - 2\gamma g_j - t_i(2\gamma + \delta) + 2\gamma t_j}{4\gamma + \delta}. \end{aligned} \tag{18}$$

The first-order conditions yield the values of the fiscal variables in this scenario (the superscript FU stands for Fiscal Union):

$$g_i^{\text{FU}}(f) = \frac{4\overline{g}\alpha\beta\gamma + 4\overline{g}\alpha f\gamma + \overline{g}\alpha\beta\delta + \overline{g}\alpha f\delta + 2\overline{g}\alpha\gamma\delta}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}, \tag{19}$$

$$t_i^{\text{FU}}(f) = \frac{4\overline{g}\alpha f\gamma + \overline{g}\alpha f\delta + 2\overline{g}\alpha\gamma\delta}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}. \tag{20}$$

Now, substituting these equations into equation (11) yields:

$$m_i^{\text{FU}}(f) = \frac{\delta\alpha\beta\overline{g}}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}. \tag{21}$$

Finally, in the first stage, the penalty (f) on deficits is selected to maximize joint social welfare. Formally, it is obtained by solving:

$$\begin{aligned} \underset{\{f\}}{\text{Min}} \quad & L_1^S + L_2^S = \sum_{i\neq j}^{2}(\alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 \\ & \quad + \gamma(m_i + m_j)^2) \\ \text{s.t.} \quad & \begin{cases} g_i = g_i^{\text{FU}}(f) \\ \quad = \dfrac{4\overline{g}\alpha\beta\gamma + 4\overline{g}\alpha f\gamma + \overline{g}\alpha\beta\delta + \overline{g}\alpha f\delta + 2\overline{g}\alpha\gamma\delta}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}, \\ t_i = t_i^{\text{FU}}(f) \\ \quad = \dfrac{4\overline{g}\alpha f\gamma + \overline{g}\alpha f\delta + 2\overline{g}\alpha\gamma\delta}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}, \\ m_i = m_i^{\text{FU}}(f) \\ \quad = \dfrac{\delta\alpha\beta\overline{g}}{4\alpha\beta\gamma + 4\alpha f\gamma + \alpha\beta\delta + \alpha f\delta + 4\beta f\gamma + 2\alpha\gamma\delta + \beta f\delta + 2\beta\gamma\delta}, \end{cases} \end{aligned} \tag{22}$$

where the six constraints (three for each country) appear in equations (19)–(21):

The solution to the problem is expressed as follows:

$$f^* = \frac{2\gamma\delta}{4\gamma + \delta} > 0. \tag{23}$$

Proposition 1. *In a monetary union, the first best is achieved when a fiscal union is created and the optimal fine on government deficits is imposed on countries.*

Proof. Substituting equation (23) into equations (19)–(21) and checking that these values are the ones that achieve the first best (appearing in equations (6)–(9)).

The intuition behind this proposition is as follows. In a monetary union, if no government takes into account the negative effects that its fiscal policy has on the welfare of the citizens in the rest of the union (stated in Remark 2), a prisoner's dilemma situation arises. This spillover can be dealt with by penalizing fiscal deficits. This kind of "pigouvian tax" can be designed in such a way that each government internalizes not just the "private" cost of its fiscal actions but the "social cost" of the whole union.

In the case of the EMU, even though fiscal institutions such as the Stability Pact in 1997 and the Fiscal Compact in 2013 have been designed to deal with the deficit bias, they have not given rise to a full-fledged fiscal union. In practice, the countries that have not followed the rules have not been fined. In 2003, France and Germany breached the 3 per cent deficit limit established in the Stability Pact but avoided sanctions, and in 2016, Spain and Portugal were also given € 0 fines after failing to comply with deficit targets. Since these precedents do not favor the credibility of the EMU fiscal institutions, we look for another solution to the problem in the following section, namely, the design of an independent central bank. □

6 An Independent Central Bank

We now analyze another commitment technology that deals with the fiscal externalities that arise in a monetary union, that is not a fiscal union. We assume that each government is only interested in its country's welfare and that there is no penalty on budget deficits or, if it exists, it cannot be enforced. This new institution consists in delegating monetary policy to an independent central bank whose preferences will be cooperatively chosen by the member countries of the union. Those preferences cannot be the ones of a benevolent central bank because, as shown in Section 4, the resulting scenario would not achieve the first best, since the negative externality of fiscal policies would not be internalized. We model this monetary regime by introducing two changes in the scenario in Section 4:

(i) The central bank's weight on its purchases of sovereign debt is collectively set by the governments so that it ceases to be γ and becomes $\gamma + \phi$, where ϕ is the choice parameter. That is, if $\phi > 0$ ($\phi < 0$), it implies that the common central bank resulting from the optimal design should be more (less) concerned than countries about the pooled risk that stems from its purchases of sovereign debts. Then, the monetary authorities loss function is now:

$$L^{\text{CB}} = \sum_{i \neq j}^{2} (\alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + (\gamma + \phi)(m_i + m_j)^2). \tag{24}$$

(ii) We add a new stage where the choice of that new parameter, ϕ, takes place. This design stage will be at the beginning of the game (before the other two stages), because altering the design of an institution such as the central bank is more difficult than changing fiscal and monetary variables. Therefore, the timing is now:

(1) Central bank design stage: Governments cooperatively choose the preference parameter of the common central bank (ϕ).
(2) Fiscal stage: Governments decide their levels of expenditure and taxes in a noncooperative way (g_i, t_i).
(3) Monetary policy stage: The central bank buys sovereign bonds (m_i).

Again, solving the last stage gives the central bank's reaction functions:

$$m_i = \frac{g_1(2\gamma + \delta + 2\phi) - t_1(2\gamma + \delta + 2\phi) - g_2(2\gamma + 2\phi) + t_2(2\gamma + 2\phi)}{4\gamma + \delta + 2\phi}. \tag{25}$$

In the second stage, the fiscal authorities in country i, face the following problem (from equations (4) and (25)):

$$\begin{aligned} &\underset{\{g_i, t_i\}}{\text{Min}} \; L_i^S = \alpha(g_i - \overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i + m_j)^2 \\ &\text{s.t.} \quad m_i \\ &\quad = \frac{g_1(2\gamma + \delta + 2\phi) - t_1(2\gamma + \delta + 2\phi) - g_2(2\gamma + 2\phi) + t_2(2\gamma + 2\phi)}{4\gamma + \delta + 2\phi}. \end{aligned} \tag{26}$$

The first-order conditions yield the government spending and taxes (the superscript ICB stands for Independent Central Bank):

$$g_i^{\text{ICB}}(\phi) = \frac{4\phi\alpha\overline{g}(8\beta\gamma + 2\beta\delta + 4\beta\phi + 4\gamma\delta + 2\delta\phi) + \alpha\overline{g}(4\gamma + \delta)(4\beta\gamma + \beta\delta + 2\gamma\delta)}{K_0}, \tag{27}$$

$$t_i^{\text{ICB}}(\phi) = \frac{4\phi\delta\alpha\overline{g}(4\gamma + 2\phi) + 2\delta\gamma\alpha\overline{g}(4\gamma + \delta)}{K_0}, \tag{28}$$

where $K_0 = 4\phi(8\alpha\beta\gamma + 2\alpha\beta\delta + 4\alpha\beta\phi + 4\alpha\gamma\delta + 2\alpha\delta\phi + 4\beta\gamma\delta + 2\beta\delta\phi) + (4\gamma + \delta)(4\alpha\beta\gamma + \alpha\beta\delta + 2\alpha\gamma\delta + 2\beta\gamma\delta)$. Now, substituting these equations into equation (25) yields:

$$m_i^{\text{ICB}}(\phi) = \frac{(4\gamma + \delta + 4\phi)\bar{g}\alpha\beta\delta}{K_0}. \tag{29}$$

Finally, in the design stage, countries collectively choose the preference parameter of the common central bank (ϕ), namely, they solve the following problem:

$$\underset{\{\phi\}}{\text{Min}} \quad L_1^S + L_2^S = \sum_{i\neq j}^{2}(\alpha(g_i - \bar{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i + m_j)^2)$$

$$\text{s.t.} \begin{cases} g_i^{\text{ICB}} \\ \quad = \dfrac{4\phi\alpha\bar{g}(8\beta\gamma + 2\beta\delta + 4\beta\phi + 4\gamma\delta + 2\delta\phi) + \alpha\bar{g}(4\gamma + \delta)(4\beta\gamma + \beta\delta + 2\gamma\delta)}{K_0}, \\ t_i^{\text{ICB}} = \dfrac{4\phi\delta\alpha\bar{g}(4\gamma + 2\phi) + 2\delta\gamma\alpha\bar{g}(4\gamma + \delta)}{K_0}, \\ m_i^{\text{ICB}} = \dfrac{(4\gamma + \delta + 4\phi)\bar{g}\alpha\beta\delta}{K_0}, \end{cases} \tag{30}$$

where the three sets of constraints appear in equations (27)–(29). The following choice parameter solves the problem:

$$\phi^* = \frac{\sqrt{(4\gamma + \delta)K_1} - (4\alpha\beta\gamma + \alpha\beta\delta)}{4(2\alpha\beta + \alpha\delta + \beta\delta)} > 0, \tag{31}$$

where $K_1 = 8\alpha\beta\gamma\delta^2 + 8\alpha\beta^2\gamma\delta + 8\alpha^2\beta\gamma\delta + 4\alpha^2\beta^2\gamma + \alpha^2\beta^2\delta + 4\alpha^2\gamma\delta^2 + 4\beta^2\gamma\delta^2$.

Proposition 2. *In a monetary union, which is not a fiscal union, welfare is maximized if monetary policy is delegated to an independent central bank, which is more worried than governments about the costs of buying sovereign debt* ($\phi > 0$).

Proof. As shown in the Appendix, the optimal value for the choice variable appearing in equation (31), ϕ, is positive. Thus, the optimal value selected for the independent central bank's weight on debt purchases ($\gamma + \phi$) is greater than the governments' (γ). □

The reason why, as stated in Proposition 2, a conservative central bank is optimal is as follows. If governments with the same preferences as their citizens control the central bank's decisions, a deficit bias will arise because of the negative externality claimed in Remark 2. That is, in this scenario, a prisoner's dilemma exists because each government anticipates that it will be bailed out by the benevolent common central bank if its budget deficit is above the level that maximizes the joint social welfare. Therefore, fiscal deficits will be suboptimally high. As a consequence, the first best will be achieved by appointing a more hawkish central banker that changes the fiscal authorities' expectations because it credibly commits not to buy as many bonds as a benevolent central bank would. In other words, a conservative central bank "will change the rules of the game" and maximize the countries' joint welfare.

Having said that, if those countries did not share a common currency, this distortion in the central bank's preferences would not be optimal. The reason is that, in this case, a benevolent central bank would not buy a suboptimally high level of sovereign bonds because fiscal spillovers would be absent. That is, the country's welfare would not be affected by any other country's fiscal policy. In this scenario, because each government sets its own budget deficit, it bares all the costs of its fiscal actions. By contrast, we have shown that, in a currency union, if no commitment technology exists that limits the issuance of sovereign bonds, that negative externality implies that governments will be more prone to incur a fiscal deficit than in the case where they did not share the same currency. To sum up, we have shown that, apart from forming a fiscal union, another possible solution to the fiscal bias is to appoint a "conservative" central bank, that is, one that will carry out a less expansionary monetary policy than if it had the governments' preferences.

Notice that this result is obtained without recurring to the traditional arguments put forward by the literature on central bank independence explained earlier, namely, the classical time inconsistency problem to discretionary monetary policy, political business cycles, and political economy issues. Therefore, Proposition 2 puts forward a novel rationale for central bank independence, namely, it is a mechanism to internalize the externalities in a monetary union, when the common central bank carries out unconventional monetary policy.

On the other hand, since we obtain this result in a setup where member countries share the same preferences, this result puts into question a common criticism to the ECB, which claims that its history is the one of a very conservative central bank, which only reflects the preferences of Germany and the other core countries, and does not take into account the preferences of the periphery countries. In this respect, Proposition 2 shows that it is optimal to delegate monetary policy to a common central bank less willing to buy member countries' bonds than all the member states. For instance, even if countries in the EMU were identical to Germany, in the absence of a fully credible fiscal commitment imposed by the union that could help reduce government deficits, the free-rider problem would be present and a central bank more hawkish than the German citizens would be called for. Another common criticism of the ECB is that it is more conservative than the FED and this is not optimal, unless the Eurozone countries and the United States have different preferences (the former being less willing to let their central bank buy governments debt). However, we have shown that, even if such differences in preferences did not

exist, the fiscal externalities problem (Remark 2) faced by the ECB imply that it has to be more conservative than the FED.

7 A Fiscal Union with an Independent Central Bank

It can be argued that, in practice, the EMU has made use of a combination of the two mechanisms analyzed in the two previous sections: strengthening the fiscal discipline (Proposition 1) and creating and independent and conservative central bank (Proposition 2). One possible explanation for the simultaneous use of the two institutions is that we cannot guarantee that any of those remedies to the deficit bias can work, in isolation, as a full commitment technology. That is, each of them could only be partially credible in practice. Therefore, making use of only one of those two tools would go against the age-old adage "don't put all your eggs in one nest." However, putting in place both institutions at the same time could turn out to be counterproductive, if they happened to be fully credible, because countries could end up with a surplus bias (instead of a deficit bias) caused by a central bank buying a suboptimally low level of public debt. In other words, if using only one of those commitment technologies were enough to achieve the optimal fiscal discipline, employing both at the same time could imply overshooting the goal, which would be welfare decreasing. This situation would turn out to be as undesirable as if, to heal a patient, a doctor gave them two medicines (both with side effects) when only one was needed.

Now, we need to obtain the optimal combinations of values of the fines on deficits and the weights that the central bank should put on its debt purchases, assuming that both commitments are in place. Therefore, the timing is now:

(1) Design stage: Governments cooperatively choose the fiscal penalties (f) and the central bank's design (ϕ).
(2) Fiscal stage: Governments decide their levels of expenditure and taxes in a noncooperative way (g_i, t_i).
(3) Monetary policy stage: The central bank buys sovereign bonds (m_i).

Again, applying backward induction, the last stage gives the central bank's reaction functions (as in equation (25)):

$$m_i = \frac{\begin{array}{l} g_1(2\gamma+\delta+2\phi) - t_1(2\gamma+\delta+2\phi) \\ -\, g_2(2\gamma+2\phi) + t_2(2\gamma+2\phi) \end{array}}{4\gamma+\delta+2\phi}. \tag{32}$$

In the second stage, the fiscal authorities in country i, face the following problem (bearing in mind (32)):

$$\begin{aligned} &\underset{\{g_i,t_i\}}{\text{Min}}\ L_i^S = \alpha(g_i-\overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \gamma(m_i+m_j)^2 + f(g_i - t_i) \\ &\text{s. t. } m_i \\ &\quad = \frac{g_1(2\gamma+\delta+2\phi) - t_1(2\gamma+\delta+2\phi) - g_2(2\gamma+2\phi) + t_2(2\gamma+2\phi)}{4\gamma+\delta+2\phi}. \end{aligned} \tag{33}$$

The first-order conditions yield government spending and taxes (the superscript FI stands for Fiscal union with an Independent central bank):

$$g_i^{\mathrm{FI}}(f,\phi) = \frac{\alpha\overline{g}(4\phi(8\beta\gamma+2\beta\delta+4\beta\phi+4f\phi+4\gamma\delta+2\delta\phi)+f(4\gamma+\delta)^2+8\phi f(4\gamma+\delta)+K_2)}{K_3}, \tag{34}$$

$$t_i^{\mathrm{FI}}(f,\phi) = \frac{2\delta\gamma\alpha\overline{g}(4\gamma+\delta)+4\phi\delta\alpha g(4\gamma+2\phi)+f\alpha g(4\gamma+\delta)^2+8\phi f\alpha g(4\gamma+\delta+\phi)}{K_3}, \tag{35}$$

where $K_2 = (4\gamma+\delta)(4\beta\gamma+\beta\delta+2\gamma\delta)$ and $K_3 = (4\gamma+\delta)(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta) + 4\phi(8\alpha\beta\gamma+2\alpha\beta\delta+4\alpha\beta\phi+4\alpha\gamma\delta+2\alpha\delta\phi+4\beta\gamma\delta+2\beta\delta\phi) + f(4\gamma+\delta)^2(\alpha+\beta)+8\phi f(4\gamma+\delta+2\phi)(\alpha+\beta)$.

Now, substituting equations (34) and (35) into equation (32) yields:

$$m_i^{\mathrm{FI}}(f,\phi) = \frac{\delta\beta\alpha\overline{g}(4\gamma+\delta+4\phi)}{K_3}. \tag{36}$$

Finally, in the first stage, countries cooperatively choose the fiscal penalties and the central bank's design by solving (using ((34)–(36)):

$$\begin{aligned} &\underset{\{f,\phi\}}{\text{Min}}\ L_1^S + L_2^S = \sum_{i\neq j}^{2}(\alpha(g_i-\overline{g})^2 + \beta t_i^2 + \delta(g_i - t_i - m_i)^2 + \phi(m_i+m_j)^2) \\ &\text{s. t.} \begin{cases} g_i^{\mathrm{FI}} \\ \quad = \dfrac{\alpha\overline{g}(4\phi(8\beta\gamma+2\beta\delta+4\beta\phi+4f\phi+4\gamma\delta+2\delta\phi)+f(4\gamma+\delta)^2+8\phi f(4\gamma+\delta)+K_2)}{K_3}, \\ t_i^{\mathrm{FI}} = \dfrac{2\delta\gamma\alpha\overline{g}(4\gamma+\delta)+4\phi\delta\alpha g(4\gamma+2\phi)+f\alpha g(4\gamma+\delta)^2+8\phi f\alpha g(4\gamma+\delta+\phi)}{K_3}, \\ m_i^{\mathrm{FI}} = \dfrac{\delta\beta\alpha\overline{g}(4\gamma+\delta+4\phi)}{K_3}. \end{cases} \end{aligned} \tag{37}$$

The following proposition shows that there are multiple combinations of optimal designs of the monetary and fiscal institutions. Besides, it explains the relationship between the optimal fines on deficits and the optimal weight on debt purchases of the central bank, when both institutions are in place.

Proposition 3. *In a monetary union where member countries agree to form a fiscal union and to grant independence to the central bank, the first best can be achieved by multiple combinations of fines on deficits and central bank's weights on debt purchases, implied by* (f^*, ϕ^*). *On*

the other hand, there exists a real function, $F(.)$*, that relates those two optimal values,* $\phi^* = F(f^*)$*, where* $F' < 0$*,* $f^* \in [0, f^{FU}]$*,* $\phi^* \in [0, \phi^{ICB}]$ *and the values of* f^{FU} *and* ϕ^{ICB} *appear in equations* (23) *and* (31)*, respectively.*

Proof. See the Appendix. □

This proposition generalizes the two particular and extreme cases characterized in the previous two sections: (i) Section 5, refers to the case in which $(f^*, \phi^*) = (f^{FU}, 0)$, that is, the scenario with a fiscal union and a dependent central bank (the maximum optimal fines on deficits is imposed, f^{FU}); and (ii) Section 6 deals with the opposite but also optimal regime, where $(f^*, \phi^*) = (0, \phi^{ICB})$, i.e., there is no fiscal union and monetary authorities are independent (the maximum optimal weight on debt purchases is chosen). This proposition also states that, as the fiscal commitment becomes stronger (higher fiscal penalties), the central bank is required to be less hawkish ($\phi^* = F(f^*)$, where $F' < 0$).

This general result rationalizes the evolution of monetary and fiscal institutions in the EMU. To wit, during the Great Recession, as more legislation was being introduced to support fiscal discipline in the union (The Six Pack in 2011 and The Fiscal Compact and Two Pack in 2013), monetary policy became more expansionary ($F' < 0$), carrying out quantitative easing. Moreover, Proposition 3 explains why this unconventional monetary policy of the ECB started to be implemented with a lag with respect to the FED, namely, because these fiscal reforms made the EMU approach the fiscal discipline of the United States. This process has been made more explicit with the recent official statement of the ECB's Governing Council that points to a change in its monetary policy strategy, which has set its inflation goal to 2% and has allowed room to overshoot it when needed. This is a significant change from the previous target of "'below, but close to, 2%" ("ECB's Governing Council approves its new monetary policy strategy," July 8, 2021, https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210708 dc78cc4b0d.en.html). This new strategy could give monetary authorities the justification for sustaining a much looser monetary policy as they strive to reverse years of below-target inflation, even before the COVID pandemic struck. Having said that, in should be born in mind that, the fact that the EMU is still further away than the United States from being a fully fledged fiscal union, explains why the ECB will continue to be less dovish than the policy of average inflation targeting that the FED announced in 2020 after its own review, which implies that inflation will automatically overshoot its 2% objective after periods of undershooting it.

8 Conclusion

After the Great Recession the widespread consensus on the need to have central banks independent from governments has been put into question. Monetary authorities around the world have been presented with new challenges. They have been given new tasks such as macroprudential policies to stabilize the financial sector and, in a world where interest rates have approached or, in some cases, even reached the lower bound limit, the conventional arsenal of monetary tools has been depleted even before the COVID pandemic broke out. As a result, monetary authorities have resorted to unconventional tools such as quantitative easing. Given the clear redistributional effects of those new monetary measures and functions, a debate has sparked on whether central banks should be independent since, after all, these institutions are run by unelected officials that are not held accountable to the electorate. Against this backdrop, COVID pandemic has mobilized massive public funds, raising the question of how to finance it and how much sovereign debt should be bought by monetary authorities, making this debate on the independence of central banks even more relevant.

In this article, we have put forward a novel rationale to support central bank independence, namely, we have shown that it is a commitment device to deal with the fiscal externalities that arise in a monetary union, where individual governments incur budget deficits which also affect other members in the union. The novelty of our argument is that we show that there is a role for central bank independence even if we put aside the arguments given in this literature, namely, the time inconsistency problem to discretionary monetary policy, political business cycles, and political economy conflicts between different public policy bodies. In our model, governments in a monetary union face spending needs that can be financed by taxes and bonds. They expect that part of this debt will be bought by the common central bank which, in doing so, creates a risk pool in the form of higher inflation and debt mutualization. As a consequence, there is a prisoner's dilemma kind of situation. That is, because each government knows that it will not bear all the risk implied by its spending, its fiscal policy will be too expansionary from a joint welfare point of

view. Therefore, in the absence of a fiscal union that prevents excessive budget deficits, the problem is solved by appointing a conservative central bank, namely, one that is less willing to buy bonds than governments.

On the other hand, since we obtain this result in a setup where member countries share the same preferences, this result responds to a common criticism to the ECB, which claims that it has always been very conservative because it only reflects the preferences of the core countries in the union. However, we have shown that the presence of fiscal externalities implies that, even if all member states shared, for instance, German preferences, it would be optimal that the ECB were even less willing to buy sovereign bonds than Germany. Another common criticism of the ECB that this article puts into question is that it should not be more conservative than the FED. To wit, we have also shown that one possible justification for the ECB to be more hawkish than the FED is that, even though the United States is not a perfect fiscal union, fiscal externalities are more of a problem in the Eurozone, and therefore, the ECB needs to be more conservative.

We have also analyzed the case where those two mechanisms are operating at the same time, as in the case of the EMU. In such a setting, we have warned that the design of both institutions has to be made carefully so that they do not overshoot their objective and enforce too much fiscal discipline. In this sense, we have shown that there is a trade-off between the optimal degree of fiscal discipline and that of central bank hawkishness. This result rationalizes how the monetary and fiscal institutions in the EMU have evolved over time to tackle the deficit bias. To wit, on the one hand, the union has put in place fiscal arrangements such as the Stability Pact (1997) that penalize excessive governments deficits and, on the other hand, monetary policy has been delegated to an independent and conservative central bank. Having said that, to avoid the risk of imposing too much fiscal discipline, as more legislation has been introduced in the union to penalize excessive budget deficits (as The Six Pack in 2011 and The Fiscal Compact and Two Pack in 2013), monetary policy has been perceived as less conservative and more expansionary (for instance, carrying out quantitative easing), even before the COVID-19 pandemic struck. This process has been made more explicit with the recent official statement of the ECB's Governing Council that points to a change in its monetary policy strategy. To wit, it has set its inflation goal to 2% and has allowed room to overshoot it when needed ("ECB's Governing Council approves its new monetary policy strategy," July 8, 2021). This is a significant change from the previous target of "below, but close to, 2%." Having said that, the fact that the EMU is still further away than the United States from being a fully fledged fiscal union explains, as our model predicts, why the ECB will continue to be less dovish than the FED, which announced in 2020 a policy of average inflation targeting, implying that inflation will automatically overshoot its 2% objective after periods of undershooting it. On the other hand, in 2021, inflation has increased in most countries well above that 2% target, fueling a new debate, namely, to what extent (and at which pace) the expansionary monetary policy carried out during the pandemic should be modified. In this respect, with the information available by the time this article is written, we consider that central banks should not overreact. In this way, they could avoid a collective reactionary panic as the so-called taper tantrum that took place in 2013 when it was known that the FED intended to put the brakes on quantitative easing. Having said that, when deciding when and how to taper monetary easing, central banks should bear in mind the pace of the recovery, which is being faster in the United States than in the Eurozone. Furthermore, in a scenario where the surge of new COVID variants could add more uncertainty to the current situation, it is preferable to err on the side of caution.

Future research could incorporate the role of structural reforms and analyze to which extent they could help to deal with the debt spillover issue analyzed in this article. In fact, if these reforms were carried out in the right way, the economy would become more resilient to shocks and, as a result, national governments would incur lower budget deficits. Therefore, in this scenario, central bank independence would be less necessary to deal with those negative externalities.

Finally, our article aims to contribute to the debate on central bank independence arguing that, to deal with the unprecedented challenges that monetary authorities are currently facing, they are better equipped if they are independent from governments. This is a guarantee that will avoid the dangers of printing too much money, which can be interpreted as "the song of the sirens" in the Homeric Odyssey. In other words, independence from government can serve as a commitment technology to guide the central bank's ship to a safe harbor, and not to give in to the temptation of overshooting the optimal level of sovereign debt purchases.

Acknowledgements: We are grateful for helpful comments and suggestions from José García-Solanes, Alfonso Rosa-García, Cecilio Tamarit, and three anonymous referees. This article has also benefited from comments by participants at

the XXII conference on International Economics/Jornadas de Economía Internacional. The usual disclaimer applies.

Conflict of interest: Authors state no conflict of interest.

References

Alesina, A., & Tabellini, G. (2008). Bureaucrats or politicians? Part II: Multiple policy tasks. *Journal of Public Economics*, *92*, 426–447.

Barro, R., & Gordon, D. (1983). A positive theory of monetary policy in anatural rate model. *Journal of Political Economy*, *91*, 589–610.

Beetsma, R., & Giuliodori, M. (2010). The macroeconomic costs and benefitsof the EMU and other monetary unions: An overview of recent research. *Journal of Economic Literature*, *48*, 603–641.

Berger, W., & Kibbmer, F. (2013). Central bank independence and financial stability: A tale of perfect harmony? *European Journal of Political Economy*, *31*(C), 109–118.

Bernanke, B. (2005). What have we learned since October 1979? *Federal Reserve Bank of St. Luis Review*, *87*, 277–282.

Blejer, M., & Wachtel, P. (2020). A fresh look at central bank Independence. *Cato Journal*, *40*(1), 105–132

Blinder, A. (1998). *Central Banking in Theory and Practice*, Cambridge (MA): MIT Press.

Buiter, W. (2014). The simple analytics of helicopter money: Why it works - always. *Economics*, *8*(1), 1–23.

Claeys, G., & Domiiinguez, M. (2020). How can the European parliament better oversee the European Central Bank? *Monetary dialogue papers*. European Parlament.

Chadha, J., Corrado, L., Meaning, J., & Schuler, T. (2021). Monetary and fiscal complementarity in the COVID-19 pandemic. *Working paper series 2588*. European Central Bank.

Cochrane, J., & Taylor, J. (2016). *Central bank governance and oversight reform*. Stanford, California, USA: Hoover Institution Press.

Dall'Orto, R., Vonessen, B., Fehlker C., & Arnold, K. (2020). The case for central bank independence: A review of key issues in the international debate. *Occasional paper series No. 248*. European Central Bank.

De Haan, J., & Eijffinger, S. (2016). The politics of Central Bank Independence. In *Handbook of public choice*. Oxford, UK: Oxford University Press.

Dell'Ariccia, G., Rabanal, P., & Sandri, D. (2018). Unconventional monetary policies in the Euro area, Japan, and the United Kingdom. *Journal of Economic Perspectives*, *32*(4), 147–172.

Dixit, A., & Lambertini, L. (2003). Interactions of commitment and discretion in monetary and Fiscal policies. *American Economic Review*, *93*, 1522–1542.

Fernández-Albertos, J. (2015). The politics of Central Bank Independence. *Review of Political Science*, *18*, 217–237.

Foresti, P. (2018). Monetary and Fiscal policies interaction in Monetary Unions. *Journal of Economic Surveys*, *32*(1), 226–248.

Giavazzi, F., & Tabellini, G. (2016). Effective Eurozone QE: size matters more than risk-sharing. In W. De Haan (Ed.), *Quantitative easing*. Washington, DC, USA: CEPR Press.

Hibbs, D. (1977). Political parties and macroeconomic policy. *The American Political Science Review*, *71*(4), 1467–1487.

Holtfrerich, C. (2008). Monetary policy in Germany since 1948: National tradition, International best practice or ideology? Chapter 2. In J.-P. Touffut (Ed.), *Central Banks as Economic Institutions*. Camberley, UK: Edward Elgar Publishing.

Kydland, F., & Prescott, E. (1977). Rules rather than discretion: The inconsistency of optimal plans. *Journal of Political Economy*, *85*, 473–491.

Lagarde, C. (2020). *Monetary policy in a pandemic emergency. Keynote Speech at the ECB Forum on Central Banking*. Germany: Frankfurt.

Mersch, Y. (2017). Central bank independence revisited. *Keynote address at the Symposium on Building the Financial System of the 21st Century*. Germany: Frankfurt.

Mishkin, F. (2013). *Central Banking after the Crisis. Working Papers Central Bank of Chile 714, Central Bank of Chile*.

Nordhaus, W. (1975). The political business cycle. *Review of Economic Studies*, *42*(2), 169–190.

Panetta, F. (2021). Monetary-fiscal interactions on the way out of the crisis. *Conference of the Governors of Mediterranean Central Banks on "Central Banks at the Frontline of the COVID-19 Crisis: Weathering the Storm, Spurring the Recovery", Frankfurt am Main*.

Pronobis, M. (2014). Is monetary policy of ECB the right response to the Eurozone crisis? *Procedia – Social and Behavioral Sciences*, *156*(26), 398–403.

Rau-Goehring, M., Reinsberg, B., & Kern, A. (2020). The role of IMF conditionality for central bank independence, *Working Papers Series - No 2464*. European Central Bank.

Rogoff, K. (1985). The optimal commitment to an intermediate monetary target. *Quaterly Journal of Economics*, *100*(4), 1169–1189.

Rogoff, K., & Sibert, A. (1988). Elections and macroeconomic policy cycles. *Review of Economic Studies*, *55*(1), 1–16.

Smets, F. (2014). Financial stability and monetary policy: How closely interlinked? *International Journal of Central Banking*, *10*(2), 263–300.

Svensson, L. (1997). Optimal inflation targets, conservative Central Bank, and linear inflation contracts. *American Economic Review*, *87*, 98–114.

Taylor, J. (2016). Independence and the scope of the Central Bankas Mandate, *Sveriges Riksbank Economic Review*, *3*, 96–103.

The Economist. (13th October 2012). https://www.economist.com/finance-and-economics/2012/10/06/europes-monetary-opposition.

Ueda, K., & Valencia, F. (2014). Central bank independence and macro-prudential regulation. *Economics Letters*, *125*(2), 327–330. Elsevier.

Walsh, C. (1995). Optimal contracts for Central Bankers. *American Economic Review*, *85*, 150–167.

Weidmann, J. (2020). *Too close for comfort? The relationship between monetary and fiscal policy, Speech at the OMFIF Virtual Panel*, London.

Woodford, M. (1998). Control of the public debt: A requirement for price stability? In G. Calvo & M. King (Eds.), *The debt burden and its consequences for monetary policy* (pp. 117–154). New York: St. Martin's Press.

Woodford, M. (2003). *Interest and prices: Foundations of a theory of monetary policy*. New Jersey, United States: Princeton University Press.

Appendix

Proof of Remark 3. The difference among, on the one hand, the values for spending, taxes, debt in the hands of the public and debt bought by the central bank in the first best and, on the other hand, the corresponding values of those variables in the scenario where governments act in a noncooperative way are, respectively:

$$-\frac{2\overline{g}\alpha\beta^2\gamma\delta(4\gamma+\delta)}{(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\gamma\delta+4\beta\gamma\delta)(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta)}<0, \quad \text{(A.1)}$$

$$\frac{2(4\gamma+\delta)\overline{g}\alpha^2\beta\gamma\delta}{(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\gamma\delta+4\beta\gamma\delta)(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta)}>0, \quad \text{(A.2)}$$

$$-\frac{8(\alpha+\beta)\overline{g}\alpha\beta\gamma^2\delta}{(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\gamma\delta+4\beta\gamma\delta)(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta)}<0, \quad \text{(A.3)}$$

$$-\frac{2(\alpha+\beta)\overline{g}\alpha\beta\gamma\delta^2}{(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta)(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\gamma\delta+4\beta\gamma\delta)}<0. \quad \text{(A.4)}$$

The signs of this differences lead us to conclude that, when governments act in a noncooperative way: (i) government spending, purchases of bonds by the central banks and the resulting common risk are suboptimally high; and (ii) taxes are suboptimally low.

We can also compute the social loss in the first best and in the case where governments act in a noncooperative way. To get the former, we substitute equations (6)–(9) into equation (4), and to obtain the latter, we plug equations (13)–(16) into equation (4). Finally, the difference between the expressions computed for the social loss in the first best and in the case where fiscal authorities act without cooperation is:

$$-\frac{4(\alpha+\beta)(4\gamma+\delta)\overline{g}^2\alpha^2\beta^2\gamma^2\delta^2}{(4\alpha\beta\gamma+\alpha\beta\delta+2\alpha\gamma\delta+2\beta\gamma\delta)^2(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\gamma\delta+4\beta\gamma\delta)}<0. \quad \text{(A.5)}$$

The negative sign of these inequality implies that, when governments do not cooperate when implementing their fiscal policies and the central bank is benevolent, countries are worse off in comparison with the first best. □

Proof of Proposition 2. We check that expression (31) takes a positive value, which requires that:

$$\sqrt{(4\gamma+\delta)K_1}>(4\alpha\beta\gamma+\alpha\beta\delta),$$

where $K_1 = 8\alpha\beta\gamma\delta^2 + 8\alpha\beta^2\gamma\delta + 8\alpha^2\beta\gamma\delta + 4\alpha^2\beta^2\gamma + \alpha^2\beta^2\delta + 4\alpha^2\gamma\delta^2 + 4\beta^2\gamma\delta^2$.

This inequality holds when:

$$(4\gamma+\delta)(8\alpha\beta\gamma\delta^2+8\alpha\beta^2\gamma\delta+8\alpha^2\beta\gamma\delta+4\alpha^2\beta^2\gamma+\alpha^2\beta^2\delta + 4\alpha^2\gamma\delta^2+4\beta^2\gamma\delta^2)>(4\alpha\beta\gamma+\alpha\beta\delta)^2.$$

That is, if $(4\gamma+\delta)(8\alpha\beta\gamma\delta^2+8\alpha\beta^2\gamma\delta+8\alpha^2\beta\gamma\delta+4\alpha^2\beta^2\gamma+\alpha^2\beta^2\delta+4\alpha^2\gamma\delta^2+4\beta^2\gamma\delta^2)-(4\alpha\beta\gamma+\alpha\beta\delta)^2>0$ or equivalently, when $4\delta\gamma(\alpha+\beta)(2\alpha\beta+\alpha\delta+\beta\delta)(4\gamma+\delta)>0$.

The previous inequality is satisfied because all the parameters on the left-hand side are positive. Therefore, $\phi^*>0$. □

Proof of Proposition 3. The solution to the minimization problem in equation (37) yields the following function:

$$f=\frac{2(\alpha\gamma\delta^2-2\alpha\beta\delta\phi-8\alpha\beta\phi^2-8\alpha\beta\gamma\phi+4\alpha\gamma^2\delta-4\alpha\delta\phi^2+\beta\gamma\delta^2+4\beta\gamma^2\delta-4\beta\delta\phi^2)}{(4\gamma+\delta+4\phi)^2(\alpha+\beta)}. \quad \text{(A.6)}$$

Finally, taking derivatives:

$$\frac{\partial f}{\partial\phi}=-\frac{4(4\alpha\beta\gamma+\alpha\beta\delta+4\alpha\beta\phi+4\alpha\gamma\delta+4\alpha\delta\phi+4\beta\gamma\delta+4\beta\delta\phi)(4\gamma+\delta)}{(\alpha+\beta)(4\gamma+\delta+4\phi)^3}<0. \quad \text{(A.7)}$$

Since the previous expression is negative, there exists a negative relationship between those two choice variables. □