Macroeconomic stabilisation in the EMU: rules versus institutions *

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Abstract

This paper investigates the macroeconomic implications of different regimes of international fiscal coordination and monetary-fiscal cooperation in a monetary union with independent fiscal authorities that act strategically vis à vis a common central bank. In the presence of other policy goals than cyclical stabilisation, such as interest rate smoothing and fiscal stability, we show that coordination among national fiscal authorities can reduce output and inflation volatility relative to the non-cooperative setting in specific circumstances only, as in case of demand disturbances, while turning potentially counterproductive otherwise. The adverse effects of union-wide coordinated fiscal measures can be attenuated in a regime of global coordination, namely when a centralised fiscal stabilisation is coordinated with the common monetary policy as well.

JEL codes: E52, E58, E61, E62, E63

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1   Introduction

The advent of the European Monetary Union has revived the interest in monetary and fiscal policy interactions. The strategic environment faced by national fiscal authorities changes as a result of monetary unification, potentially affecting the optimal design of fiscal policy in several ways. While monetary policy is delegated to the European central bank, fiscal policies are decided by national authorities. Coordination failures between monetary and fiscal policies as well as among national fiscal measures may then emerge.

While there is wide consensus in the literature on the possibility of coordination failures arising from the strategic interplay between national fiscal authorities and a supra-national central bank, it is highly debatable whether the desired policy mix can be conveniently implemented through appropriate fiscal rules, such as the Stability and Growth Pact, or via institutional design, as for example the creation of a supra-national fiscal entity. The main upshot of rules is rigidity and lack of economic foundations, as evidenced by arbitrary debt and deficit limits. Moreover, adherence to formal rules may be attained through falsified accounts. Institutions, instead, can be designed so as to act on the proper incentives and deliver the desired outcome (Wiplosz, 2002). Political viability is the main hurdle in this case.

In this paper, we aim to shed some light on these issues by providing a simple model of a monetary union with independent fiscal authorities that act strategically vis à vis a common central bank. We study the macroeconomic implications of different regimes of international fiscal coordination and monetary- fiscal cooperation along the business cycle.

If policy-makers have other goals than macroeconomic stabilisation, such as interest rate smoothing and fiscal stability, this paper shows that macroeconomic outcomes may deteriorate in a monetary union as a consequence of fiscal policy-makers failing to internalise the union-wide consequences of their moves: a fiscal expansion in one country of the union may directly spill-over onto other members' output as well as affect union-wide prices and interest rates. Depending on the relative magnitude of these effects and the source of cyclical instability, excess volatility in union-wide output and inflation may occur.

Comparing macroeconomic outcomes across policy regimes, the paper further shows that non-cooperative fiscal and monetary policies lead to higher output volatility and may raise the variance of inflation as well. Coordination among national fiscal authorities improves the stabilisation properties

of monetary and fiscal measures when policy instruments are strategic complements, as for example in the wake of demand shocks. Fiscal coordination may, however, turn counter-productive and induce excessive fiscal activism when facing supply shocks.

The case for counter-productive fiscal coordination is weakened when fiscal authorities behave cooperatively towards the central bank, i.e. under global coordination. Global coordination unambiguously helps to solve the free-riding problems that may originate in a monetary union as a consequence of the attempts on the part of each policy-maker to shift the burden of cyclical adjustment onto other authorities. It may also reduce policy conflicts by favouring a more appropriate split of tasks between monetary and fiscal policy.

The paper is organised as follows: section 2 relates our contributions to the recent literature on policy games in a monetary union. Section 3 models the monetary union and describes the rules of the game. Section 4 compares the union-wide macroeconomic performance in a regime of non-coordinated monetary and fiscal policies as well as under fiscal and global coordination. Section 5 discusses the policy implications of our model and presents the main conclusions.

2   A look at the literature

It is often argued that the loss of monetary sovereignty increases the potential role for fiscal policy as a stabilisation tool and raises the gains from fiscal coordination among member countries. The strongest argument in favour of fiscal stabilisation in a monetary union is the risk of asymmetric cyclical developments across member countries which cannot be accounted for by the common monetary policy.

A growing number of contributions has tried to investigate the role of fiscal policy as a stabilisation tool in a monetary union by stressing the interdependence between monetary and fiscal policies. In a micro-founded framework, Lombardo and Sutherland (2004) find that welfare in the monetary union may be increased when both monetary and fiscal policies are used as stabilisation tools. They further show that international fiscal coordination may be advantageous when the correlation of shocks across countries is strongly negative. Results in favour of an active role for fiscal stabilisation in a monetary union are obtained in Beetsma and Jensen (2002, 2004)

and Kirsanova, Satchi and Vines (2004). Empirical-oriented studies, such as Westaway (2003), seem to support the view that active fiscal rules can significantly improve macroeconomic performance relative to automatic stabilisers when facing asymmetric shocks.

The strategic approach to cyclical stabilisation in a monetary union has focused on two main issues. First is the scope for international fiscal coordination.

By internalising international spillovers, coordinated fiscal policies are generally found to deliver better outcomes than in non-cooperative regimes, as recently argued by Uhlig (2002) in a context where national fiscal authorities bargain independently vis à vis a common central bank. Counterproductive fiscal coordination may, however, arise whenever output-oriented fiscal authorities gain too much power towards a highly conservative common central bank. Fiscal coordination may in fact exacerbate the time-inconsistency problem of monetary policy and induce the central bank to accommodate fiscal profligacy ex post (Beetsma and Bovenberg (1998) and Beetsma et al. (2001)). The optimal degree of international fiscal policy coordination may therefore be less than complete (Alesina and Wacziarg (1999)).

The second issue is the extent to which monetary and fiscal policy interdependence affect the optimal design of institutions. Most of the contributions compare macroeconomic outcomes across policy regimes that differ depending on the timing of action. [1] Pre-commitment to optimal rules is usually advocated whenever there is a policy conflict, i.e. disagreement over ideal policy targets, and institutional reforms are viewed as the most appropriate way of implementing the desired commitment technology. [2] A more limited

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[1] A partial list of recent contributions focusing on the macroeconomic implications of different institutional arrangements in a monetary union includes: Cooper and Kempf (2000), Dixit and Lambertini (2001, 2003a, 2003b), Gambacorta (2001) and Beetsma and Jensen (2002).

[2] Dixit and Lambertini (2003a) show that coordination as well as commitment and leadership are redundant whenever fiscal and monetary authorities agree on the ideal targets for inflation and output, independently on the relative weight attached to this targets. In the authors' view, this suggests that committing to an ultra-conservative objective, as the European Central Bank, or to fiscal rules, such as the Stability and Growth Pact, places additional, unnecessary constraints on member countries and may prove counter-productive. But, if agreement on the ideal targets is not achievable, namely if policy preferences are fixed, than the outcomes can only be affected by constitutional constraints that shift the policy reaction functions.

number of papers considers coordination between the fiscal authorities and the common central bank. [3] A common finding is that fiscal-monetary coordination improves macroeconomic outcomes relative to the non-cooperative regime.

In this contribution, we bridge the gap between these two lines of research by investigating the macroeconomic implications of both international fiscal coordination and fiscal-monetary cooperation under different cyclical conditions. We derive optimal fiscal and monetary rules in the different regimes and compare their performance in terms of union-wide inflation and output. We deliberately consider a pure stabilisation game, so as to derive endogenously the potential conflicts over the orientation of monetary and fiscal policies. This allows us to ascertain pros and cons of different policy regimes depending on the nature of the shocks that hit the economy.

3   A simple analytical framework

Recent advances in macroeconomic modelling as synthesised by Clarida, Galì and Gertler (1999), show that expectations-augmented versions of traditional aggregate demand and supply equations provide a first-order approximation to a dynamic, general equilibrium model with monopoly distortions and nominal rigidities, capturing in a reduced-form context the main transmission mechanisms in the economy. This proves particularly useful in policy games, where a simplified analytical framework allows to compare different solution concepts without resorting to otherwise inevitable numerical simulations.[4]

Drawing on the Clarida-Galì-Gertler approach, we consider an aggregate demand cum Phillips curve model of a monetary union that comprises n identical countries indexed by $i = (1, ...n)$. As we focus on cyclical stabilisation, structural asymmetry among member countries can be conveniently disregarded.

In each country, the aggregate demand equation relates the output gap, y_{it}, to the real interest rate - defined as the difference between the union-wide nominal interest rate, i_t, and expected national inflation, π_{it+1}^e - to a measure

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[3] See Buti, Roeger and In't Veld. (2001), Beetsma and Jensen (2002) and Von-Hagen and Mundeschenk (2002) among others.

[4] Numerical methods for assessing the performance of alternative regimes of fiscal and monetary interaction are provided, among others, by: Beetsma and Jensen (2002), Van Aarle et al. (2000) and Beetsma et al. (2001).

of the fiscal stance, such as the public deficit, in the own and other member countries, g_{it} and g_{jt} respectively, and to an error term, v_{it},:

$$y_{it} = ag_{it} - b(i_t - \pi_{it+1}^e) + \frac{c}{(n-1)} \sum_{j=1, j \neq i}^{n} g_{jt} + v_{it} \qquad (1)$$

where the exogenous stochastic process has zero mean [5]. Consistently with so-called new-keynesian approach, the transmission of monetary policy to aggregate demand mainly works through the conventional interest rate channel (Galì (2002)). Yet, such transmission does not necessarily involve the traditional liquidity effect (i. e., a decline in the nominal interest rate following a monetary expansion), nor the competitiveness effect due to a change in the nominal exchange rate. Monetary policy works primarily through changes in expected inflation. [6] In our framework of symmetric countries in a monetary union, the impact of real exchange rate changes on aggregate demand can be safely ignored.

The parameters in the IS equation (1) should be thought of as positive. With sticky prices, in fact, output accommodates any change in aggregate demand due to monetary and fiscal policies. As will become apparent later, our model is robust to non-Keynesian fiscal effects, i.e. negative values for the fiscal parameters a and c, which might emerge when agents anticipate the long-run consequences of current fiscal measures. [7]

The Phillips curve in each country directly links inflation to the output gap, expected inflation and to a zero mean cost-push shock, u_{it}:

$$\pi_{it} = \lambda y_{it} + \mu \pi_{i,t+1}^e + u_{it} \qquad (2)$$

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[5] Clarida et al. (1999) consider an AR(1) stochastic process for both aggregate demand and supply shocks. For our purposes, the hypothesis of no persistency in the exogenous driving forces has no practical consequences: it would affect forward-looking expectations while playing no role in policy strategies.

[6] The key role of the interest rate channel in the monetary transmission mechanism is responsible for the isomorphic behaviour of aggregate demand in open and closed economies, as documented by Clarida, Galì and Gertler (2001).

[7] Several empirical studies, mainly regarding successful fiscal retrenchments in the 90's as doumented by Giavazzi and Pagano (1996), seem to support the view that credible fiscal restrictions can be expansionary.

3.1 Policy preferences

Our model aims at capturing in a simplified fashion the main features of the European Monetary Union's institutional architecture. The European Central Bank has a constitutional mandate to maintain price stability in Europe and may pursue output stabilisation as long as this does not interfere with price stability. Yet, monetary activism is costly, particularly in case of conflict between inflation and output stabilisation. [8] Since price stabilisation is delegated to the central bank, fiscal policy-makers can focus on the domestic output gap. [9] Given the constraints imposed by the Stability and Growth Pact, however, they face a cost in changing the fiscal stance. [10]

The common central bank is assumed to stabilise union-wide inflation and smooth short-run interest rate movements. [11] Interest rate smoothing, while potentially capturing the central bank's care about output stabilisation, accords to a widespread practice in central banking, as documented by Blinder (1999) and Clarida, Galì and Gertler (1999). In each period, the central bank sets the nominal interest rate so as to minimise the quadratic loss:

$$L_t^M = \alpha \pi_t^2 + i_t^2 \tag{3}$$

where the ideal targets for inflation and nominal interest rates are normalised to zero. In our notation, variables without subscript refer to union-wide averages.

Each national fiscal authority is assumed to combine output and public deficit stabilisation, in the attempt to dampen cyclical fluctuations yet preserving long-run sustainability of fiscal policy. The level of the public deficit in each period is chosen so as to minimise the following loss function:

$$L_{it}^{FA} = \tau y_{it}^2 + g_{it}^2 \tag{4}$$

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[8] Central bankers may be reluctant to change short-run interest rates by much in any case, as this would imply large variations in the prices of outstanding debts.

[9] In our symmetric model, domestic inflation would play no role as an autonomous objective of fiscal authorities since equilibrium inflation rates are equalised across countries. We thank an anonimous referee for suggesting the point.

[10] The EU fiscal rules mainly reflect a desire to enhance long-run fiscal discipline and interrupt the rapid accumulation of government debt that occurred in many member countries in the 80's and early 90's.

[11] Beetsma et al. (2001) argue that output does not enter as an autonomous target in the preferences of the European Central Bank. Driffil and Rotondi (2004) explore the macroeconomic consequences of an explicit lexicografic preference ordering.

where the ideal levels of the output gap and public deficit are normalised to zero. It is worth stressing that the natural output target in (4) implies that there is no inflationary bias in the economy. As already discussed, we consider a pure stabilisation game. In our view, the conflict between monetary and fiscal authorities arises from differences in the relative weights of policy objectives rather than disagreement on the ideal levels of these targets.

The specification of policy-makers' preferences in (3) and (4) is meant to capture the primary concern for inflation of the European central bank in the most parsimonious way. The implications of a more general specification where both policy-makers care about output and inflation will be discussed later in the paper.

3.2   Rules of the game

The timing of events is as follows: first, the private sector formulates inflation expectations in a rational way, then shocks realise and finally policies are set. Monetary and fiscal authorities move simultaneously.

Leadership equilibria could be considered as an alternative institutional arrangement. Some authors argue that fiscal leadership is the most appropriate description of policy interactions in a monetary union on the ground that fiscal policy cannot be adjusted as quickly as monetary policy (Beetsma and Bovenberg (1998) and Beetsma et al. (2001)). Leadership, however, may also be conceived as the result of the leader's pre-commitment capacity, which would imply that monetary rather than fiscal leadership characterises the strategic policy framework in the EMU (Cooper and Kempf (2000)). [12]

The order of moves does not affect the qualitative features of our results. It is easy to show that leadership, as compared to simultaneous moves, reduces the leader's activism yet increasing the volatility of her target. [13] Since the follower will not accommodate the leader's strategies in our framework of different goals for monetary and fiscal policies, there is no first-mover advantage.

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[12]See discussion in Debrun (2000) and Dixit and Lambertini (2001).

[13]The solution of the model under alternative regimes of monetary and fiscal leadership is available from the authors upon request.

4 Monetary-fiscal interdependence in a monetary union

This section compares the macroeconomic outcomes of three alternative policy regimes. In the non-cooperative regime, NC, the monetary and each national fiscal authority move independently from each other. Under fiscal coordination, FC, national fiscal authorities choose domestic deficit levels in a cooperative way while playing Nash towards the common central bank. Global coordination, GC, is characterised by cooperation between a supranational fiscal authority and the central bank.

4.1 Non-cooperative policies

The central bank sets the nominal interest rate so as to minimise her losses (3) subject to the IS (1) and Phillips curves (2) and taking private sector's expectations as given. This yields a "lean against the wind" optimal policy:

$$i_t = \alpha \lambda b \pi_t \tag{5}$$

where a monetary restriction, namely an increase in the interest rate, is realised whenever inflation is above the ideal target.

Each national fiscal authority independently sets the own country level of public deficit so as to minimise her losses (4) subject to the economy's constraints (1) and (2) and taking as given the behaviour of private agents and the central bank. The optimal policy (best response) is as follows:

$$g_{it} = -a\tau y_{it} \tag{6}$$

After substituting optimal monetary and fiscal policies, (5) and (6) respectively, into the IS and Phillips curves, aggregating across countries and applying the rational expectations operator to the resulting expressions, we obtain the (Nash) equilibrium levels of union-wide output and inflation:

$$
\begin{aligned}
y_t^N &= \frac{1}{\gamma^N} v_t - \frac{\alpha \lambda b^2}{\gamma^N} u_t \\
\pi_t^N &= \frac{\lambda}{\gamma^N} v_t + \frac{1 + \tau a(a+c)}{\gamma^N} u_t
\end{aligned}
\tag{7}
$$

where $\gamma^N \equiv 1 + \tau a(a+c) + \alpha\lambda^2 b^2$.[14]

As apparent in the above expressions, output and inflation can be stabilised only partially unless shocks are perfectly and negatively correlated across union members, i. e. union-wide shocks are zero.[15] Partial stabilisation is the result of a coordination failure between monetary and national fiscal policies which does not arise in case of perfectly asymmetric cycles. In such a case, in fact, monetary policy is passive and fiscal policy bears the whole burden of idiosyncratic adjustment.

Coordination failures stem from a conflict in policy orientation when facing cost-push shocks, namely when monetary and fiscal measures are strategic substitutes. Consider for instance an exceptionally high realisation of the cost-push shock in a member country. Output stabilisation calls for a domestic fiscal expansion, which in turn boosts the union-wide inflation rate. In the attempt to control inflation, the central bank then raises the nominal interest rate, partly vanishing the fiscal stimulus (and possibly inducing other members to loosen their own fiscal stance). The monetary response to supply-side disturbances is more effective on curbing inflation the higher the weight the central bank attaches to its inflation target, namely the higher α. By the same token, the central bank's ability to counteract the inflationary consequences of a cost-push shock is inversely related to the weight of the output target in fiscal policy preferences, τ.

Free-riding on cyclical adjustment emerges, instead, in case of demand disturbances when monetary and fiscal policies are strategic complements. In, say, an overheated scenario, the orientation of discretionary monetary and fiscal measures is restrictive. Each policy-maker, however, has an incentive to shift the burden of cyclical adjustment onto other policy-makers so as to economise on the use of its policy instrument. This in turn results in too low a degree of macroeconomic stabilisation.

Equations (7) evidence that under-stabilisation of demand shocks is inversely related to the weight of output and inflation in policy preferences. Full stabilisation is achieved when at least one policy instrument is not constrained, i.e. when either α or τ are infinite. In such cases, the non-

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[14]It is worth stressing that, since the fiscal parameters a and c are both positive or negative in our symmetric model, macroeconomic outcomes in the non-cooperative as well as in the other policy regimes do not depend on the sign of fiscal effects.

[15]This result accords with the findings of Beetsma et al. (2001) showing that macroeconomic stabilisation in a monetary union is favoured the more asymmetric the cyclical developments among member countries.

constrained policy bears the whole burden of adjustment, while the constrained one is completely passive, independently on whether the shocks are asymmetric across member countries.

Using the solution (7) into optimal policies (6) and (5), it is easy to derive the feedback monetary and fiscal rules:

$$
\begin{aligned}
g_{it}^N &= \frac{a\tau}{\left(1 + \tau a \left(a - \frac{c}{n-1}\right)\right)} \\
&\quad \left[-v_{it} + \frac{\alpha\lambda b^2 \left(1 + \tau a \left(a - \frac{c}{n-1}\right)\right)}{\gamma^N} u_t + \frac{\left(\tau a c \frac{n}{n-1} + \alpha\lambda^2 b^2\right)}{\gamma^N} v_t\right] \\
i_t^N &= \frac{\alpha\lambda^2 b}{\gamma^N} v_t + \frac{(1 + \tau a(a+c))\,\alpha\lambda b}{\gamma^N} u_t \quad\quad (8)
\end{aligned}
$$

The optimal fiscal rule in (8) is outward-looking: fiscal policy reacts to both country-specific and union-wide cyclical disturbances. Moreover, it is counter-cyclical in facing asymmetric, country-specific demand shocks while turning pro-cyclical in case of symmetric, union-wide disturbances. [16] Equation (8) reveals, in fact, that a positive aggregate demand shock in the own country, namely a positive realisation of v_{it}, triggers a fiscal restriction, while fiscal policy is relaxed in union-wide upswings, i.e. when v_t is positive. Such a pro-cyclical activism is due to the attempt of national fiscal authorities to contrast the domestic deflationary consequences of monetary and fiscal restrictions in the monetary union.

In the wake of a negative supply shock, namely a positive realisation of u_t, national public deficits rise unless the cost-push shock is perfectly and negatively correlated across union members. Fiscal profligacy is due to the attempt on the part of national fiscal authorities to offset the domestic output consequences of a tightening in the common monetary policy. In the absence of a monetary restriction, as would be the case with strongly negative cyclical correlation among member countries, adjustment to asymmetric supply shocks is more efficiently achieved through the divergent behaviour of domestic inflation rates and fiscal discipline.

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[16] The European Commission (2001) claims that fiscal policies in Europe have been characterised by "pro-cyclical activism" in the last decades. Mélitz (2000) and Wyplosz (2002), find evidence in favour of weak counter-cyclical effects in the European fiscal policies.

In order to gain some intuition on the likely effects of alternative policy rules on macroeconomic stabilisation, consider a first best environment as the one that arises in the absence of policy coordination failures and disregarding constraints on policy instruments. In such circumstances, it is generally argued that monetary policy should remove the distortions caused by nominal rigidities, favouring price adjustment, while fiscal policy should be set as if prices were flexible (Correia, Nicolini and Teles, 2003). In our framework, this amounts to set fiscal policy independently on the supply shock: there is no reason for reacting to a fluctuation in union-wide costs that can be fully compensated for by monetary policy.

In a monetary union, however, fiscal authorities have an incentive to "inefficiently" respond to union-wide supply shocks as a result of coordination failures of the type we have discussed above, as well as due to the inability of the central bank to fully offset country-specific, asymmetric cost-push-shocks in the absence of exchange rate movements. Consistently with a second best argument, we will show below that getting closer to the ideal first-best rule, for example through fiscal coordination, does not necessarily reduce macroeconomic fluctuations.

4.2   Fiscal cooperation

Each fiscal authority sets its government deficit so as to minimise the average loss in the monetary union:

$$\frac{1}{n}\sum_{i=1}^{n} L_{it}^{FA} \tag{9}$$

taking private sector' expectations as well as the behaviour of the central bank as given. This yields the optimal policies:

$$g_{it} = -a\tau y_{it} - \frac{c}{(n-1)}\tau \sum_{j=1,j\neq i}^{n} y_{jt} \tag{10}$$

It is worth noticing that in our framework of identical countries and policy preferences, cooperation among n fiscal authorities delivers the same outcome as a supra-national fiscal entity that sets the union-wide public deficit.

Following the same steps as before, we obtain the equilibrium levels of output and inflation under fiscal cooperation:

$$y_t^{FC} \;=\; \frac{1}{\gamma^{FC}}v_t - \frac{\alpha\lambda b^2}{\gamma^{FC}}u_t \tag{11}$$

$$\pi_t^{FC} \;=\; \frac{\lambda}{\gamma^{FC}}v_t + \frac{1+\tau(a+c)^2}{\gamma^{FC}}u_t$$

where $\gamma^{FC} \equiv 1 + \tau(a+c)^2 + \alpha\lambda^2 b^2$.

Comparing the above expressions with (7) reveals that output volatility under fiscal coordination is lower than in the non-cooperative regime. Moreover, in the absence of conflicting policy targets, as it is the case when facing demand disturbances, fiscal coordination reduces inflation volatility as well.

Inflation volatility increases, instead, in the wake of a cost-push shock. By strengthening the strategic position of fiscal authorities towards the central bank and exacerbating the conflict on policy orientation, fiscal cooperation may turn counter-productive, as originally stressed by Beetsma and Bovenberg (1998). A casual inspection of equations (7) and (11) reveals that this is more likely to happen the higher the weight attached to macroeconomic stabilisation as opposed to instruments' smoothing (high values of α and τ). Whenever the costs of policy adjustment are not too high, a union-wide monetary restriction triggers offsetting fiscal expansions in member countries. In such a "struggle for dominance" coordinated fiscal policies end up destabilising the economy.[17]

4.3   Global cooperation

Consider a supra-national entity that is interested in union-wide output, inflation and policy variables:

$$L^{GC} = \alpha\pi_t^2 + i_t^2 + \tau y_t^2 + g_t^2 \tag{12}$$

Minimisation of (12) subject to the usual constraints gives the following optimal monetary and fiscal policies:

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[17]In case of strongly asymmetric fiscal effects across countries, the above results would be reversed. Consider for example the case of non-keynesian fiscal effects in only one country in the monetary union. The internalisation of the expansionary effects of a fiscal restriction in this country reduces fiscal activism in other members of the monetary union. International fiscal coordination would then be helpful whenever there is a policy conflict with the common central bank.

$$i_t = b \left(\alpha\lambda\pi_t + \tau y_t \right) \tag{13}$$

$$g_t = - \left(a + c \right) \left(\alpha\lambda\pi_t + \tau y_t \right) \tag{14}$$

The equilibrium output under global coordination is given by:

$$
\begin{aligned}
y_t^{GC} &= \frac{1}{\gamma^{GC}} v_t - \frac{\alpha\lambda \left(b^2 + (a+c)^2 \right)}{\gamma^{GC}} u_t \\
\pi_t^{GC} &= \frac{\lambda}{\gamma^{GC}} v_t + \frac{1 + \tau \left(b^2 + (a+c)^2 \right)}{\gamma^{GC}} u_t
\end{aligned}
\tag{15}
$$

where $\gamma^{GC} \equiv 1 + \tau(a+c)^2 + \alpha\lambda^2 \left(b^2 + (a+c)^2 \right) + b^2\tau$.

Comparing the above equations with the ones under fiscal coordination (11) and non-cooperative behaviour (7) reveals that global coordination improves macroeconomic outcomes when facing demand shocks. By coordinating their policies, monetary and fiscal authorities can engineer adjustment in prices and output yet saving on their (costly) instruments. This amounts to an unambiguous gain for all players.[18]

In case of a trade-off between inflation and output as after a supply shock, the efficacy of macroeconomic stabilisation across policy regimes crucially depends on the relative impact of policy instruments on output. [19] When the output effect of fiscal policy is higher than that of monetary policy, namely when $b < a+c$, global coordination reduces inflation volatility at the cost of higher output volatility relative to fiscal coordination. Yet, output and inflation in the full cooperative setting may be lower and less volatile than in the non-cooperative one (7). In such circumstances, fiscal authorities have a comparative advantage in stabilising output and cooperation with the central bank allows them to specialise on that task. By recognising that the central bank is more effective in facing supply shocks, fiscal authorities are induced to behave in a more disciplined way.

The opposite occurs when monetary policy is relatively more efficient in output stabilisation ($b > a+c$). Global coordination leads to lower output and

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[18]One could define the social welfare function as a concave combination of the policy-makers' loss functions. Making both policy-makers better off, the regime of global coordination improves social welfare.

[19]In the US, Blanchard and Perotti (2002) find that the output effect of fiscal policy is rather small. A discussion on the relative efficacy of monetary and fiscal policies as stabilisation tools in Europe is provided by Wyplosz (2002).

higher inflation volatility in this case, unless fiscal authorities are sufficiently interested in fiscal stability, i.e. $\tau < (a+c)^2 / \left(b^4 - (a+c)^4 \right)$. They will refrain from dampening the inflationary consequences of a cost-push shock only in the event of a binding constraint on the public deficit.

After substituting the equilibrium outcome (15) into the policy reaction functions (13) and (14), the following feedback rules are obtained:

$$
\begin{aligned}
g_t^{GC} &= -(a+c)\left[\frac{\tau + \alpha\lambda^2}{\gamma^{GC}} v_t + \frac{\alpha\lambda}{\gamma^{GC}} u_t \right] & (16) \\
i_t^{GC} &= b\left(\frac{\alpha\lambda^2 + \tau}{\gamma^{GC}} v_t + \frac{\alpha\lambda}{\gamma^{GC}} u_t \right)
\end{aligned}
$$

As apparent in the above expressions, global coordination helps to solve the conflict on policy orientation and leads to counter-cyclical measures: both the interest rate and public deficit are raised whenever output or inflation are above their target levels. Differently from the non-coordinated setting, where fiscal policy may turn pro-cyclical, fiscal authorities need not offset the output consequences of monetary measures when behaving cooperatively.

4.3.1   Is global cooperation really necessary?

The analysis above shows that coordination between monetary and fiscal policies may reduce output as well as inflation volatility in the monetary union. In this section, we investigate whether the cooperative outcome can be reproduced in a setting where monetary and fiscal policies are determined independently and simultaneously.

Assume that monetary and fiscal authorities care about, respectively, union-wide and domestic output and inflation and that policy adjustment is costly for both policy-makers:

$$
L_t^M = \alpha\pi_t^2 + \beta y_t^2 + i_t^2 \tag{17}
$$

$$
L_{it}^F = \gamma\pi_{it}^2 + \tau y_{it}^2 + g_{it}^2
$$

For the reason already discussed, policy-makers share the same ideal targets for output and inflation while potentially disagreeing on their relative weights. The best monetary response is given by:

$$i_t = b \left(\alpha \lambda \pi_t + \beta y_t \right) \tag{18}$$

The above strategy coincides with the one in the cooperative regime provided the central bank attaches to output the same weight as the fiscal authority, $\beta = \tau$.

Under non-coordinated national fiscal policies, the union-wide fiscal stance is as follows:

$$g_t = -a \left(\gamma \lambda \pi_t + \tau y_t \right) \tag{19}$$

and becomes more disciplined in case of international fiscal coordination:

$$g_t = - \left(a + c \right) \left(\gamma \lambda \pi_t + \tau y_t \right) \tag{20}$$

It is immediate to realise that the cooperative outcome (15) can be replicated in a non-coordinated framework (with international fiscal coordination) only when $\beta = \tau$ and $\gamma = \alpha$. Differently from Dixit and Lambertini (2003a), the macroeconomic performance under global coordination cannot be reproduced in a non-cooperative setting unless there is agreement on policy targets as well as on their relative weights. Monetary-fiscal "symbiosis" vanishes when there are other policy goals than cyclical stabilisation.

Furthermore, the non-cooperative framework may deliver an unstable outcome. Even in case of identical preferences, the cooperative outcome (15) may not be a (Nash) equilibrium in the game for the choice of the institutional regime as there could be a unilateral incentive to deviate from the optimal strategies (18) and (20). Unless binding agreements are in place, a typical prisoner-dilemma applies. The central bank has an incentive to deflate once fiscal discipline is achieved in order to reach her bliss point. By the same token, fiscal profligacy may turn rewarding once the common monetary policy is set.

5   Conclusions

Drawing on a simplified aggregate demand-cum-Phillips curve model, this paper has investigated the implications for output and inflation of different policy regimes in a monetary union. A setting where monetary and fiscal authorities move simultaneously and independently is compared with regimes of international fiscal policy coordination and monetary-fiscal cooperation.

In the presence of other policy goals than cyclical stabilisation, such as interest rate smoothing and fiscal stability, we show that output is more volatile in non-coordinated than in cooperative settings, while the performance of inflation across policy regimes depends on the nature of the shocks that hit the countries in the monetary union.

International fiscal policy coordination is shown to be of help in controlling for free-riding behaviour, namely the attempt on the part of national fiscal authorities to shift the burden of cyclical stabilisation onto other policy-makers. A union-wide centralised fiscal policy can effectively speed adjustment to demand shocks as well as to strongly negatively correlated supply shocks. International fiscal coordination may, however, turn harmful in case of conflict with the common central bank over the orientation of discretionary measures.

The adverse effects of union-wide coordinated fiscal measures can be attenuated in a regime of global coordination, when a centralised fiscal stabilisation is coordinated with the common monetary policy as well. In our framework, global coordination can be reproduced in a non-cooperative setting whenever monetary and fiscal authorities share the same objectives. Differently from Dixit and Lambertini (2003a), no fiscal-monetary "symbiosis" arises when policy adjustments are costly. This suggests that, except in the unlikely event of identical preferences, monetary and fiscal policy coordination should be favoured through an appropriate institutional design, such as a constitutional mandate for output and inflation stabilisation.

An inflation target for fiscal authorities can be assigned within the existing policy arrangements in the EMU. [20] An explicit mandate for output and inflation is consistent with delegation of fiscal stabilisation to an independent fiscal entity along the lines of delegation of monetary policy to an independent central bank [21], although for such purposes an appropriate federal budget might be needed [22]. More controversial is the assignment of an explicit

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[20] Article 4(3) of the Treaty requires that the Member States define common objectives in accordance with "*stable prices, [*as well as] *sound public finances and monetary conditions and a sustainable balance of payments*".

[21] Delegation of fiscal policy to an independent agency with macroeconomic stabilisation purposes is advocated, among others, by Seidman (2001), EEAG Report (2003), and Calmfors (2003). Wyplosz (2002) argues in favour of the inclusion of debt management among the goals of such an institution.

[22] The European budget, which is currently around 1 percent of joint EU gross domestic product and mostly devoted to redistributive tasks may not be appropriate for stabilisation purposes.

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output target to the European Central Bank, which would require a change in the European treaties.

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