# Fiscal Policy in a Monetary Union under Alternative Labor Market Regimes

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### Abstract

This paper examines the policy and wealth consequences of alternative fiscal policy and labor market institutional arrangements through which national fiscal policies interact with the commun monetary policy in a monetary union, such as the European Monetary Union (EMU). We develop a model of a two-country monetary union functioning in an asymmetric environment, where fiscal policies are alternatively decentralised and centralised, and labor markets are caracterised by decentralised and centralised wage bargainings. The central issue of the paper is the design of the appropriate fiscal policy institutions by comparing alternative arrangements to distribute the power over fiscal authorities between the center of the union and the individual members of the union and evaluating their performance. The main result of this paper reveal that, delegate the fiscal policy in amonetary union to a council of country representatives with centralised wage bargaining in union-members labor markets is the appropriate institutional design that would stabilize better the regional idiosyncratic supply shocks in a monetary union.

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# 1 Introduction

The launch of the Economic and Monetary Union (EMU) has changed the quality of economic policymaking of the member countries participating in EMU. In the integrated monetary and financial market system created by the euro and the Euro-system, the euro area member states have delegated the authority over monetary policy to a common, supranational institution, the European Central Bank (ECB). Other important parts however of economic policy, such as fiscal policy, continue to be decided at the national level, even if they have welfare effects for other member states, because they affect price stability, financial stability, or the EMU's external balance directly or indirectly through the ECB's reaction to national economic policies. The interdependence between the ECB's monetary policy and national fiscal policies and the existence of externalities and free-riding incentives in EMU imply that non cooperative fiscal policies and ECB monetary policy do not yield efficient policy outcomes in a monetary union.

However, to analyse the interactions between fiscal and monetary authorities in a monetary union, we must incorporate in our analysis a number of additional policy questions that involve interactions between the different institutions operating in a monetary union such as the European Monetary Union. Among them there are the following ones: the possibility for trade unions of internalising external effects stemming from wage setting in a national context and the possibility for governments of internalising macroeconomic spillovers deriving from public expenditure at a national level. The first question has to do with the advantages and disadvantages of various levels of centralised bargaining, from complete decentralisation to complete centralisation. Concerning the advantages and disadvantages of the centralised and decentralised wage setting, these have been the object of an extensive literature at least since Bruno and Sachs (1985). Calmfors and Driffill (1988) and others emphasise the effects of the degree of centralisation of wage bargaining.

According to Calmfors and Driffill (1988), there is wage restraint in economies with an extreme degree of decentralisation or centralisation. Complete decentralisation would ensure a nominal wage restraint and a higher employment level through the effects of competition between unions. The foundation of cooperative wage determination or complete centralisation derives from the possibility to internalise the effects of wage setting at the level of each single region, industry or firm on the consumer price index of all the regions, industries or firms of the national economy. On the other hand, external effects of wage setting at a national level have the same foundation as those stemming from bargaining at a sub-national level. In wage setting at a national level perception of the inflationary consequences for a wider than national area is limited and unions tend to be aggressive, since they can beggar-their-neighbour. This is a powerful argument in favour of international wage co-operation. It is important to note, however, that international co-operation between unions – as distinct from their co-operation at a national level – introduces a new dimension, since unions no longer face, as they do in a national context, a single policy maker, the government, or a couple of policy makers, the government

and the central bank.

The second question has to do with the advantages and disadvantages of various levels of fiscal policy decentralisation in a monetary union, from complete decentralisation (i.e., fiscal policy at the national level) to complete centralisation (i.e., fiscal policy at the level of the whole monetary union area). The question of the governments possibility to internalise macroeconomic spillovers deriving from public expenditure at a national level has been extensively examined in the literature on the advantages of international cooperation. In this respect, fiscal policy cooperation may be founded on the existence of negative or positive spillovers. When there are negative spillovers coordination leads to a reduction in government expenditure, whereas positive spillovers imply increased government expenditure in the co-ordinated case, if there are nominal inertia (see Mundell, 1968; Hamada, 1985; Svensson, 1987; van der Ploeg, 1993). However this question has been also examined in a monetary union context, where cooperating national governments face a single monetary authority. A number of papers explore the free rider behaviour in a monetary union (Dixit and Lambertini 1999, 2001; Beetsma and Bovenberg, 2001; Uhlig, 2002). In a similar setting Buti, Roeger and Velt (2001) model analyze cooperation among fiscal authorities in the presence of symmetric shocks. They find that cooperation is desirable especially if the euro economy is hit by a supply shock. Andersen (2002) shows that, in the case of a common shock, the inefficiency of non-cooperation is increasing in the number of member countries, whereas it is decreasing in the case of idiosyncratic shocks.

The purpose of this paper is to analyse and discuss once again the coordination of monetary and fiscal policies in a monetary union such as the EMU. We develop a framework for studying monetary and fiscal policy in a monetary union by explicitly incorporating the interactions between the monetary-fiscal policymaking and the labour market institutions. Indeed, recent work investigating the interactions between the institutional structures of labor markets and monetary policymaking has shown that labor market features such as the degree of centralization of wage bargaining and the inflation aversion of labor unions significantly influence the effects of monetary policy on economic performance (see, for example, Cukierman and Lippi, 1999; Guzzo and Velasco, 1999). However, these relationships should not be viewed as independent from fiscal policymaking which plays a key role in shaping these interactions and their consequences for economic performance. In this respect, we add also in this framework another feature concerning the degree of fiscal policy decentralisation or centralisation in a monetary union. Thus we analyse the interaction between a common monetary policy and differentiated labour market institutions (centralised or decentralised) and differentiated fiscal policy institutions (centralised or decentralised) in the context of a monetary union.

Specifically, the purpose of this paper is to examine the policy and wealth consequences of alternative fiscal policy and labor market institutional arrangements through which fiscal policy interact with monetary policy in a monetary union. We analyse the policy making in an environment like the Euroland one, which is characterised by the existence of nation-states with their own idiosyncrasies, and policy-makers who may take decisions jointly but also keep the interests of their

countries. Consequently, we have to ask which labour market structure and which fiscal policy regime could significantly influence the effects of policy-mix on economic performance in a monetary union? Is the framework chosen able to overcome the relevant local asymmetries in a monetary union? These are the issues we want to address here. To do so we analyse the problem of monetary and fiscal policies in an asymmetric environment assuming a two-country monetary union. In each country, different labour market institutions are distinguished by the degree of centralisation in wage bargaining. In each country the government can also use a fiscal policy instrument in a decentralised (national level) or in a centralised (monetary union level) way. Finally an independent common monetary policy is followed in a "conservative" manner, as defined by Rogoff's classical 1985 article. We then compare four regimes: in the two of them fiscal policy is decentralised and the labour market is alternatively decentralised and centralised in all countries. In our third and forth regime, we analyse a situation of a centralised fiscal policy and decentralised and centralised labour market in all countries. In this context we ask the following question: given monetary union, how might different fiscal policy arrangements and labour market structures (or different degrees of flexibility) affect economic performance in the monetary union member countries? This is an important issue because it allows us to explore what incentives may exist for undertaking institutional reforms that might make Eurosystem's policy-mix more centralised or decentralised.

The rest of the paper is organized as follows. In section 2, we present the model. In section 3, the results of a the two first regimes under fiscal policy decentralisation and respectively decentralised and centralised wage bargaining are derived. In section 4, the results under fiscal policy centralisation and respectively decentralised and centralised wage bargaining are derived. In sections 5, we compare results of the four alternative regimes. The final section concludes.

# 2   The model

## 2.1   The economy

Consider a monetary union which is formed by two countries. In each country $i$ ($i = 1, 2$), firms face a standard production function featuring decreasing returns to scale in labor given by

$$y_i = al_i + \theta_i, \qquad 0 < a < 1 \tag{1}$$

where $y_i$ is the output, $l_i$ the employment and $\theta_i$ the productivity shock (distributed with variance $\sigma_\theta^2 > 0$ around a zero mean ) faced by firms in country $i$. Firms decide on labor demand and output by maximizing their profits. Hence, labor demand is given by

$$l_i = \ln \arg \max_{L_i} \left\{ P_i(1 - \tau_i)Y_i - W_i L_i \mid Y_i = L_i^a \Theta_i \right\}, \tag{2}$$

where capital letters denote the according non-logaritmic variables. $P_i$ is the price level, $W_i$ is the nominal wage and $\tau_i$ is a distorsionary tax affecting firms. Firms produce a homogenous good and stand in perfect competition. Maximizing profits yields the labor demand function:

$$l_i = \widetilde{l_i} + \alpha(p_i - w_i - \tau_i) + \epsilon_i, \tag{3}$$

where $\widetilde{l_i} = 1/(1-a)\ln(a)$ stands for natural level of employment[1], $\alpha = 1/(1-a) > 0$, and $\epsilon_i = \theta_i/(1-a)$ is a random term distributed with mean zero and variance $\sigma_\epsilon^2 > 0$. Nominal wages $w_i$ are set either at a decentralized level or at a centralized level.

In a first regime, labor markets are assumed identical in the two countries and atomistic (or decentralised). Hence, we assume that nominal wages in both countries are set by atomistic trade unions which try to minimize deviations of real wages from their real wage targets, $v_i$, as set out in the following objective function:

$$\min_{w_i} V_i = \frac{1}{2} E\left[(w_i - p_i) - v_i\right]^2 \tag{4}$$

where, solving conditional on expected values, we have the folowing reaction function for the unions:

$$w_i = p_i^e + v_i \tag{5}$$

in which the superscript, $e$ , refers to the expectation of a variable. $p_i^e = Ep_i$ denotes the expected inflation rate.

In a second labor regime, we assume that both countries have a single centralized union and that national wages will be set according to the objectives of those unions. Wage bargainers still determine the nominal wage at the begining of each period and each trade union aims for full employment and to preserve the growth of real wages in line with productivity, as set out in the following objective function:

$$\min_{w_i} V_i = \frac{1}{2} E\left[(w_i - p_i - v_i)^2 + \delta(l_i - \widetilde{l_i})^2\right] \tag{6}$$

This regime of wage setting is the first in which wages could become an additional policy instrument. Using the employment equation (3) and solving conditional on expected values for taxes and inflation, losses are minimized if:

$$w_i = p_i^e - [\delta/(1+\delta)]\,\tau_i^e + [1/(1+\delta)]\,v_i \tag{7}$$

Finally, aggregate demand is generated by the quantity equation, and prices are assumed to clear the goods market. This defines the price level as :

$$p_i = m - y_i \tag{8}$$

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[1]For convenience and without loss of generality, the natural level of output in each country, $\widetilde{l}$, is normalized to zero.

Equation (8) links the monetary union's central bank policy instrument ( the money supply growth $\Delta m$ ) to the union's countries inflation rate $\pi_i$ $(\equiv p_{it} - p_{it-1}) = \pi$ because the output growth rate is assumed to be zero.

## 2.2 The policy environment

We consider a monetary union in which the monetary policy decision process is assumed to be organized by a common (union-wide) monetary authority composed entirely by country representatives . We assume one monetary representative for each country. All union members have one vote and a proposal may be accepted according to a majority rule of votes. One way this idea can be formalized is the following. Each country representative (or national central bank) computes its loss, represented respectively by equation (9), given the asymmetric shock it observes in its domestic supply function (i.e. equation 1). In this monetary union the monetary policy decision process is unified. We consider that monetary policy is delegate to a common central bank $(CCB)$, such as the European Central Bank (ECB) with direct control over the union's inflation rate. The $CCB$'s monetary policy will be derived by minimising a generic quadratic loss function defined over inflation $\pi$ and employment $l$, as follows:

$$\min_{\pi} L_{CCB} = \frac{1}{2} \left[ \pi^2 + \lambda \left( l - \widetilde{l} \right)^2 \right] \tag{9}$$

where $\lambda \geqslant 0$ is the relative importance, in the CCB's view, of stabilizing output levels across the union as a whole. So, $l$ is the average level of employment in the monetary union, with target $\widetilde{l}$. For $\lambda = 0$, we say that $CCB$ is hardnosed about inflation. The implicit assumption here is that the union participants are of equal size and exert the same influence on the union monetary policy. In particular, we assume that the weight given to each country $i$ in the decision process is the same and not chosen proportional to the size or the population of each country.

On the other hand, each country features a social welfare function which is shared by the government of the country. Consider that fiscal policies in monetary union are set either at a decentralized way or at a centralized way. In the first fiscal policy regime, national fiscal authorities $(G)$ are assumed identical in the two countries and atomistic and government in country $i$ is assumed to minimise a loss function defined over inflation $\pi$, employment $l$ and public spending, $g$, as follows:

$$\min_{\tau_i} L_{G,i} = \frac{1}{2} \left[ \pi^2 + \mu \left( l_i - \widetilde{l_i} \right)^2 + \phi \left( g_i - \widetilde{g_i} \right)^2 \right], \quad \mu, \phi > 0 \tag{10}$$

where $g_i$ denotes government spending as a share of its nondistortionary output (i.e. employment in the absence of distortionary taxes, inflation surprises and shocks). Parameters $\mu$ and $\phi$ correspond to the weights of employment and government spending objectives, respectively, relative to the weigth of the inflation objective[2]. It assumed that welfare losses increase in the deviations of inflation, employment and

[2]For convenience, the weights $\mu$ and $\phi$ are assumed to be identical across the union participants.

government spending from their first-best levels (or "bliss points"). The bliss point for inflation corresponds to price stability, the first-best level of employment corresponds to the natural rate of employment, $\widetilde{l}_i$ (assumed, for convenience, equal to zero). The first-best of government spending, $\widetilde{g}_i\,(>0)$, can be interpreted as the optimal share of nondistortionary output to be spent on public goods if (nondistortionary) lump-sum taxes would be available. The government budget constraint in each country $i$ can be approximated by [3] :

$$g_i + (1+r)\,b_{i,t-1} = \tau_i + \kappa\pi + b_i \qquad (11)$$

where $\tau_i$ is the (distortionary) tax revenue as a share of country $i$'s nondistortionary output, while $\kappa \geqslant 0$ stands for union-wide real base money holdings as a constant share of total nondistortionary output in the union. Therefore, the seignoriage revenues accruing to any country $i$ as a fraction of its nondirtionary output amount to $\kappa\pi$. $b_i$ stands for the amount of debt outstanding at the end of periode $t$, while $b_{i,-1}$ represents the amount of public debt carried over from the previous period into period $t$. All public debt matures after one period and is sold on the capital market against a real rate of interest of $r\,(\geqslant 0)$ considered exogenous in this paper[4]. In this first regime, fiscal authorities in monetary union countries choose the tax rates $\tau_i$ in their respective country by minimizing their respective loss functions (10) in a decentralized way.

Finally, we switch to a second fiscal policy regime, in which we assume that both countries have a single centralized fiscal authority. We consider the case where a centralized fiscal policies are delegated to a union-wide council of country fiscal representatives$CFR$ in which there is one representative for each union participant country and all members have one vote. The common fiscal authority set the common tax rate $\tau$ so as to minimize the following loss function:

$$\min_{\tau} L_{CFR} = \frac{1}{2}\sum_{i=1}^{2} L_{G,i} \qquad (12)$$

The federal structure of the monetary union raises the question of how to distribute the power over and fiscal policy between the center and the two countries of the union. We assume a monetary union in which the members of the common monetary authority are governors keeping the interest of the whole union. The decision process in this monetary union is now assumed to be organized according to the two alternative institutional arrangements considered below. First, we consider, in the presence of centralized and decentralised wage bargaining, a combinaiton of the

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[3]The nominal government budget contraint can be written $PG_i + (1+\rho)\,PB_{i,-1} = PT_i + (M - M_{-1}) + PB_i$, where $G_i$ is the government spending, $T_i = \tau_i Y_i$ is the taxes, $M$ is the money supply, $B_i$ is the public debt, $P$ is the price level, $Y$ is the output level and $B_{i,-1}$the debt issued in period $t-1$ and paid in $t$. Dividing both sides of equation by nominal nondistortionary output, $PY$ , we obtain $g_i + (1+\rho)\,b_{i,-1} = \tau_i + (M - M_{-1})/PY + b_i$, where $g_i = G/PY$ and $b_i = B/PY$. Finally, using a standard quantity theory equation $MV = PY$, we obtain equation (11), where $\pi = (M - M_{-1})/M$ and $\kappa = 1/V = (M/P)/Y$ (see Beestma and Bovenberg, 1999).

[4]For convenience and without loss of generality, we neglect the intertemporal dimension of the government budget constraint. We will assume that there is no public debt ($b_i = b_{i,-1} = 0$) and the real money holding as shares of output $\kappa$ is equal to 1 ( see Alesina and Tabelini, 1987).

common monetary policy and fiscal policies decisions uncoordinated and completely decentralized in the hands of the national governments. Second, we consider, under centralized and decentralised wage bargaining, a combinaiton of the common monetary policy and fiscal policies decisions coordinated and completely centralised in the hands of a common fiscal authority where the members are country representatives.

# 3    Decentralized fiscal policies

In this section, we consider two alternative scenarios of fiscal policy making by assuming alternatively that national fiscal authorities coordinate or not their fiscal policies in the presence of the common monetary authority. In this initial setting, the fiscal authority of each country-member of the monetary union is assumed not to coordinate with either the common monetary authority or the fiscal authority of the other country. Thus both national fiscal authorities choose the tax rates in their own countries to minimize their loss functions represented respectively in equations (10). In this institutional setting, we consider the time-consistent ex post optimal solutions under monetary and fiscal discretion for common inflation rate, national tax rates and national outputs. From the first order conditions for $\pi$ and $\tau_1$ and $\tau_2$ in the problems (9) and (10), we obtain respectively the following reaction functions:

$$\pi = \frac{\lambda\left[(w_1 + w_2) + (\tau_1 + \tau_2) - (\epsilon_1 + \epsilon_2)\right]}{2\left(1 + \lambda\right)} \tag{13}$$

$$\tau_1 = \frac{\mu\left(\pi - w_1 + \epsilon_1\right)}{\mu + \phi} \tag{14}$$

$$\tau_2 = \frac{\mu\left(\pi - w_2 + \epsilon_2\right)}{\mu + \phi} \tag{15}$$

Solving the system of equations (13), (14) and (15), we obtain :

$$\pi = \frac{\lambda\phi\left[(w_1 + w_2) - (\epsilon_1 + \epsilon_2)\right]}{2\left(\mu + \phi + \lambda\phi\right)} \tag{16}$$

$$\tau_1 = \frac{\mu\lambda\phi(w_2 - \epsilon_2)}{2(\mu + \phi)\left(\mu + \phi + \lambda\phi\right)} - \frac{\left[2(\mu + \phi) + \lambda\phi\right]\left(w_1 - \epsilon_1\right)}{2(\mu + \phi)\left(\mu + \phi + \lambda\phi\right)} \tag{17}$$

$$\tau_2 = \frac{\mu\lambda\phi(w_1 - \epsilon_1)}{2(\mu + \phi)\left(\mu + \phi + \lambda\phi\right)} - \frac{\left[2(\mu + \phi) + \lambda\phi\right]\left(w_2 - \epsilon_2\right)}{2(\mu + \phi)\left(\mu + \phi + \lambda\phi\right)} \tag{18}$$

The preceding equations clarify that the equilibrium which emerges depends on the wage formation mechanism in each country. In the following, we analyse two alternative labour market regimes, both of them are symmetric, with either full centralization or complete decentralization in the labour market.

## 3.1 with decentralised wages bargaining

In this first regime, labor markets are assumed identical and atomistic (or decentralised) in the two countries. Hence, we have the folowing reaction functions for the two national unions:

$$w_1 = \pi^e + v_1 \tag{19}$$

$$w_2 = \pi^e + v_2 \tag{20}$$

where taking rational expectations of (16), we obtain :

$$\pi^e = \frac{\lambda\phi\,(v_1 + v_2)}{2\,(\mu + \phi)} \tag{21}$$

Thus, the optimal solutions under monetary and fiscal discretion are :

$$\pi = \frac{\lambda\phi\,(v_1 + v_2)}{2\,(\mu + \phi)} - \frac{\lambda\phi\,(\epsilon_1 + \epsilon_2)}{2\,(\mu + \phi + \lambda\phi)} \tag{22}$$

$$\tau_1 = -\frac{\mu v_1}{\mu + \phi} + \frac{\mu\epsilon_1}{\mu + \phi + \lambda\phi} + \frac{\mu\lambda\phi(\epsilon_1 - \epsilon_2)}{2(\mu + \phi)(\mu + \phi + \lambda\phi)} \tag{23}$$

$$\tau_2 = -\frac{\mu v_2}{\mu + \phi} + \frac{\mu\epsilon_2}{\mu + \phi + \lambda\phi} + \frac{\mu\lambda\phi(\epsilon_2 - \epsilon_1)}{2(\mu + \phi)(\mu + \phi + \lambda\phi)} \tag{24}$$

$$l_1 = -\frac{\phi v_1}{\mu + \phi} + \frac{\phi\epsilon_1}{\mu + \phi + \lambda\phi} + \frac{\lambda\phi^2(\epsilon_1 - \epsilon_2)}{2(\mu + \phi)(\mu + \phi + \lambda\phi)} \tag{25}$$

$$l_2 = -\frac{\phi v_2}{\mu + \phi} + \frac{\phi\epsilon_2}{\mu + \phi + \lambda\phi} + \frac{\lambda\phi^2(\epsilon_2 - \epsilon_1)}{2(\mu + \phi)(\mu + \phi + \lambda\phi)} \tag{26}$$

$$l = \frac{n_1 + n_2}{2} = -\frac{\phi\,(v_1 + v_2)}{2\,(\mu + \phi)} + \frac{\phi\,(\epsilon_1 + \epsilon_2)}{2\,(\mu + \phi + \lambda\phi)} \tag{27}$$

Each country is populated by a continuum of individual agents. All agents within a country $i$ are identical and share preferences that depend on local employment level and union's inflation rate. We consider that the loss function of the representative agent in the monetary union is given by

$$L = (1/2)\,\pi^2 + (\gamma/2)\,l^2, \quad \gamma > 0 \tag{28}$$

which can be derived from the loss function $L$ of the representative agents in the member countries. The expected value $E(L)$ of (28) will be used to evaluate the expected society's welfare loss in the comparison of the alternative policy institutional arrangements in this monetary union. The expected loss under domestic fiscal policies and decentralised wage bargaining follows immediately:

$$E(L^{DD}) = \frac{\phi^2(\gamma + \lambda^2)}{2}\left[\frac{(v_1 + v_2)^2}{(\mu + \phi)^2} + \frac{2\,(1 + \rho)}{(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2\right] \tag{29}$$

where $E(L^{DD})$ indicates the expected value of the loss function in the presence of decentralised fiscal policies and decentralised wage bargaining.

## 3.2   with centralised wages bargaining

We will assume that both countries in the monetary union experience centralised wages bargaining. Hence, we have the folowing reaction functions :

$$\min_{w_i} L_i^u = \frac{1}{2} E \left[ (w_i - p_i - v)^2 + \delta(l_i - \widetilde{l_i})^2 \right] \tag{30}$$

$$w_i = \pi_i^e - \frac{\delta}{1+\delta} \tau_i^e + \frac{1}{1+\delta} v \tag{31}$$

Thus, the optimal solutions under monetary and fiscal discretion are :

$$\pi = \frac{\lambda\phi}{\mu+\phi+\delta\phi} v - \frac{\lambda\phi}{\mu+\phi+\lambda\phi} \left( \frac{\epsilon_1+\epsilon_2}{2} \right) \tag{32}$$

$$\tau_1 = -\frac{\mu v}{\mu+\phi+\delta\phi} + \frac{\mu\epsilon_1}{(\mu+\phi+\lambda\phi)} + \frac{\mu\lambda\phi(\epsilon_1-\epsilon_2)}{2(\mu+\phi)(\mu+\phi+\lambda\phi)} \tag{33}$$

$$\tau_2 = -\frac{\mu v}{\mu+\phi+\delta\phi} + \frac{\mu\epsilon_2}{(\mu+\phi+\lambda\phi)} + \frac{\mu\lambda\phi(\epsilon_2-\epsilon_1)}{2(\mu+\phi)(\mu+\phi+\lambda\phi)}$$

The optimal solutions therefore for national employment and the average level of employment in the monetary union are:

$$l_1 = -\frac{\phi v}{\mu+\phi+\delta\phi} + \frac{\phi\epsilon_1}{\mu+\phi+\lambda\phi} + \frac{\lambda\phi^2(\epsilon_1-\epsilon_2)}{2(\mu+\phi)(\mu+\phi+\lambda\phi)}$$

$$l_2 = -\frac{\phi}{\mu+\phi+\delta\phi} v + \frac{\phi\epsilon_2}{\mu+\phi+\lambda\phi} + \frac{\lambda\phi^2(\epsilon_2-\epsilon_1)}{2(\mu+\phi)(\mu+\phi+\lambda\phi)}$$

$$l = \frac{l_1+l_2}{2} = -\frac{\phi v}{\mu+\phi+\delta\phi} + \frac{\phi}{\mu+\phi+\lambda\phi} \left( \frac{\epsilon_1+\epsilon_2}{2} \right)$$

The expected loss under domestic fiscal policies and centralised wage bargaining is given by

$$E(L^{DC}) = \frac{1}{2}\phi^2(\gamma+\lambda^2) \left\{ \left[ \frac{v}{\mu+\phi+\delta\phi} \right]^2 + \left[ \frac{1}{2(\mu+\phi+\lambda\phi)} \right]^2 2(1+\rho)\sigma_\epsilon^2 \right\} \tag{34}$$

where $E(L^{DC})$ indicates the expected value of the loss function in the presence of decentralised fiscal policies and centralised wage bargainings.

Comparing the results reported in equations (29) and (34), we can establish a first poposition.

**Proposition 1** *The expect loss in the presence of decentralised fiscal policies and centralised wage bargaining is smaller than with a decentralised fiscal policies and decentralised wage bargaining.*

$$E(L^{DD}) > E(L^{DC})$$

**Proof.** Under the assumption that $v = (v_1 + v_2)/2$ it is strainforward to find that :

$$E(L^{DD}) - E(L^{DC}) = \frac{1}{2}\phi^2(\gamma + \lambda^2)v^2(\frac{1}{(\mu+\phi)^2} - \frac{1}{(\mu+\varphi+\delta\phi)^2}) \geqslant 0 \quad \blacksquare$$

# 4  Centralized fiscal policies

We now assume that, in the presence of the common monetary authority, the two national fiscal authorities coordinate their fiscal policies. In this respect, the control over taxation and government spending will be assumed centralized at the union's level rather than at a national level. In an admittedly simplified manner, this case can be analysed by introducing a federal fiscal authority which might be looked upon as a coalition of the national fiscal authorities designing a common fiscal policy[5]. One way this idea can be formalized is by assuming, in a similar way to the case of the common monetary authority, that the federal fiscal authority seeks to minimize the loss function (12). This is different from the insular fiscal policy in which the fiscal authorities chose the tax rates in their own countries to minimize their own loss function. It is assumed here that the federal fiscal authority chose a common output tax rate, $\widetilde{\tau} = (\tau_1 + \tau_2)/2$ the common monetary authority chooses again the union inflation in order to minimize its loss function.

$$\pi = \frac{\lambda}{1+\lambda}\left[\frac{w_1 + w_2}{2} + \widetilde{\tau} - (\frac{\epsilon_1 + \epsilon_2}{2})\right] \tag{35}$$

$$\widetilde{\tau} = \frac{\mu}{\mu+\phi}\left[\pi - (\frac{w_1 + w_2}{2}) + \frac{\epsilon_1 + \epsilon_2}{2}\right] \tag{36}$$

Solving the system of equations (35), (36) , we have :

$$\pi = \frac{\lambda\phi}{\mu+\phi+\lambda\phi}\left[\frac{w_1 + w_2}{2} - (\frac{\epsilon_1 + \epsilon_2}{2})\right] \tag{37}$$

$$\widetilde{\tau} = \frac{\mu}{\mu+\phi+\lambda\phi}\left[-(\frac{w_1 + w_2}{2}) + \frac{\epsilon_1 + \epsilon_2}{2}\right] \tag{38}$$

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[5]In this perspective, it might be similar to the current ECOFIN in which the ministers of finance and economic affairs of the EU countries regularly meet to coordinate fiscal and economic policies. As in the case of the ECB, the ultimate policies of the federal fiscal authority are likely to involve an intricate bargaining process between the EU countries.

## 4.1 with decentralised wages bargaining

We consider then the scenario in the monetary union is decided by a common monetary and fiscal authorities composed by country representatives. Labor markets are assumed identical and atomistic (or decentralised) in the two countries. Hence, we have the folowing reaction functions for the two national unions:

$$w_1 = \pi^e + v_1$$
$$w_2 = \pi^e + v_2$$

$$\pi^e = \frac{\lambda\phi}{\mu + \phi}\left(\frac{v_1 + v_2}{2}\right)$$

The time-consistent solutions under monetary and fiscal discretion in the presence of a common monetary authority and coordinating fiscal authorities and therefore for national employment give us the following optimal solutions:

$$\pi = \frac{\lambda\phi}{\mu + \phi}\left(\frac{v_1 + v_2}{2}\right) - \frac{\lambda\phi}{\mu + \phi + \lambda\phi}\left(\frac{\epsilon_1 + \epsilon_2}{2}\right) \tag{39}$$

$$\widetilde{\tau} = -\frac{\mu}{\mu + \phi}\left(\frac{v_1 + v_2}{2}\right) + \frac{\mu}{(\mu + \phi + \lambda\phi)}\left(\frac{\epsilon_1 + \epsilon_2}{2}\right) \tag{40}$$

$$l_1 = -\frac{(2\phi + \mu)\,v_1}{2(\mu + \phi)} + \frac{\mu v_2}{2(\mu + \phi)} + \frac{\phi\epsilon_1}{\mu + \phi + \lambda\phi} + \frac{(\mu + \lambda\phi)(\epsilon_1 - \epsilon_2)}{2(\mu + \phi + \lambda\phi)}$$

$$l_2 = -\frac{(2\phi + \mu)\,v_2}{2(\mu + \phi)} + \frac{\mu v_1}{2(\mu + \phi)} + \frac{\phi\epsilon_2}{\mu + \phi + \lambda\phi} + \frac{(\mu + \lambda\phi)(\epsilon_2 - \epsilon_1)}{2(\mu + \phi + \lambda\phi)} \tag{41}$$

the average level of employment in the monetary union follows:

$$l = \frac{l_1 + l_2}{2} = -\frac{\phi(v_1 + v_2)}{2(\mu + \phi)} + \frac{\phi(\epsilon_1 + \epsilon_2)}{2(\mu + \phi + \lambda\phi)} \tag{42}$$

The expected loss under centralised fiscal policies and decentralised wage bargaining is given by

$$E(L^{CD}) = \frac{1}{2}\phi^2(\gamma + \lambda^2)\left\{\left[\frac{v_1 + v_2}{2(\mu + \phi)}\right]^2 + \left[\frac{1}{2(\mu + \phi + \lambda\phi)}\right]^2 2\,(1 + \rho)\,\sigma_\epsilon^2\right\} \tag{43}$$

where $E(L^{CD})$ indicates the expected value of the loss function in the presence of centralised fiscal policies and decentralised wage bargaining.

## 4.2   with centralised wages bargaining

We will assume that both countries in the monetary union experience centralised wages bargaining and we obtain :

$$\pi = \frac{\lambda\phi}{\mu + \phi + \delta\phi}v - \frac{\lambda\phi}{\mu + \phi + \lambda\phi}\left(\frac{\epsilon_1 + \epsilon_2}{2}\right)$$

$$\widetilde{\tau} = -\frac{\mu}{\mu + \phi + \delta\phi}v + \frac{\mu}{(\mu + \phi + \lambda\phi)}\left(\frac{\epsilon_1 + \epsilon_2}{2}\right)$$

$$l_1 = -\frac{\phi v}{\mu + \phi + \delta\phi} + \frac{\phi\epsilon_1}{\mu + \phi + \lambda\phi} + \frac{(\mu + \lambda\phi)(\epsilon_1 - \epsilon_2)}{2(\mu + \phi + \lambda\phi)}$$

$$l_2 = -\frac{\phi v}{\mu + \phi + \delta\phi} + \frac{\phi\epsilon_2}{\mu + \phi + \lambda\phi} + \frac{(\mu + \lambda\phi)(\epsilon_2 - \epsilon_1)}{2(\mu + \phi + \lambda\phi)}$$

the average level of employment in the monetary union is follows:

$$l = \frac{n_1 + n_2}{2} = -\frac{\phi v}{\mu + \phi + \delta\phi} + \frac{\phi(\epsilon_1 + \epsilon_2)}{2(\mu + \phi + \lambda\phi)}$$

and the expected society's welfare loss in the case of centralised fiscal policies with centralised wage bargainings is given by

$$E(L^{CC}) = \frac{1}{2}\phi^2(\gamma + \lambda^2)\left\{\left[\frac{v}{\mu + \phi + \delta\phi}\right]^2 + \left[\frac{1}{2(\mu + \phi + \lambda\phi)}\right]^2 2\left(1 + \rho\right)\sigma_\epsilon^2\right\}$$

where $E(L^{CC})$ indicates the expected value of the loss function in the presence of centralised fiscal policies with centralised wage bargainings.

Comparing the results reported in equations (29) and (34), we can establish a second poposition.

**Proposition 2** *The expect loss in the prensence of centralised fiscal policies and centralised wage bargaining is smaller than with centralised fiscal policies and decentralised wage bargaining.*

$$E(L^{CD}) > E(L^{CC})$$

**Proof.** Under the assumption that $v = (v_1 + v_2)/2$ , it is strainforward to find that :

$E(L^{CD}) - E(L^{CC}) = \frac{1}{2}\phi^2(\gamma + \lambda^2)v^2(\frac{1}{(\mu+\phi)^2} - \frac{1}{(\mu+\varphi+\delta\phi)^2}) > 0$ ∎

A first interpretation of our results is that the expected society's welfare loss is always smaller in the case of centralised wage bargaining for both fiscal policy regimes.

# 5   Comparison of alternative institutions

The question arising here is which is the appropriate institutional policy design that would better resolve the trade-off between the inflation bias (credibility) and the output stabilization (flexibility) in a monetary union. To investigate the appropriate policy design (or the optimal policy mix), we evaluate and compare the performances of the four previous alternative institutional arrangements : A monetary union-wide governors with and without coordinating fiscal authorities and with centralised or decentralised wage bargaining . In this respect, we focus our analysis on the variability of inflation and output in the following special cases: the case of perfect asymmetry in the national shocks (i.e. $\rho = -1$ ), and the case of perfect symmetry in the national shocks (i.e. $\rho = 1$ ).[6]

Consider first the case in which monetary union countries are affected by perfectly symmetric shocks ($\rho = 1$). Comparing the results reported in appenix B, we can establish the following poposition:

**Proposition 3** *When schocks are symetrical ($\rho = 1$) , we can not concude which of the two fiscal regimes will stabilise better employment.*

$$Varl_i^{CC(CD)} = Varl_i^{DC(DD)}$$

**Proof.**   it is strainforward  to find that:
$VarL_i^{CC(CD)} - VarL_i^{DC(DD)} = \frac{\phi^2}{(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 - \frac{\phi^2}{(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 = 0$ ■

where $Varl_i^{CC(CD)}$ indicates the variance of the output in the presence of centralised fiscal policies with centralised(CC) or decentalised(CD) wage bargaining. Similary, $Varl_i^{DC(DD)}$ denotes the variance of the output in country i in the case of decentralised fiscal policy with centalised(DC) or decentralised(DD) wage bargaining.

Consider now the case in which individual countries are affected by perfectly asymmetric shocks ($\rho = -1$).The comparison of the results obtained in appendix B helps us to establish our last proposition.

**Proposition 4** *When schocks are asymetrical ($\rho = -1$) , decentralised fiscal policies with centralised or decentralised wage bargaining stabilise better employment in both countries than centralised fiscal policies with decentralised or centralised wage bargaining.*

$$Varl_i^{CC(CD)} > Varl_i^{DC(DD)}$$

**Proof.**   it is strainforward  to find that:
$Varl_i^{CC(CD)} - Varl_i^{DC(DD)} = \frac{4(\mu+\phi+\lambda\phi)^2 + 2(\mu+\lambda\phi)(\mu+\lambda\phi+2\phi)}{4(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 - \frac{\left(\phi(\mu+\phi)+\lambda\phi^2\right)^2}{(\mu+\phi)^2(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 > 0$

■

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[6]see appendix B

We demonstrate in the appendix B that the variance of output under a centalised fiscal policy is always bigger than the variance of the supply shocks.At the same time, we show that the variance of output under a decentralised fiscal policy is smaller than the variance of the shocks and in this respect decentalised fiscal policy stabilise better employment.

The comparison of these results indicates that, in the case of perfectly asymetric shocks in a monetary union, the regime where a common monetary authority constituting by union-wide governors exist in the presence of decentralised national fiscal policies with decentralised or centralised wage bargaining is the appropriate institutional design.

By taking into account the results of the previous section we come to the conclusion that delegate the fiscal policy, in a monetary union, to a council of country representatives with centralised wage bargaining in union-members labor markets is the appropriate institutional design that would stabilize better the regional idiosyncratic supply shocks in a monetary union.

# 6    Conclusion

In this paper, we examine the policy and wealth consequences of alternative fiscal policy and labor market institutional arrangements through which national fiscal policies interact with the commun monetary policy in a monetary union, such as the European Monetary Union (EMU). The central issue of the paper is the design of the appropriate fiscal policy institutions by comparing alternative arrangements to distribute the power over fiscal authorities between the center of the union and the individual members of the union and evaluating their performance. To do so we develop a model of a two-country monetary union functioning in an asymmetric environment, where fiscal policies are alternatively decentralised and centralised, and labor markets are caracterised by decentralised and centralised wage bargainings. Thus, we analyse the fiscal policy making in an environment like the Euroland one, which is characterised by the existence of nation-states with their own idiosyncrasies, and policy-makers who may take decisions jointly but also keep the interests of their countries. The main result of this paper reveal that, delegate the fiscal policy in a monetary union to a council of country representatives with centralised wage bargaining in union-members labor markets is the appropriate institutional design that would stabilize better the regional idiosyncratic supply shocks in a monetary union.

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## 6.1 Appendix A:Derivation of the output equation

As in the standard literature such as Alesina and Tabellini (1987), the supply function can be derive from the firm's optimization problem. We consider a production function, $Y_i = A \cdot N_i^{\delta}$, with labor , $N_i$, as the only one production factor, $A = 1$ and $\delta$ denotes the labor share of production supply. The firms have to maximize its benefit and faces to a distorsionary tax $\tau_i$.

$$Max \ \Pi_i = P_i(1 - \tau_i)Y_i - W_i L_i$$

where $W_i$ denotes the wage and $P_i$ the price of goods.From the first-order condition, we obtain the output supply which optimize the firm's benefit:

$$L_i = \left[ \frac{W_t}{\kappa P_i(1 - \tau_i)} \right]^{\frac{1}{\kappa - 1}}$$

After a log translation of the above equation, we can re-written the output supply as follow:

$$l_i = \frac{1}{1 - \kappa}[\log(P_i) - \log(W_i) + \log(1 - \tau_i) + \log(\delta)]$$

Using the approximation for $\log(1 - \tau_i) \simeq -\tau_i$ and written lower cases letters for log values, we finally obtain equation (**??**):

$$l_i = \widetilde{l_i} + \alpha(\pi_i - w_i - \tau_i)$$

where $\widetilde{l_i} = \kappa/(1-\kappa)\log(\kappa)$ stands for natural level of output, $\alpha = \kappa/(1-\kappa)$, $\pi_i$ is the inflation rate. Note that $\pi_i \equiv \log(P_{it}) - \log(P_{it-1})$.

Monetary union's workers are represented by trade unions who aim for some target real wage rate (see Alesina and Tabellini,1987, and Jensen, 1994).At the start of each period, and before monetary policy is implemented, they set nominal wages so as to minimize their expected losses.

## 6.2 Appendix B:The variances of the inflation and the output in both countries under the four alternative regimes

For the first two regimes, decentralised fiscal policy with decentralised wage bargaing(DD) and decentralised fiscal policy with decentralised wage bargaing(DC), we obtain the same variances of the inflation and the output.

We first compute the variance of the expressions Var $(\pi)$ and Var $(l_i)$ and we obtain the following results under the assumption that $\sigma_{\epsilon 1}^2 = \sigma_{\epsilon 2}^2 = \sigma_{\epsilon}^2$.[7]

$$\text{Var}(\pi) = \frac{\lambda^2\phi^2(1+\rho)}{2(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 \tag{44}$$

$$\text{Var}(l_i) = \frac{[(2\phi(\mu+\phi)+\lambda\phi^2)]^2 + (\lambda\phi^2)^2}{4(\mu+\phi)^2(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 - \frac{2(2\phi(\mu+\phi)+\lambda\phi^2)\lambda\phi^2\rho}{4(\mu+\phi)^2(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 \tag{45}$$

where $\rho$ denotes the correlation coefficient of the national idiosyncratic shocks and $\epsilon_1$ and $\epsilon_2$.Two extreme cases can be distinguished : the case of perfect asymmetry in the national shocks (i.e. $\rho = -1$ ), and the case of perfect symmetry in the national shocks (i.e. $\rho = 1$).

In the presence of asymetric schocks($\rho = -1$) the variance of the output in both countries follows:

$$\text{Var}(\pi) = 0 \tag{46}$$

$$\text{Var}(l_i) = \frac{(\phi(\mu+\phi)+\lambda\phi^2)^2}{(\mu+\phi)^2(\mu+\phi+\lambda\phi)^2}\sigma_\epsilon^2 \leqslant \sigma_\epsilon^2 \tag{47}$$

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[7]A possible justification of this assumption is that the two countries in the monetary union are assumed of equal size.In this respect, see De Grauwe(2000)

and in the case of symetric shocks ($\rho = 1$) the variance of the output in both countries is given by:

$$\text{Var}(\pi) = \frac{\lambda^2 \phi^2}{2(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2 \tag{48}$$

$$\text{Var}(l_i) = \frac{\phi^2}{(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2 \tag{49}$$

For the other two regimes,centralised fiscal policy with decentralised wage bargaing(CD) and decentralised fiscal policy with decentralised wage bargaing(CC),we also obtain similar results.

The computation of the variances, $\text{Var}(\pi)$ and $\text{Var}(l_i)$, under the same assumptions follows:

$$\text{Var}(\pi) = \frac{\lambda^2 \phi^2 (1 + \rho)}{2(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2$$

$$\text{Var}(l_i) = \frac{(\mu + \lambda\phi)^2 + (\mu + 2\phi + \lambda\phi)^2}{4(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2 - \frac{(\mu + \lambda\phi)(\mu + 2\phi + \lambda\phi)\rho}{2(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2$$

In the presence of asymetric shocks($\rho = -1$) the variance of the inflation and the output in both countries follows:

$$\text{Var}(\pi) = 0 \tag{50}$$

$$\text{Var}(l_i) = \frac{4(\mu + \phi + \lambda\phi)^2 + 2(\mu + \lambda\phi)(\mu + \lambda\phi + 2\phi)}{4(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2 \geq \sigma_\epsilon^2$$

and in the case of symetric schocks ($\rho = 1$) the variances of the inflation and the output in both countries are given by:

$$\text{Var}(\pi) = \frac{\lambda^2 \phi^2}{2(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2$$

$$\text{Var}(l_i) = \frac{\phi^2}{(\mu + \phi + \lambda\phi)^2}\sigma_\epsilon^2$$