

Monetary union enlargement, fiscal policy and strategic wage setting

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– *First draft* –

Abstract

This contribution develops a framework for studying the effects of the enlargement of a monetary union on macroeconomic performances in the presence of strategic interactions between non atomistic labour unions, monetary and fiscal authorities. We show that the extension of the monetary union to new identical member countries may have beneficial effects, depending on the fiscal policymaking parameters. Qualifications to this result are provided under cross-country asymmetries in the labour market structures as well as in the fiscal authorities' preferences.

Key words: Monetary union, fiscal policy, labour unions, employment.

JEL classification: E24, E62, F33, J51.

1 Introduction

In this contribution, we develop a framework for studying the effects of the enlargement of a monetary union (MU) on macroeconomic outcomes (as characterised by unemployment, inflation and deviations of public expenditures from their target) in the presence of strategic interactions between non atomistic labour unions, fiscal policy and monetary policy.

Our analysis, in fact, is based on two different strands of literature that until now have evolved separately. The first focuses on the effects of monetary institutions on the labour market performances. Recent contributions have shown that in the presence of strategic interactions between non atomistic

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wage setters and the central bank, neutrality of monetary regime does no longer hold.¹ Applied to a MU context, this result suggests that the switch to a common currency may affect employment as well as inflation. On this issue, Soskice and Iversen (1998), Grüner and Hefeker (1999) and Cukierman and Lippi (2001) have demonstrated that the monetary unification may deteriorate the macroeconomic performances as it reduces the inflationary impact of each individual wage setters' decision, thus inducing less wage discipline. This literature, however, abstracts from the decisions of the fiscal authorities in the member countries.

The second strand of literature relates to the strategic interactions between the fiscal and monetary authorities. Beetsma and Bovenberg (1998) have studied how these interactions are affected by the establishment of the European Economic and Monetary Union (EMU). They considered a framework with fiscal leadership where the government sets taxes so as to encourage the central bank to produce more inflation and seigniorage revenue. In this framework, they showed that the monetary unification may discipline the fiscal policymakers and thereby reduce inflation, taxes and the public spending bias. This happens since in a larger monetary union, the strategic position of each individual fiscal player vis-à-vis the common central bank is weakened. This result, however, crucially hinges on the fiscal leadership assumption. Indeed, Beetsma and Bovenberg (1997) demonstrated that, with Nash behaviour of both authorities, the monetary unification has no impact on the equilibrium outcomes. This literature, however, ignores the strategic interactions between wage setters and policymakers as the labour markets are assumed to be competitive.

In this paper, we present a unified framework, integrating these two distinct strands of literature. The objective is to examine the repercussions of the enlargement of a MU on macroeconomic performances in a model where the common central bank strategically interact with both, non atomistic labour unions and national fiscal policymakers. The development of such a model is particularly relevant for the understanding of the challenge of the EMU enlargement. Indeed, labour unions have a significant role in shaping the industrial relationships in the European economies and wages are largely determined by collective bargaining agreements. Moreover, with the centralisation of the monetary policy at a supra-national level, new light is shed on the national fiscal policies as they remain the only tool available to the public authorities in the member countries.

The three ways interaction between monetary authorities, non atomistic wage setters and fiscal authorities has received recent attention. Acocella, Di Bartolomeo and Tirelli (2007) examine these interactions in a MU set up. They argue that, once the wage setting behaviour and the resulting

¹A non exhaustive list includes Skott (1997), Grüner and Hefeker (1999), Cukierman and Lippi (1999, 2001), Guzzo and Velasco (1999), Soskice and Iversen (1998, 2000), Lawler (2000, 2001) and Coricelli, Cukierman and Dalmazzo (2004, 2006). Cukierman (2004) provides a survey of this literature.

labour market distortions are endogenous, fiscal coordination and monetary conservatism may improve the macroeconomic performances in the member countries. Cukierman and Dalmazzo (2006) develop a one-country set up with monopolistically competitive price-setting firms. They first focus on the impact of given fiscal policy variables on the strategic interactions between wage setting and monetary policy. Then, they allow for endogenous taxes by government and explore the effects of central bank conservatism and centralisation of wage bargaining on these fiscal decisions. Fracasso and Ozkan (2004) also consider a one-country set up in which they examine how fiscal policymaking may influence the impact of labour market and monetary policy institutions on macroeconomic outcomes.

The framework we use is built around the two-country MU model of Cukierman and Lippi (2001) in which we explicitly incorporate fiscal policymaking as in Alesina and Tabellini (1987). This framework corresponds to an extended version of the model of Fracasso and Ozkan (2004) as it presents a similar description of the labour market structure and a similar timing of events. Indeed, we consider a two-stage game in which the labour unions act as Stackelberg leader vis-à-vis the monetary and fiscal policymakers while those latter play Nash against each other.

The first part of the paper displays the strategic interactions between fiscal policy, unionised labour market and monetary policy in a closed economy set up. In particular, we address questions such as how do institutional parameters, like the degree of central bank conservatism, the level of wage bargaining decentralisation and the fiscal authorities' preferences affect the macroeconomic outcomes in the presence of those multilateral interactions. In the second and main part of the paper, we consider a MU and investigate whether its extension may ameliorate or deteriorate the macroeconomic performances. We start by assuming that the current and new member countries of the MU are identical in every respect. We then extend this analysis by allowing for cross-country asymmetries in the wage setting structure, the economic size and the fiscal authorities' preferences.

This second part contains two sets of results. First, compared to Beetsma and Bovenberg (1997), we show that the MU enlargement (or the monetary unification) leads to changes in the macroeconomic outcomes even though the monetary and fiscal policymakers play Nash against each other. This is due to the fact that, once wage-setting is explicitly modelled, the change in the *policy mix* resulting from the MU enlargement also modifies the wage setters' decisions, thereby affecting macroeconomic outcomes. Second and most importantly, we find that the integration of fiscal policymaking in the game between monetary authorities and labour unions alters the conclusions of Soskice and Iversen (1998), Grüner and Hefeker (1999) and Cukierman and Lippi (2001) concerning the negative repercussions of the monetary unification (or MU enlargement) on macroeconomic performances. More precisely, in addition to the conventional wage-increasing effects of the MU, we identify

a new mechanism through which, depending on the fiscal policymaking parameters, the MU extension may render the labour demand more responsive to wage demand, thereby encouraging unions to moderate their wage claims. As a result, we find that if this new mechanism prevails, MU extension is likely to improve the macroeconomic performances.

The paper is structured as follows. Section 2 presents the analytical framework. Section 3 characterises the equilibrium in a closed economy set up and investigates the impact of institutional parameters, like the degree of central bank conservatism, the level of wage bargaining decentralisation and the fiscal authorities' preferences on the macroeconomic performances. Equilibrium observed in the countries forming the MU is presented in section 4. Section 5 discusses the consequences of the MU enlargement on unemployment, inflation and public expenditures. This is followed by a short conclusion which summarises our main results in section 6.

2 The model

We consider an economy consisting of a central bank (CB), a fiscal authority (FA) and competitive firms which use the national labour force as the unique variable input in the production process. The labour supply is inelastic and equal to L . It is uniformly distributed over n unions (indexed by $i = 1, 2, \dots, n$), so that the labour supplied by union i equals L/n .

In specifying the labour demand function, we use a broadly similar formulation as Fracasso and Ozkan (2004). Hence, the labour demand faced by the union i is described as :

$$L_i^d = \left[\frac{1}{1-\alpha} (d - w_i^r - \tau) - \sigma n (w_i^r - w^r) \right] \frac{L}{n} \quad \alpha, \sigma, d > 0 \quad (1)$$

where w_i^r is the (log of the) real wage of union's i members and $w^r = \sum_{i=1}^n w_i^r / n$ is a measure of the country's average real wage. We admit that labour is differentiated and hence imperfectly substitutable. In that way, an increase of union's i relative wage ($w_i^r - w^r$) induces a loss of labour demand which is proportional to σ , the degree of labour substitutability. Labour demand is also decreasing with τ , the tax rate on the total revenue of the country's firms. Indeed, high taxes induce firms to reduce their production and thus their labour demand.

It follows that the aggregate labour demand in the economy can be written as:

$$L^d \equiv \sum_{i=1}^n L_i^d = \frac{1}{1-\alpha} (d - w^r - \tau) L \quad (2)$$

Hence, the aggregate demand for labour is inversely related to the average

real wage w^r and to the tax rate τ .

The objectives of union i can be described by the loss function:

$$V_i = -(w_i - \pi) + \frac{A}{2}u_i^2 + \frac{B}{2}\pi^2 \quad A, B > 0 \quad (3)$$

where $w_i - \pi = w_i^r$ with w_i and π defining respectively (the log of) the union i 's nominal wage and the economy's inflation rate.² The variable u_i represents the unemployment rate among the members of union i . Parameters A and B measure respectively the unions' dislike for unemployment and aversion for inflation.³

We define the unemployment rate inside union i as:

$$u_i \equiv \frac{(L/n - L_i^d)}{L/n} \quad (4)$$

$$= \frac{1}{1 - \alpha} (w_i - \pi + \tau) + \sigma n (w_i - w) \quad (5)$$

where $w^r = w - \pi_j$ with $w = \sum_{i=1}^n w_i/n$ a measure of the economy's average nominal wage.⁴

In specifying the CB's objectives we draw on Grüner and Hefeker (1999) and Cukierman and Lippi (1999, 2001). The CB dislikes both unemployment and inflation according to:

$$\Omega^{CB} = I\pi^2 + u^2 \quad I > 0 \quad (6)$$

where I captures the central bank's aversion to inflation and is commonly known, after Rogoff (1985), as the degree of central bank conservativeness. Variable u represents the economy's unemployment rate.

Using definition $u \equiv (L - L^d)/L$ and equation (2), it can be written as:

$$u = \frac{1}{1 - \alpha} (w - \pi + \tau) \quad (7)$$

As for the preferences of the FA, we assume that they are described by:

$$\Omega^{FA} = \mu\pi^2 + u^2 + \delta(g - \tilde{g})^2 \quad \mu, \delta > 0 \quad (8)$$

where g and \tilde{g} are respectively the actual and targeted ratio of public expenditure over output. The parameters μ and δ represent, respectively, the FA's

²Without loss of generality, this equality implies that the log of the previous-period's price level is normalized to zero.

³Note that the assumption of inflation averse union ($B > 0$) is not necessary for our results to appear, although it makes our model more general by encompassing Grüner and Hefeker (1999) and Cukierman and Lippi (2001) one.

⁴To simplify notation and without loss of generality, we posed that: $d = (1 - \alpha)$.

relative dislikes of the deviations of inflation and public expenditure from their target level.⁵

As in Alesina and Tabellini (1987), we consider a one-period setting where public expenditures are solely financed from taxes and seigniorage revenues.⁶ In the absence of public debt, the government budget constraint equates :⁷

$$g = \kappa\pi + \tau \tag{9}$$

where κ stands for the constant ratio between real money holdings and output. Canzoneri (1985), Alesina and Tabellini (1987), Debelle (1996) and more recently Ozkan (2000), among others, assume that $\kappa = 1$ whereas Accella, Di Bartolomeo and Tirelli (2007), for example, assume that $\kappa = 0$. In order to render our model more general and to point out the fact that money holdings still exist but tend to be quite small in modern economies with highly developed financial systems, we admit that $0 \leq \kappa \leq 1$. As will become clear below, a non-unitary value of κ plays an important role in our results.

3 Equilibrium in the closed economy

We first analyse the case where the economy has full monetary autonomy with its own central bank setting the inflation rate (superscript N). The model is a two-stage game in which the wage setters act as Stackelberg leaders vis-à-vis the monetary and fiscal authorities. In the first stage each union sets its own nominal wage taking the nominal wages of the others as given and anticipating the monetary and fiscal reactions. In the second stage the CB and the FA choose simultaneously their instrument – π for the CB and τ for the FA – taking the nominal wages previously set by the unions as given. The game is solved by backward induction, that is why we begin by considering the monetary and fiscal choices.

3.1 Policy choices

The CB and FA choose respectively the inflation and tax rate so as to minimise their losses as defined above. This yields the following monetary reaction function:

$$\pi^N = \frac{w + \tau}{1 + (1 - \alpha)^2 I} \tag{10}$$

⁵We suppose that the target level of inflation and unemployment are normalised to zero.

⁶For a multi-period setting where government expenditure are also financed by public debt, see for example Jensen (1994), van Aarle, Bovenberg and Raith (1997), Beetsma et Bovenberg (1997, 1999) or Muscatelli, Natale and Tirelli (2003).

⁷This relation is in fact an approximation that follows from a quantity theory equation for money demand. For further details, see Alesina and Tabellini (1978, p. 623).

Concerning the FA, its reaction is given by:

$$\tau^N = \frac{-w + [1 - \kappa \delta (1 - \alpha)^2] \pi + \delta (1 - \alpha)^2 \tilde{g}}{1 + (1 - \alpha)^2 \delta} \quad (11)$$

As can be seen from equation (11), the FA reacts to a reduction in the inflation rate either by increasing or decreasing the tax rate. Indeed, a reduction in the inflation rate leads to both, an increase in unemployment and a decrease in the public expenditures. The FA chooses to raise the tax rate in order to counter the decrease in the public expenditures if the size of real money holdings, as represented by k , is sufficiently important ($\kappa > [\delta(1 - \alpha)^2]^{-1}$). On the opposite, with relatively small or nil money holdings ($\kappa < [\delta(1 - \alpha)^2]^{-1}$ or $\kappa = 0$), the loss of seigniorage revenues generated by the reduction in inflation is relatively unimportant. In this case, the FA will prefer to counter the unemployment rate increase by reducing the taxes. It will become clear below that the distinction between these two cases plays an important role in the effects of the monetary union enlargement.

The Nash equilibrium of the game between the national CB and FA is obtained by combining equations (21) and (11). This allows the inflation and tax rates to be written in terms of the average wage respectively as:

$$\pi^N = \frac{\delta (w + \tilde{g})}{I [\delta (1 - \alpha)^2 + 1] + (\kappa + 1) \delta} \quad (12)$$

$$\tau^N = \frac{-(I + \delta \kappa) w + \delta [I (1 - \alpha)^2 + 1] \tilde{g}}{I [\delta (1 - \alpha)^2 + 1] + (\kappa + 1) \delta} \quad (13)$$

Hence, a rise in the average nominal wage leads the CB to increase inflation and the FA to reduce taxes in order to counteract its negative effect on labour demand.

3.2 Wage setting

As Stackelberg leaders, the unions are perfectly aware of the monetary and fiscal reactions. Under simultaneous bargaining, each union in the economy determines its nominal wage by minimising the loss function (3), taking the CB and the FA's reaction and the nominal wage set by the other unions as given.

At symmetric equilibrium between the unions ($w_i = w; \forall i$), the resulting aggregate nominal wage can be written as:

$$w^N = \frac{(1 - s^N) \{ I [\delta (1 - \alpha)^2 + 1] + (\kappa + 1) \delta \}}{AI \delta [1 - s^N + v^N + \sigma (n - 1) (1 - \alpha)] + B s^N \delta} - \tilde{g} \quad (14)$$

where $s^N \equiv \frac{\partial \pi^N}{\partial w_i} = \frac{\delta}{n \{ I [\delta (1 - \alpha)^2 + 1] + (\kappa + 1) \delta \}} > 0$

and $v^N \equiv \frac{\partial \tau^N}{\partial w_i} = \frac{-(I+\delta\kappa)}{n\{I[\delta(1-\alpha)^2+1]+(\kappa+1)\delta\}} < 0$ respectively measure the increase in inflation and in taxes caused by a one-unit rise in union i 's nominal wage.

3.3 Economic outcomes

Incorporating expression (14) in the monetary and fiscal reaction functions, respectively equations (12) and (13), yields the following equilibrium inflation and tax rates:

$$\pi^N = \frac{\delta(1-s^N)}{AI\delta[1-s^N+v^N+\sigma(n-1)(1-\alpha)]+Bs^N\delta} > 0 \quad (15)$$

$$\tau^N = \tilde{g} - \frac{(1-s^N)(I+\kappa\delta)}{AI\delta[1-s^N+v^N+\sigma(n-1)(1-\alpha)]+Bs^N\delta} \quad (16)$$

Then, in substituting these results into equations (7) and (9), we obtain the equilibrium unemployment rate and ratio of public spending, respectively given by:

$$u^N = \frac{I\delta(1-s^N)(1-\alpha)}{AI\delta[1-s^N+v^N+\sigma(n-1)(1-\alpha)]+Bs^N\delta} > 0 \quad (17)$$

$$g^N = \tilde{g} - \frac{I(1-s^N)}{AI\delta[1-s^N+v^N+\sigma(n-1)(1-\alpha)]+Bs^N\delta} < 0 \quad (18)$$

As can be noted, in equilibrium, unemployment and inflation are above their target (zero) while the public expenditures are below their target (\tilde{g}). This is due to the distortions in the labour market. Indeed, the unions take advantage of their monopoly power to negotiate high wages. These excessive wage claims, in turn, lead the CB to implement an inflationary monetary policy ($\pi^N > 0$) and the FA to set the tax revenue below the target level of public spending ($\tau^N < \tilde{g}$). Yet, the efforts of the policymakers only partly offset the negative effects of wage claims on labour demand, so that the unemployment rate remains positive. Moreover, the revenues in the form of inflation and taxes are not sufficient to finance the public spending target ($g^N < \tilde{g}$). However, it can be easily seen that the more the unions care about unemployment and inflation (the higher A and B are), the lower are their wage claims and the closer are u , π and g to their respective target.

Contrary to the results of Alesina and Tabellini (1987), the fiscal distortions, as represented by \tilde{g} , do not enter into the definition of the equilibrium rate of unemployment and inflation. This happens, because the wage setters integrate these distortions into their decisions. More precisely, they reduce their nominal wages in the amount of \tilde{g} , so as to compensate the surplus of taxes and inflation intended to finance \tilde{g} .

3.4 Features of economic outcomes

Equations (15) through (18) shows that the equilibrium outcomes depend on a number of parameters, such as the preferences of the policymakers (I and δ) and the structure of the labour market (σ and n). This section presents several comparative static experiments that study how equilibrium outcomes vary when some of those parameters change.⁸

3.4.1 Policymakers' preferences and economic outcomes

We first consider the effects of the policymakers' preferences on the economic outcomes. Examination of equations (15) through (18) leads to the following propositions.

Proposition 1 *An increase in the degree of central bank conservativeness I*
(i) may reduce the unemployment rate and the deviations of public expenditures from their target for sufficiently low values of B and σ if $\kappa > [\delta(1 - \alpha)^2]^{-1}$. Otherwise, it increases u^N and $(g^N - \tilde{g})$.

(ii) reduces the inflation rate for sufficiently large n , but may increase π^N for given values of n if B is sufficiently high.

Proof :

(i) Differentiating u^N and $(g^N - \tilde{g})$ with respect to I leads respectively to :

$$\frac{\partial u^N}{\partial I} = \frac{(1 - \alpha) \delta F}{\{AI [nD^N - \delta(\kappa + 1) - I + \sigma(1 - \alpha)(n - 1)nD^N] + B\delta\}^2}$$

$$\frac{\partial (g^N - \tilde{g})}{\partial I} = \frac{-F}{\{AI [nD^N - \delta(\kappa + 1) - I + \sigma(1 - \alpha)(n - 1)nD^N] + B\delta\}^2}$$

where $C = [1 + \delta(1 - \alpha)^2]$, $D^N = I[\delta(1 - \alpha)^2 + 1] + (\kappa + 1)\delta$ and $F = AI^2 \{n[1 - \delta\kappa(1 - \alpha)^2] - 1\} + \sigma AI^2(1 - \alpha)(n - 1)nC + B[n(D^N + IC) - \delta]$.

The sign of these partial derivatives is determined by the sign of expression F which is a sum of three terms. The last two terms of F are positive and respectively calibrated by σ and B . The first term, however, is negative if $\kappa > [\delta(1 - \alpha)^2]^{-1}$. Hence, in this case, for sufficiently low values of σ and B the whole expression may eventually be negative.

(ii) The effect of an increase in the degree of central bank conservativeness on inflation is obtained by the partial derivative of expression (15) with respect to I :

⁸This study has already been undertaken by Fracasso and Ozkan (2004) in a broadly similar framework.

$$\frac{\partial \pi^N}{\partial I} = \frac{B\delta nC + AnCI [nD^N - \delta(\kappa + 1) - I + \sigma(1 - \alpha)(n - 1)nD^N]}{\{AI [nD^N - \delta(\kappa + 1) - I + \sigma(1 - \alpha)(n - 1)nD^N] + B\delta\}^2} - \frac{A(nD^N - \delta) [2nIC + \delta(\kappa + 1)(n - 1) - 2I + \sigma(1 - \alpha)(n - 1)n(IC + D^N)]}{\{AI [nD^N - \delta(\kappa + 1) - I + \sigma(1 - \alpha)(n - 1)nD^N] + B\delta\}^2}$$

The sign of this derivative depends on the sign of the expression in the numerator. This expression is composed of three terms, the two first of which are positive. The last one is negative and grows faster than the two others if n goes up. Thus, for high values of n , the whole expression may become negative. However, for sufficiently high B , the expression is positive whatever the values of n .

Proposition 1 indicates that the impact of I on the unemployment rate and the public expenditures depends on both, the labour market institutions and the fiscal policymaking (part *(i)*). Indeed, an increase in the degree of central bank conservativeness affects the macroeconomic performances by modifying the wage setters' behaviour.⁹ This modification operates via three distinct mechanisms.¹⁰

The first is due to the assumption that the unions are averse to inflation. In this case, they abstain from raising their nominal wages in order to moderate the inflationary temptations of the CB. We refer to this wage-moderating effect as the 'inflation aversion effect'. However, an increase in the CB degree of conservatism reduces the inflationary impact of higher wage demands.¹¹ Thus, it attenuates the 'inflation aversion effect' and thereby leads unions to increase their wages.

The second mechanism appears when there is more than one union in the economy and some competition among them. Indeed, each union knows that when it raises its nominal wage in order to obtain an increase in its real wage, it also has to accept an increase in its *relative wage* and thereby a deterioration in competitiveness. This induces it to moderate its wage claims. We refer to this second wage-moderating effect as the 'competition effect'. However, the higher is I , the higher is the impact of an increase in w_i on $(w_i - \pi^N)$ and thus, the lower is the increase in the relative wage the union has to accept to obtain a one unit increase in its real wage.¹² To say

⁹Indeed, we have observed above that the labour market distortions caused by excessive wage claims are the unique source of deviation of the economic outcomes from their target. Thus, a change in I affects the macroeconomic performances only through the wage setters' behaviour.

¹⁰As will become clear in section 5, these mechanisms are also crucial for the understanding of the workings of the monetary union enlargement.

¹¹The inflationary impact of an increase in the union i 's nominal wage is measured by s^N as defined in relation (14). It is easy to observe that s^N is decreasing in I .

¹²The impact of w_i on $(w_i - \pi^N)$ is obtained by the derivative $\partial(w_i - \pi^N)/\partial w_i = (1 - s^N)$. Considering the definition of s^N given in (14), it is easy to see that $(1 - s^N)$ is

it differently, the more conservative the CB is, the less it is costly for the unions, in terms of competitiveness (relative wage), to raise their own real wage. As a result, an increase in I mitigates the ‘competition effect’ and thereby induces unions to demand higher wages.

Whereas these two mechanisms have already been identified by Cukierman and Lippi (1999), the third mechanism is novel and hinges on the fiscal policymaking. According to the relation (13), the FA reacts to an increase in the aggregate nominal wage by reducing the taxes. As Stackelberg leaders, unions are aware of this fiscal reaction. They understand that it helps to reduce the negative impact which their wage claims have on labour demand. This, in turn, induces them to behave more aggressively. This wage-increasing effect, labelled the ‘fiscal policy effect’, is yet affected by the monetary authority’s conservativeness. Indeed, an increase in I yields a less inflationary monetary policy and thus is likely to generate both, a reduction in the seigniorage revenue for the financing of the public expenditures and a lower labour demand. As has already been pointed out above (see section 3.1), the way the FA adjusts its decisions to this tighter monetary policy depends on the value of the parameter κ , representing the money holdings. If $\kappa < [\delta(1 - \alpha)^2]^{-1}$, the FA adopts a less tight fiscal stance by accruing the diminution of taxes in response to a wage increase.¹³ As a consequence, the ‘fiscal policy effect’ is amplified and the unions are induced to raise their wage claims. In this case, this third mechanism adds to the two first so that a move towards more conservatism translates into less wage discipline and thus higher unemployment and public spending deviations. At the opposite, if $\kappa > [\delta(1 - \alpha)^2]^{-1}$, a rise in I leads to more fiscal restraint, thereby limiting the reduction of taxes in response to wage hikes and mitigating the ‘fiscal policy effect’.¹⁴ This, in turn, renders the labour demand more sensitive to wage claims and disciplines unions. Hence, with relatively small money holdings, the third mechanism we identified, leads to a less aggressive wage behaviour. In this case, a more conservative CB may eventually favour wage moderation, thereby reducing unemployment and the deviations of public spending from the target if this third mechanism dominates. This occurs if B and σ , which respectively calibrate the first and the second mechanism, are sufficiently low.

The second part of proposition 1 (part (ii)) establishes that a higher degree of monetary conservatism may be counterproductive and raise inflation for a sufficiently small number n of unions in the economy. The intuition to this result is as follows. I has two opposing effects on the inflation rate: a direct negative effect as highlighted in Rogoff (1985) and an indirect effect operating through the wage setting behaviour. This latter effect can be

increasing in I .

¹³Indeed, we observe that the impact of a one-unit increase in w_i on the taxes, as defined by v^N in relation (14), is decreasing in I if $\kappa < [\delta(1 - \alpha)^2]^{-1}$.

¹⁴ v^N is increasing with respect to I if $\kappa > [\delta(1 - \alpha)^2]^{-1}$.

positive since a more conservative CB may lead to less wage discipline, in particular, when the unions are highly inflation averse (see the first mechanism described above). With a relatively centralised labour market, that is with a low value of n , this indirect positive effect eventually prevails. However, if the labour market is decentralised (large n), the unions will be too small to internalise a monetary regime change into their wage decisions. In this case, the direct negative effect dominates and the CB conservatism recovers its decreasing effect on inflation.

Next, we also examine the impact of the FA's preferences on the macroeconomic outcomes. According to the expressions (15) through (18), the macroeconomic performances only depend on δ , the weight the FA attaches on its public spending objective. The impact of this parameter on the economic outcomes is described in the following proposition.

Proposition 2 *An increase in the weight that the FA attributes to its public spending objective reduces unemployment, inflation and the deviations of the public spending ratio from its target.*

Proof : The impact of an increase in δ on u^N , π^N and $g^N - \tilde{g}$ is respectively obtained from the following derivatives.

$$\begin{aligned} \frac{\partial u^N}{\partial \delta} &= \frac{-I^2(1-\alpha)\{AI\{n[1+I(1-\alpha)^2]-1+\sigma(n-1)(1-\alpha)n\}+Bn\}}{\{AI[nD^N-\delta(\kappa+1)-I+\sigma(1-\alpha)(n-1)nD^N]+B\delta\}^2} < 0 \\ \frac{\partial \pi^N}{\partial \delta} &= \frac{-\{AI\{n[1+I(1-\alpha)^2]-1+\sigma(n-1)(1-\alpha)n\}+Bn\}}{\{AI[nD^N-\delta(\kappa+1)-I+\sigma(1-\alpha)(n-1)nD^N]+B\delta\}^2} < 0 \\ \frac{\partial (g^N - \tilde{g})}{\partial \delta} &= \frac{AI^2\{(nD^N-\delta)[nD^N-\delta(\kappa+1)-I]+\delta n[1+I(1-\alpha)^2]-\delta\}}{\delta^2\{AI[nD^N-\delta(\kappa+1)-I+\sigma(1-\alpha)(n-1)nD^N]+B\delta\}^2} \\ &+ \frac{\sigma I(n-1)(1-\alpha)n(nD^N-\delta+\delta I)+B\delta(nD^N+nI-\delta)}{\delta^2\{AI[nD^N-\delta(\kappa+1)-I+\sigma(1-\alpha)(n-1)nD^N]+B\delta\}^2} > 0 \end{aligned}$$

where $C = [1 + \delta(1 - \alpha)^2]$ and $D^N = IC + (\kappa + 1)\delta$.

The difference $(g^N - \tilde{g})$ is negative. Thus, a positive derivative of $(g^N - \tilde{g})$ with respect to δ means that the deviation of g^N from \tilde{g} is decreasing in δ .

According to this proposition, an increase in the weight assigned by the FA to its public spending objective has a beneficial impact on the economic performances. This is due to the fact that a higher δ leads to more wage discipline in the economy. Indeed, an increase in δ affects the wage setting behaviour via the three effects already described above.

First, if the FA attributes a higher weight to public expenditures, it is less willing to decrease taxes in response to wage hikes.¹⁵ This implies that

¹⁵The impact of a one-unit wage increase on taxes, as represented by $v^N < 0$, is positively related to δ .

the ‘fiscal policy effect’ is weakened. As a result, the labour demand becomes more sensitive to wages, thus obliging unions to more wage restraint.

Then, since an increase in δ leads to a tighter fiscal stance, it also augments the CB’s incentive to create inflation in response to wage increases and thereby exacerbates the inflationary consequences of higher wage claims.¹⁶ Thus, a higher δ strengthens the ‘inflation aversion effect’, leading unions to adopt a less aggressive wage strategy.

Finally, by amplifying the inflationary consequences of wage demands, the increase in δ also reduces the positive impact of nominal wage hikes on the real wage.¹⁷ Hence, to obtain an increase in their real wage, unions have to accept a higher increase in their relative wage. This implies that an increase in their real wage becomes more costly in terms of competitiveness. Thus, as the ‘competition effect’ is intensified, unions are induced to moderate their wage demands.

3.4.2 Labour market structure and economic outcomes

The macroeconomic performances also depend on the parameters that characterise the structure of the labour market. The following propositions summarize our findings.

Proposition 3 *The higher is the degree of labour substitutability (σ), the lower are the unemployment and inflation rates as well as the deviations of public spending from the target level.*

The intuition for this result is simple. A high degree of labour substitutability is associated with a strong ‘competition effect’ between unions. This implies that the labour demand function is extremely sensitive to variations in the relative wage. In this case, unions are induced to behave less aggressively, thus improving the macroeconomic performances in the economy.

Proposition 4 *A move towards more decentralisation of the labour market (increase in n) has a negative impact on unemployment, inflation and deviations of the public spending from the target if $B < \frac{AI}{\delta} [\mu_1 + \delta\kappa + \sigma(1 - \alpha)(D^N - \delta)] \equiv B_c$. This impact is positive at low n and negative at large n if $B > B_c$.*

Proof : The impact of an increase in n on u^N , π^N and $g^N - \tilde{g}$ is obtained from the following derivatives.

¹⁶Indeed, s^N , which measures the inflationary impact of a one-unit increase in wages, is positively related to δ .

¹⁷The impact of w_j on $(w_j - \pi)$, represented by $(1 - s^N)$, is decreasing in δ .

$$\begin{aligned} \frac{\partial u^N}{\partial n} &= \frac{D^N I (1 - \alpha) G}{\{AI [nD^N - \delta (\kappa + 1) - I + \sigma (1 - \alpha) (n - 1) nD^N] + B\delta\}^2} \\ \frac{\partial \pi^N}{\partial n} &= \frac{\delta D^N G}{\{AI [nD^N - \delta (\kappa + 1) - I + \sigma (1 - \alpha) (n - 1) nD^N] + B\delta\}^2} \\ \frac{\partial (g^N - \tilde{g})}{\partial n} &= \frac{-ID^N G}{\{AI [nD^N - \delta (\kappa + 1) - I + \sigma (1 - \alpha) (n - 1) nD^N] + B\delta\}^2} \end{aligned}$$

where $G = -AI \{ \mu_1 + \delta \kappa + \sigma(1 - \alpha) [n(nD^N - 2\delta) + \delta] \} + B\delta$.

The sign of these derivatives is determined by the sign of expression G , which is monotonically decreasing in n . Thus, if G is negative for $n = 1$ – this is the case if $B < \frac{AI}{\delta} [\mu_1 + \delta \kappa + \sigma(1 - \alpha)(D^N - \delta)] \equiv B_c$ – it remains negative for all values of n . Otherwise, it becomes negative for sufficiently large n .

The ambiguous impact of labour market decentralisation on macroeconomic performances is the result of three mechanisms operating in opposite directions through the wage setters' behaviour.

The first mechanism is related to a mitigation of the 'inflation aversion effect'. Indeed, an increase in the number of unions in the economy reduces the inflationary consequences of individual wage claims.¹⁸ This alleviates the unions' fear of inflation, leading them to less wage discipline.

The second mechanism is inverse and operates through an amplification of the 'competition effect'. In fact, a higher degree of wage bargaining decentralisation renders the labour market more competitive. Therefore, it reduces the unions' market power and moderates their wage demands.

Finally, the third mechanism concerns the 'fiscal policy effect'. The increase in n also attenuates the diminution in taxes decided by the FA in reaction to wage hikes.¹⁹ This renders each individual union's wage demand more costly in terms of reduced labour demand and forces it to behave less aggressively.

The first mechanism implies that an increase in the degree of decentralisation of the labour market translates into higher wage claims and thus deteriorates the economic performances. It is calibrated by B , the parameter measuring the unions' aversion to inflation. Hence, if this aversion is higher than the threshold B_c , the first mechanism eventually dominates at low levels of n . In this case, unemployment, inflation (and the deviations of public expenditures from their target) display a hump-shaped relation with the degree of wage bargaining decentralisation as shown in Calmfors and Driffill (1988). However, if the unions have little concern for price stability ($B < B_c$), the two last mechanisms dominate. In this case, more decentrali-

¹⁸The impact $s^N > 0$ is decreasing with respect to n .

¹⁹The impact $v^N < 0$ is increasing with respect to n .

sation of the labour market leads to an improvement of the macroeconomic outcomes.

4 Enlargement of the monetary union

Having established the interactions between monetary, fiscal and labour market institutions in a single economy, we now shift our attention to these interactions in a monetary union (MU) composed of two countries. Let us represent the current members of the MU by country 1 and the new entering members by country 2. We allow for cross-country differences in the size of the economies, the structure of the labour markets and the preferences of the FAs.²⁰ This allows us to study how the effects of the MU expansion vary across the current and entering members, depending on these structural parameters.

With the MU enlargement (superscript U), the monetary policy is now centralised in the hands of a larger CB (CCB) which sets the common inflation rate prevailing in both countries.²¹ We assume that institutional monetary parameters such as the degree of central bank conservativeness are unaltered by the extension of the MU. Hence, the CCB's loss function is given by (6) where the inflation and unemployment arguments now correspond to the extended MU area-wide measures:

$$\Omega^{CCB} = I (\pi^U)^2 + \bar{u}^2 \quad I > 0 \quad (19)$$

where π^U and $\bar{u} = \gamma u_1 + (1 - \gamma)u_2$ respectively define the common inflation rate and the average unemployment rate in the extended MU ; $\gamma = \frac{L_1}{L_1 + L_2}$ and $(1 - \gamma) = \frac{L_2}{L_1 + L_2}$ denote the relative size of both economies.²²

The FAs retain their national status, so that their objective function is still given by equation (8). Their budget constraint now relates the public spending to national taxes plus seigniorage received from the CCB. The budget constraint of government in country j ($j = 1, 2$) is then described by:

$$g_j = \kappa \pi^U + \tau_j \quad (20)$$

²⁰Concerning the FAs, we assume that the weight which they attribute to their public spending objective differs across countries so that: $\delta_1 \neq \delta_2$. The public spending target \tilde{g} however is identical in both countries.

²¹We admit that the goods market of country 1 and 2 are perfectly integrated. Thus the MU enlargement implies a common inflation rate in both countries.

²²Hence, we suppose that the relative weight of each country in the decision process of the CCB corresponds to its economic size. This differs from the decision process in the European Central Bank (ECB) where the "one country, one vote" principle applies. Berger and Hefeker (2005) studied the impact of the voting right distribution in the ECB council on macroeconomic performances. They showed that attributing a voting weight that is different from the country's relative economic size can be beneficial.

The timing of the game remains unchanged. So we begin by determining the policymakers' choice.

The CCB minimises (19) with respect to π^U taking nominal wages and tax rates set in both countries as given. This yields the following reaction function:

$$\pi^U = \frac{\bar{w} + \bar{\tau}}{1 + (1 - \alpha)^2 I} \quad (21)$$

where $\bar{w} = \gamma w_1 + (1 - \gamma)w_2$ and $\bar{\tau} = \gamma\tau_1 + (1 - \gamma)\tau_2$ respectively define the average nominal wage and the average tax rate in the extended MU.

As for the national FAs, they choose the tax rate such as to minimise their loss function under the budget constraint (20) taking the aggregate nominal wage and the common inflation rate as given. This leads to the following fiscal reaction in country 1:²³

$$\tau_1^U = \frac{-w_1 + [1 - \kappa \delta_1 (1 - \alpha)^2] \pi^U + \delta_1 (1 - \alpha)^2 \tilde{g}}{1 + (1 - \alpha)^2 \delta_1} \quad (22)$$

Then we derive the Nash equilibrium of the game between the CCB and the national FAs. This is done by combining the monetary and fiscal reactions (equation (22) and its counterpart for country 2's FA) so that we obtain π^U and τ_1^U (τ_2^U) in terms of aggregate nominal wages.

$$\pi^U = \frac{w_1 \delta_1 \gamma C_2 + w_2 \delta_2 (1 - \gamma) C_1 + [\delta_1 \gamma C_2 + \delta_2 (1 - \gamma) C_1] \tilde{g}}{D^U} \quad (23)$$

$$\begin{aligned} \tau_1^U &= \frac{w_1 \{-D^U + \delta_1 \gamma C_2 [1 - \delta_1 \kappa (1 - \alpha)^2]\} + w_2 \delta_2 (1 - \gamma) C_1 [1 - \delta_1 \kappa (1 - \alpha)^2]}{D^U C_1} \\ &+ \frac{\tilde{g} [IC_2 \delta_1 (1 - \alpha)^2 + \delta_1 \gamma C_2 + \delta_2 (1 - \gamma) C_1]}{D^U} \end{aligned} \quad (24)$$

where $C_1 = 1 + \delta_1 (1 - \alpha)^2$, $C_2 = 1 + \delta_2 (1 - \alpha)^2$ and $D^U = IC_1 C_2 + (\kappa + 1) [\delta_1 \gamma C_2 + \delta_2 (1 - \gamma) C_1]$.

We now turn to the resolution of the labour unions' problem. All the unions (of country 1 and 2) play a Nash game against each other, while they continue to act as Stackelberg leaders vis-à-vis the monetary and fiscal authorities. Thus, if we consider union i in country 1 (henceforth union $i1$), it minimises its loss function (3) subject to the reactions of the CCB (23) and the national FA (24), taking the nominal wages of other unions, at home and abroad, as given.

²³In this article, we will only present the results for country 1. Obviously, analogous expressions hold for country 2.

At the Nash symmetric equilibrium between all the unions ($w_{ij} = w_j, \forall i$ and j), the aggregate nominal wage in country 1 is given by:

$$w_1^U = -\tilde{g} + \frac{(1 - s_1^U) \{A\phi_2^U \delta_2 [IC_1 + (\kappa + 1) \delta_1 \gamma] + Bs_2^U C_1 \delta_2 (1 - \gamma)\}}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} - \frac{(1 - s_2^U) \{-A\phi_1^U \delta_1 \delta_2 (1 - \gamma) (\kappa + 1) + Bs_1^U C_1 \delta_2 (1 - \gamma)\}}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} \quad (25)$$

where $\phi_1^U = 1 - s_1^U + v_1^U + \sigma_1 (n_1 - 1) (1 - \alpha)$, $s_1^U = \frac{C_2 \delta_1 \gamma}{n_1 D^U}$ and $v_1^U = \frac{-D^U + C_2 \delta_1 \gamma [1 - \delta_1 \kappa (1 - \alpha)^2]}{n_1 D^U C_1}$. Expressions ϕ_2^U , s_2^U and v_2^U are respectively the counterparts of ϕ_1^U , s_1^U and v_1^U for country 2.

Then we incorporate this expression into the monetary and fiscal reaction functions (equations (23) and (24)) in order to obtain the equilibrium values of the inflation and tax rates.

$$\pi^U = \frac{(1 - s_1^U) \phi_2^U \gamma + (1 - s_2^U) \phi_1^U (1 - \gamma)}{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]} > 0 \quad (26)$$

$$\tau_1^U = \tilde{g} - \frac{(1 - s_1^U) \delta_2 \{A\phi_2^U [I + \kappa \delta_1 \gamma] + Bs_2^U (1 - \gamma)\}}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} + \frac{(1 - s_2^U) \delta_2 \{-A\phi_1^U \delta_1 \kappa (1 - \gamma) + Bs_1^U (1 - \gamma)\}}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} \quad (27)$$

In integrating these results into relations (7) and (9), we finally obtain the equilibrium unemployment rate and public expenditures.

$$u_1^U = \frac{AI(1 - s_1^U) \phi_2^U (1 - \alpha) + B(1 - \alpha) (1 - \gamma) (s_2^U - s_1^U)}{A \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} > 0 \quad (28)$$

$$g_1^U = \tilde{g} - \frac{(1 - s_1^U) \delta_2 \{AI\phi_2^U + Bs_2^U (1 - \gamma)\}}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} + \frac{(1 - s_2^U) \delta_2 Bs_1^U (1 - \gamma)}{A\delta_1 \delta_2 \{AI\phi_1^U \phi_2^U + B[\phi_1^U s_2^U (1 - \gamma) + \phi_2^U s_1^U \gamma]\}} \quad (29)$$

Now that we have determined the equilibrium values observed in both countries after the MU enlargement, we can compare them with the equilibrium values observed in the closed economy set up.

5 The effects of the monetary union enlargement

This section investigates the effects of the MU extension on macroeconomic performance as characterised by unemployment, inflation and the deviations of the public expenditures from their target. We first analyse these effects in the case of a MU enlargement between two countries that are identical in every respect. We then take into account the possibility of existing asymmetries in the labour market structures, in the FAs' preferences and in the relative size of the current (country 1) and new (country 2) member countries. For this case, we simplify our analysis by assuming that the unions do not care about inflation ($B = 0$).

5.1 The symmetric case

In order to highlight the different mechanisms through which the MU enlargement may affect the macroeconomic performances, it is useful to begin our analysis from the case where countries are identical in their relative size ($\gamma = (1 - \gamma) = 1/2$), fiscal preferences ($\delta_1 = \delta_2 = \delta$), number of unions ($n_1 = n_2 = n$) and degree of labour substitutability ($\sigma_1 = \sigma_2 = \sigma$).

By substituting these parametric values into (26) through (18), we obtain the equilibrium macroeconomic performances in the symmetric case.

$$\pi^U = \frac{(1 - s^U)}{AI\phi^U + Bs^U} > 0 \quad (30)$$

$$u^U = \frac{I(1 - s^U)(1 - \alpha)}{AI\phi^U + Bs^U} > 0 \quad (31)$$

$$g^U = \tilde{g} - \frac{I(1 - s^U)}{\delta(AI\phi^U + Bs^U)} < \tilde{g} \quad (32)$$

where $\phi^U = 1 - s^U + v^U + \sigma(n - 1)(1 - \alpha)$, $s^U = \frac{\delta}{2n\{I[\delta(1-\alpha)^2+1]+(\kappa+1)\delta\}}$ and $v^U = \frac{-\{I[\delta(1-\alpha)^2+2]+(2\kappa+1)\delta\}}{2n[\delta(1-\alpha)^2+1]\{I[\delta(1-\alpha)^2+1]+(\kappa+1)\delta\}}$.

Now we can compare these outcomes with those observed in the closed economy set up. In doing this, we derive the following proposition.

Proposition 5 *If $\kappa > [\delta(1 - \alpha)^2]^{-1}$, the enlargement of the MU is likely to reduce unemployment (u), inflation (π) and deviations of the public expenditures from their target ($g - \tilde{g}$) in the current and new member countries for sufficiently low values of B and σ .*

If $\kappa < [\delta(1 - \alpha)^2]^{-1}$, the enlargement of the MU unambiguously increases u , π and ($g - \tilde{g}$) at all levels of B and σ .

Proof: The comparison of expressions (30), (31) and (32) respectively with (15), (17) and (18) reveals that the enlargement of the MU has a negative impact on inflation, unemployment and deviations of the public expenditures from their target if the following condition holds:

$$H = AI \{n [1 - \delta\kappa(1 - \alpha)^2] - 1\} + AI\sigma(1 - \alpha)(n - 1)n[1 + \delta(1 - \alpha)^2] + Bn[1 + \delta(1 - \alpha)^2] < 0.$$

This condition is composed of three terms, the last two of them are positive. The first term, however, is negative if $\kappa > [\delta(1 - \alpha)^2]^{-1}$. In this case, the whole expression H may be negative for sufficiently low values of σ and B , respectively calibrating the second last and the last term.

To understand the underlying intuition of this proposition, we must note that the overall impact of the MU enlargement on the macroeconomic performances originates from similar mechanism that those appearing with an increase in the degree of CB conservativeness.

Indeed, with the MU enlargement, the unions of both, the current and new member countries, become smaller relative to the monetary authority and thereby observe a diminution of the inflationary impact of their wage decisions.²⁴ This affects their strategic behaviour via two separate mechanisms. The first operates through a mitigation of the ‘inflation aversion effect’ and the second operates through a mitigation of the ‘competition effect’, both inducing the unions to behave more aggressively. These two mechanisms have already been highlighted by Cukierman and Lippi (2001) concerning the repercussions of the switch to a MU on the economic outcomes.

Yet, by extending Cukierman and Lippi’s framework to the fiscal policymaking, we managed to detect a third mechanism. Whether it yields an increase or a decrease in wages depends on the value of the parameter κ , representing the money holdings. Indeed, as we saw above, the larger CB reacts to a wage rise in each country to a less inflationary manner. This also leads the national FAs to modify their reaction to wage decisions in their country. If $\kappa > [\delta(1 - \alpha)^2]^{-1}$, the FAs’ reaction is amplified. This means that if they observe an increase in the aggregate nominal wage, they reduce the tax rate to a greater extent.²⁵ This, in turn, strengthens the ‘fiscal policy effect’ and induces the unions to demand higher wages. In this case, the three mechanisms lead to less wage discipline and thereby translate into a deterioration in the macroeconomic performances. However, if $\kappa < [\delta(1 - \alpha)^2]^{-1}$, the FAs’ tax-decreasing reaction to wages is attenuated.²⁶ By mitigating the ‘fiscal policy effect’, this renders the labour demand more responsive to wages and thereby disciplines the unions. In this case, the overall impact that the MU expansion has on the macroeconomic performances is beneficial if this third mechanism dominates. This scenario may occur for sufficiently low values of B and σ calibrating the others mechanisms.

²⁴In technical terms, this means that $s_{ij}^U < s_{ij}^N, \forall i, j$.

²⁵Formally, in this case, we observe that $v_{ij}^U < v_{ij}^N < 0, \forall i, j$.

²⁶This signifies that $v_{ij}^N < v_{ij}^U < 0, \forall i, j$.

5.2 The case of heterogeneous countries

We now study how the effects of the MU enlargement may vary across the (current and new) member countries, depending on their economic size, the structure of their labour market and the preferences of their FAs. We study these effects under the assumption that unions are not inflation averse, which formally means that: $B = 0$.

In this case, expressions for the equilibrium unemployment and public expenditures observed in country 1 after the MU enlargement reduce to:

$$u_1^U = \frac{(1 - s_1^U)(1 - \alpha)}{A\phi_1^U} > 0 \quad (33)$$

$$g_1^U = \tilde{g} - \frac{(1 - s_1^U)}{A\delta_1\phi_1^U} \quad (34)$$

If we look at these expressions more in detail, we observe that, when $B = 0$, equilibrium unemployment and public expenditures in country 1 do not depend on the structural features of the labour market in country 2. However, they depend on the country 2's FA preferences. Comparison of expressions (33) and (34) with those obtained under the closed economy set up (where we also assume that $B = 0$) leads to the following proposition.

Proposition 6 *If unions do not care about price stability ($B = 0$)*

(i) and $\kappa > [\delta(1 - \alpha)^2]^{-1}$ then the enlargement of the MU is likely to reduce unemployment (u_j) and deviations of the public expenditures from their target ($g_j - \tilde{g}$) in the countries characterised by low levels of labour market decentralisation (n_j) and competitiveness (σ_j). However, if $\kappa < [\delta(1 - \alpha)^2]^{-1}$ the MU enlargement increases u_j and ($g_j - \tilde{g}$) in the member countries whatever the structure of their labour market.

(ii) then the (positive or negative) effect of the MU enlargement on u_j and ($g_j - \tilde{g}$) is decreasing in the country's relative economic size.

(iii) then the (positive or negative) effect of the MU enlargement on u_j and ($g_j - \tilde{g}$) is increasing in the weight assigned by the other country's FA on public expenditures.

Proof: If $B = 0$, the difference between u_1^U and u_1^N , on the one hand, and between ($g_1^U - \tilde{g}$) and ($g_1^N - \tilde{g}$), on the other hand, respectively reduce to:²⁷

$$u_1^U - u_1^N = \frac{\delta_1(1 - \alpha)(1 - \gamma)[IC_2 + \delta_2(\kappa + 1)]}{A\phi_1^U\phi_1^N D^U [IC_1 + \delta_1(\kappa + 1)]} K$$

²⁷The same demonstrations hold for country 2.

$$g_1^U - g_1^N = -\frac{(1-\gamma)[IC_2 + \delta_2(\kappa+1)]}{A\phi_1^U \phi_1^N D^U [IC_1 + \delta_1(\kappa+1)]} K$$

$$\text{where } K = \frac{n[1-\delta_1\kappa(1-\alpha)^2]-1}{n_1^2} + \frac{\sigma_1(1-\alpha)(n_1-1)[1+\delta_1(1-\alpha)^2]}{n_1}.$$

(i) The sign of these differences depends on the sign of K . This expression may be negative if $\kappa > [\delta_1(1-\alpha)^2]^{-1}$ and if σ_1 and n_1 are sufficiently low since $\partial K/\partial\sigma = (1-\alpha)(n_1-1)[1+\delta_1(1-\alpha)^2]n_1^{-1} > 0$ and $\partial K/\partial n_1 = \{-n_1[1-\delta_1\kappa(1-\alpha)^2] + 2\}n_1^{-3} > 0$ for $\kappa > [\delta_1(1-\alpha)^2]^{-1}$.

Moreover, by differentiating $(u_1^U - u_1^N)$ and $(g_1^U - g_1^N)$ with respect to γ and δ_2 , we obtain:

$$(ii) \frac{\partial(u_1^U - u_1^N)}{\partial\gamma} = \frac{-\delta_1(1-\alpha)KC_2[IC_2+\delta_2(\kappa+1)]\{I(n_1C_1-1)+(n_1-1)[\sigma_1n_1(1-\alpha)IC_1+\delta_1(\kappa+1)[\sigma_1n_1(1-\alpha)+1]]\}}{An(\phi_1^U D^U)^2 \phi_1^N [IC_1+\delta_1(\kappa+1)]}$$

$$\frac{\partial(g_1^U - g_1^N)}{\partial\gamma} = \frac{KC_2[IC_2+\delta_2(\kappa+1)]\{I(n_1C_1-1)+(n_1-1)[\sigma_1n_1(1-\alpha)IC_1+\delta_1(\kappa+1)[\sigma_1n_1(1-\alpha)+1]]\}}{An(\phi_1^U D^U)^2 \phi_1^N [IC_1+\delta_1(\kappa+1)]}$$

The sign of these two derivatives are respectively negatively and positively related to the sign of K .

$$(iii) \frac{\partial(u_1^U - u_1^N)}{\partial\delta_2} = \frac{\gamma\delta_1(1-\alpha)(1-\gamma)(\kappa+1)K\{I(n_1C_1-1)+(\kappa+1)\delta_1(n_1-1)+\sigma_1n_1(1-\alpha)(n_1-1)[IC_1+\delta_1(\kappa+1)]\}}{An(\phi_1^U D^U)^2 \phi_1^N [IC_1+\delta_1(\kappa+1)]}$$

$$\frac{\partial(g_1^U - g_1^N)}{\partial\delta_2} = \frac{-\gamma(1-\gamma)(\kappa+1)K\{I(n_1C_1-1)+(\kappa+1)\delta_1(n_1-1)+\sigma_1n_1(1-\alpha)(n_1-1)[IC_1+\delta_1(\kappa+1)]\}}{An(\phi_1^U D^U)^2 \phi_1^N [IC_1+\delta_1(\kappa+1)]}$$

The sign of these two derivatives are respectively positively and negatively related to the sign of K .

If unions do not care about price stability, the overall impact of the MU extension on unemployment and public expenditures is triggered by only two mechanisms.²⁸ They rely on the 'competition' and 'fiscal policy effects'. On one hand, with the MU extension, the larger monetary authority responds in a less inflationary manner to wage claims. As a consequence, any given rise in the real wage becomes less costly in terms of loss of competitiveness, encouraging unions to behave more aggressively. On the other hand, the MU extension also forces the national FA to modify its strategy. Two cases appear. If $\kappa < [\delta_1(1-\alpha)^2]^{-1}$, the FA will soften its policy by reducing taxes to a greater amount in reaction to wage increases. This will encourage unions to demand higher wages. At the opposite, if $\kappa > [\delta_1(1-\alpha)^2]^{-1}$, the FA will choose to tighten its strategy by providing less accommodation (less reduction of taxes) of wage increases, thereby favouring wage moderation. According to part (i) of the proposition, whether, in this case, the overall impact of the MU expansion on macroeconomic performances is beneficial or not depends on some structural features of the national labour market. In particular, when the degrees of wage bargaining decentralisation (n) and

²⁸In effect, in this case, the mechanism relying on the 'inflation aversion effect' does not operate.

labour substitutability (σ) are low, the latter mechanism may dominate the former, and the MU expansion may be conducive to less unemployment and deviations of public expenditures from their target. This happens because the mechanism relying on wage competition among unions is weak for low values of n and σ .

The intuition underlying part (ii) of the proposition is obvious. In effect, in large countries, the unions experience a lower decrease in their relative size than in small countries as a result of the MU enlargement. Thus, they modify their wage setting behaviour to a lesser extent, which also translates into a lower change in the macroeconomic performances. In particular, if $\gamma = 1$, the macroeconomic outcomes observed in country 1 after the MU enlargement correspond to those observed in the closed economy set up.

Finally, part (iii) of the proposition states that the (negative or positive) impact of the MU enlargement on a country's economic outcomes is increasing in the weight that the other country's FA puts on its public spending objective. More concretely, this means, for example, that the more the FA in country 2 is concerned about public spending (δ_2 high), the larger is the overall impact of the MU enlargement in country 1. The reason is that if δ_2 is high, the CCB knows that the FA in country 2 will implement a tough policy, thus accommodating wage increases into a relatively small extent. In order to offset the contractionary effect that this fiscal strategy may have on the labour demand in country 2, the CCB will respond to wage increases in this country in a more inflationary manner. This, however, obliges it to moderate its inflationary response to wage increases in country 1, thereby amplifying the mechanisms through which the MU enlargement affects macroeconomic outcomes in this country.

Next, we turn to the effects of the MU enlargement on inflation. Under the assumption that $B = 0$, the equilibrium inflation rate observed in the enlarged currency area is given by:

$$\pi^U = \gamma \frac{(1 - s_1^U)}{AI\phi_1^U} + (1 - \gamma) \frac{(1 - s_2^U)}{AI\phi_2^U} \quad (35)$$

Not surprisingly, the equilibrium inflation rate in the enlarged MU is a function of the relative size and the labour market structures of the two countries. As can be seen, the greater a member country is, the more the common inflation rate will depend on the structural features of its labour market.

By comparing π^U with the inflation rate in country 1 before the MU enlargement (under the assumption that $B = 0$)

$$\pi^U - \pi_1^N = \gamma \frac{(1 - s_1^U)}{AI\phi_1^U} + (1 - \gamma) \frac{(1 - s_2^U)}{AI\phi_2^U} - \frac{(1 - s_1^N)}{AI\phi_1^N} \quad (36)$$

and rearranging, we obtain:

$$\pi^U - \pi_1^N = \left[\frac{(1 - s_1^U)}{AI\phi_1^U} - \frac{(1 - s_1^N)}{AI\phi_1^N} \right] + (1 - \gamma) \left[\frac{(1 - s_2^U)}{AI\phi_2^U} - \frac{(1 - s_1^U)}{AI\phi_1^U} \right] \quad (37)$$

According to this relation, the overall impact of the MU enlargement on inflation in country 1 can be seen as a consequence of two effects. The first operates through a change in the domestic unions' wage behaviour and the second hinges on the structural asymmetries between the current and the new member countries. A detailed analysis of expression (37) delivers the following proposition.

Proposition 7 *Under the assumption that unions do not care about price stability ($B = 0$), a single country can expect a fall in the inflation rate due to the MU enlargement if the labour market of its new partner country is sufficiently decentralised and competitive (respectively high n and σ).*

Proof: From (36), we calculate the partial derivatives of $(\pi^U - \pi_1^N)$ with respect to n_2 and σ_2 and observe that:

$$\frac{\partial(\pi^U - \pi_1^N)}{\partial n_2} = \frac{-(1-\gamma)C_2^2 D^U \{ \sigma_2(1-\alpha) [D^U n_2^2 - C^1 \delta_2(1-\gamma)(2n_2-1)] + C_1 \delta_2 \kappa(1-\gamma) + IC_1 + (\kappa+1)\delta_1 \gamma \}}{AI [D^U (C_2 n_2 - 1) - \delta_2^2 C_1 (1-\gamma)(1-\alpha)^2 (\kappa+1) + \sigma_2 n_2 (n_2 - 1)(1-\alpha) D^U C_2]^2} < 0$$

and $\frac{\partial(\pi^U - \pi_1^N)}{\partial \sigma_2} = \frac{-(1-\gamma)(n_2^2 - 1)(1-\alpha)(1 - s_2^U)}{(\phi_2^U)^2} < 0.$

The intuition underlying this result is simple. As suggested in propositions (3) and (4), if the labour market in country 2 is highly competitive and decentralised, the wage demands in this country will be relatively low. Country 1 will benefit from this wage moderation as the CCB then conducts a less inflationary policy.

6 Conclusion

The MU enlargement is quite likely to induce important interactions between monetary, fiscal and labour market institutions, thereby influencing macroeconomic variables. A recent strand of literature has shown that in the presence of unionised labour markets, a change in the monetary regime (such as a MU enlargement) affects both, real as well as nominal variables. This literature, however, abstracts from the fiscal policymaking. Another strand of literature has studied the effects of a monetary regime change on the interactions between fiscal and monetary policy, though considering that labour markets are perfectly competitive. Thus, each strand of literature focusses on one kind of interaction, ignoring the other. So far, the full consequences of the MU on the **three** ways interactions between fiscal, monetary and labour market institutions remain largely unexplored.

The main objective of this paper is to fill this void and thereby to complement these two strands of literature. To that end, we develop a MU model in which the common central bank strategically interacts with both, the national fiscal policymakers and the labour unions. We add two innovations to the existing literature cited above. First, we show how the change in the *policy mix* resulting from the MU enlargement modifies the strategic decisions of the non-atomistic wage setters and thereby affects the labour market outcomes. Second, we investigate how fiscal institutions may influence the impact of the MU enlargement on the wage-setting behaviour. On this issue, the main result of the paper is that we identify a condition, depending on fiscal policymaking parameters, under which the MU extension is likely to be beneficial. In particular, we find that for relatively large levels of money holdings, the MU extension may improve the macroeconomic performances in countries that are characterised by low degrees of labour substitutability and wage bargaining decentralisation. This optimistic conclusion, however, crucially hinges on the assumption that money holdings must be large. Yet, in modern economies with highly developed financial systems, money holdings tend to be quite small.

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