DEPARTMENT OF ECONOMICS

UNIVERSITY OF MILAN - BICOCCA

WORKING PAPER SERIES

Reconsidering the Pros and Cons of Fiscal Policy Co-ordination in a Monetary Union: Should We Set Public Expenditure Targets?

Marco Catenaro, Patrizio Tirelli

No. 30 - December 2000

Reconsidering The Pros and Cons of Fiscal Policy Co-ordination in a Monetary Union: Should We Set Public Expenditure Targets?

Marco Catenaro
University of Milano-Bicocca and
University of Surrey (UniS)

Patrizio Tirelli [*]
University of Milano-Bicocca and
University of Glasgow

First Draft - July 12, 1999

This Draft - September 6, 2000

Abstract

We reconsider the issues of fiscal policy interdependence in a monetary union, challenging the view that non co-ordination is always preferable. Moreover, we show that an expenditure bias occurs irrespective of the fiscal regime in place. We argue that a contractualist approach à la Walsh should be extended to the conduct of fiscal policy, setting explicit public expenditure targets.

[*] *Corresponding Author: Dipartimento di Economia Politica, Universita' di Milano-Bicocca, Edificio U6, P.zza dell' Ateneo Nuovo 1, 20126 Milan, Italy. Tel. ++39-02-64486592 Fax. ++39-02-64486585. Email: patrizio.tirelli@unimib.it.*

1. Introduction

Now that EMU has become a reality, there is a considerable debate on how fiscal policy should be managed in Europe. In fact, while monetary policy is under the sole responsibility of the European Central Bank (ECB), fiscal policies continue to be decentralised and implemented at the national level. Despite the ceilings set out by the Stability and Growth Pact (SGP), each fiscal authority (FA) will in fact remain free to decide its domestic levels of taxes and public expenditures. This means that significant macroeconomic effects are still likely to arise from fiscal choices.

In this paper we reconsider the issue taking into account the interdependence between the fiscal and the monetary regimes in place. On the fiscal side we obviously consider the alternative scenarios of co-ordination and non co-ordination among FAs. Conversely, on the monetary side we distinguish between an inflation targeting regime and delegation to a weight-conservative central bank. Our aim is to identify the most desirable fiscal regime for a given monetary policy rule.

A large body of literature suggests that decentralised fiscal policies cause a bias in inflation and public spending (Sibert 1992, Levine 1993, Levine and Pearlman 1998, Levine and Brociner 1994). Hence, lack of fiscal discipline is thought to provide a case in favour of fiscal policy co-ordination in a monetary union. Beetsma and Bovemberg (1998, B&B henceforth), however, have contested this result. They reconsider the issue in a model where distortionary taxes are used to finance public expenditures, as in Alesina and Tabellini (1987), but with the FAs behaving as Stackelberg leaders. In this case each FA acts strategically, perceiving that the output distortions caused by a tax increase will be partly offset by an inflation surprise. Yet, rational wage setters anticipate this, and the advantage of the fiscal policymaker eventually results into an inflation bias. Hence, fiscal policy co-ordination, which strengthens the strategic position of the

leader, turns out to be counterproductive. B&B, however, neglect the possibility that in a monetary union national FAs might have an incentive to boost domestic output through traditional open-economy (i.e. relative price) policies as in Levine and Pearlman (1998).

In this paper we develop an encompassing model accounting for both the B&B and the open-economy effects. We show that, if the latter is sufficiently strong, the B&B's argument is in fact reversed. We also analyse the fiscal responses to shocks.[1] By definition these do not affect expectations. Hence, under fiscal policy co-ordination, each FA correctly internalises the reaction of the other policymakers (including the ECB). It turns out that the relative strength of the open-economy and the B&B effects is crucial to explain the difference between co-ordinated and uncoordinated fiscal responses to shocks.

To assess the relative merits of the two fiscal scenarios, one must also take into account the specific features of the monetary regime in place. In this regard we show that a weight-conservative ECB unambiguously reduces systematic tax distortions by limiting the B&B effect under both regimes, although with different intensity. We identify the critical levels of weight conservatism such that co-ordination dominates and *vice versa*. If weight conservatism is replaced by an inflation target, the B&B effect strengthens. As a consequence, tax distortions increase under both fiscal scenarios. Our analysis shows that, even in this case, fiscal co-ordination is desirable if open-economy effects are sufficiently strong. Moving on to countercyclical policies, we find that co-ordination is generally preferable but for one case. This may occur if uncoordinated fiscal responses to symmetric shocks lead to stronger intervention thereby compensating for the ECB weight conservatism. We show that the relative strength of the open-economy/B&B effects once again determines the desirability of co-ordination.

---

[1] Countercyclical policies are often conceived as the exclusive domain of monetary policy, which provides a more flexible instrument. Yet, since both fiscal and monetary policies are useful stabilisation tools, what matters is whether fiscal policy is sufficiently flexible to respond to shocks. Empirical evidence suggests that European

Finally, we reconsider the design of optimal monetary and fiscal institutions suggesting further refinements in the arrangements regulating EMU fiscal policies. We claim that inefficient macroeconomic policies originate from lack of commitment both *vis-à-vis* the private sector (B&B) and among policymakers (open-economy effect). As a result, systematic tax distortions are too high for any fiscal regime in place. This suggests that novel institutional arrangements should be designed to achieve fiscal restraint, possibly along the lines of the contractualist approach inspiring the design of the SGP. We show that adverse incentives in the use of systematic tax policies can be eliminated by assigning to each FA a properly designed public expenditure target, in analogy with the popular inflation-targeting proposal (Svensson 1997). The intuition behind this result is rather simple. Tax rates are a fraction of governments' public expenditure targets, where such a fraction depends on the fiscal regime in place. Hence, institutional design may minimise tax distortions by properly reducing the public expenditure targets conditional on the fiscal regime. Our proposal gives specific content to the argument presented in Dixit and Lambertini (2000, a, b) who, using a different analytical framework, make a strong case for constitutional constraints on fiscal policy.

The paper proceeds as follows: sections 2 and 3 present the model and derive the main results, section 4 analyses the fiscal and monetary policy responses to both symmetric and asymmetric shocks, and section 5 sketches out a possible institutional arrangement for the conduct of national fiscal policies within EMU. Section 6 summarises and concludes.

2. The Model

We consider a monetary union characterised by a single monetary authority (ECB), which sets monetary policy for all countries, and by *n* decentralised FAs conducting policies at their

---

governments have made substantial use of their fiscal policies for stabilisation purposes (Arreaza, Sorensen and Yosha, 1998).

national level. The results concerning the desirability of fiscal policy co-ordination crucially depend on the introduction of a demand factor - public expenditure - in a model where distortionary taxes generate adverse supply-side effects and time inconsistency in monetary policy, as in Beetsma and Bovemberg (1998). Standard models (Alesina and Tabellini, 1987) neglect such an effect assuming that the central bank perfectly stabilises demand without consequences for the price level. This result still holds in our model at the union level, where a generalised increase in expenditures aiming to stimulate demand will be entirely offset by a monetary contraction. However, the ECB will be unconcerned with purely asymmetric effects originating from the domestic fiscal stances. It is indeed the incentive to manipulate the national fiscal stance that will drive our results.

Let us consider a monetary union consisting of n symmetric countries, each producing a differentiated good. Output supply in each country is defined as follows[2]:

$$x_i^s = p_i - \left(p^c \right)^e - t_i - \boldsymbol{e}_i \tag{1}$$

where p_i is the price of domestically produced goods, $(p^c)^e$ is the expected value of the consumer price level p^c, defined as:

$$p^c = p_i + \frac{\boldsymbol{g}}{n} \sum_{h=1}^{n} \left(p_h - p_i \right) \tag{2}$$

t_i is a distortionary tax on firms' revenues and $\boldsymbol{e}_i$ is a supply shock. We can decompose $\boldsymbol{e}_i$ as $\boldsymbol{e}_i = \boldsymbol{w}_i + \boldsymbol{m}$, where $\boldsymbol{w}_i$ and $\boldsymbol{m}$ are respectively a symmetric and a perfectly asymmetric shock. Substituting (2) into (1), straightforward manipulations show that:

---

[2] See Appendix I for the derivation of the model.

$$x_i = \boldsymbol{p} - \boldsymbol{p}^e - t_i - \frac{\boldsymbol{g}}{n} \sum_{h=1}^{n} (p_h - p_i) - \boldsymbol{e}_i = \boldsymbol{p} - \boldsymbol{p}^e - t_i + \bar{c} \left[g_i - \sum_{h=1}^{n} \left(\frac{g_h}{n} \right) \right] - \boldsymbol{e}_i \qquad (3)$$

where $\boldsymbol{p} - \boldsymbol{p}^e$ is the inflation surprise of the union wide consumer price index and

$g_i - \sum_{h=1}^{n} \left(\frac{g_h}{n} \right)$ is the domestic fiscal stance relative to the union average. The output impact of the

latter is described by the coefficient $\bar{c} < 1$ (see Appendix I for derivation and discussion).

Equation (3) shows that if the ECB controls the inflation rate, each FA can boost domestic

output in two ways, either through a reduction in the tax rate or by means of policies which

appreciate the real exchange rate, $-\frac{\boldsymbol{g}}{n} \sum_{h=1}^{n} (p_h - p_i)$. Such an appreciation occurs when domestic

expenditures increase *vis-a-vis* the rest of the union[3].

We assume that governments run balanced budgets, therefore we can write government

spending g_i as:

$$g_i = t_i \qquad (4)$$

where t_i is a distortionary tax on firms' revenues[4].

The loss function of the FAs is a traditional quadratic in output, inflation and expenditure

deviations from the target:

$$V^{FA} = \frac{1}{2} \left\{ \boldsymbol{a}_{pf} (\boldsymbol{p} - \tilde{\boldsymbol{p}})^2 + x_i^2 + \boldsymbol{a}_{gs} (g_i - \tilde{g})^2 \right\} \qquad (5)$$

---

[3] Equation (3) is a reduced form of an underlying structural model which does not necessarily imply a negative transmission of domestic fiscal policy on foreign demand.

where $\tilde{p}, \tilde{g}$ define the bliss points for inflation and public expenditure (Svensson 1997). Conversely, the loss function of the ECB depends on a weighted average of output in each country and on inflation:

$$V^{CB} = \frac{1}{2}\left\{ a_{pm}(p - \tilde{p})^2 + \frac{1}{n}\sum_{i=1}^{n}(x_i)^2 \right\}$$

(6)

The sequence of events follows Beetsma and Bovemberg (1998):

1. nominal wage contracts are signed;

2. shocks are observed;

3. the FAs set taxes and public expenditure conditional to the expected inflation rate and subject to (1) and (2);

4. the ECB sets inflation subject to (1) and (2) and taking taxes and expenditures as given.

3. Results with Systematic Policies

At this stage we neglect policy responses to shocks and start solving the game by backward induction. Our aim is to compute the equilibrium solutions for distortionary taxes under the monetary delegation schemes of *i) weight-conservatism* and *ii) inflation targeting* and the two fiscal policy scenarios of non co-ordination (FPNC) and co-ordination (FPC) respectively.

3.1 *Weight conservatism*

We start by assuming that monetary policy is delegated to a weight-conservative central banker ($a_{pm} > a_{pf}$). Recalling the definition of x_i given in (3), the central bank's reaction function is:

---

[4] Our results would not change if we were to consider distortionary income taxes.

$$p = \frac{1}{1+a_{pm}} \left\{ a_{pm}\tilde{p} + p^e + \frac{1}{n}\sum_{i=1}^{n}(t_i) \right\} \qquad (7)$$

On the fiscal side, each FA sets the tax rate so as to balance the marginal benefits of a tax financed increase in expenditure with the costs of higher taxes. It is important to observe that the FAs, acting as Stackelberg leaders *vis-a-vis* the central bank, anticipate the monetary responses to their own decisions. The first order condition for each FA therefore is:

$$a_{pf} p \frac{\partial p}{\partial t_i} + x_i \frac{\partial x_i}{\partial t_i} + a_{gs}(g_i - \tilde{g}) = 0 \qquad (8)$$

The nature of the fiscal game crucially affects the perceived costs and benefits of fiscal actions. To begin with, let us assume that the tax rate in each country in set non co-operatively, so that the FA fails to internalise the responses of the other FAs. Combining equations (3) and (4) we get:

$$\frac{\partial x_i}{\partial t_i} = -\left[1 - \bar{c}\left(\frac{n-1}{n}\right) \right] + \frac{\partial p}{\partial t_i} = -\left[1 - \bar{c}\left(\frac{n-1}{n}\right) \right] + \frac{1}{(1+a_{pm})}\frac{1}{n} \qquad (9)$$

Each FA, by taking as given public expenditures in the rest of the union, realises that an increase in domestic expenditures will boost output. Such an effect (open-economy henceforth) will partly compensate for the distortionary impact of the higher taxes required to finance the rise in expenditures. Furthermore, the FAs correctly anticipate that asymmetries in public spending policies have no effect on inflation. On the other hand, they foresee that the ECB will increase inflation following a rise in the average EU tax rate. Therefore the FAs take into account the inflationary consequences of raising the domestic tax rate. As in Beetsma and Bovemberg, we assume that the FAs do not internalise the adverse effect of taxation on

expectations. Hence, they perceive that the inflation response to t_i partly offsets output distortions. Due to the sequential nature of the game, fiscal policy is subject to time inconsistency. However, without co-ordination each FA neglects the symmetric tax policies pursued in rest of the union. As a result, the impact of higher domestic taxes on inflation is underestimated. This, in turn, mitigates the consequences of time inconsistency.

Combining equations (3), (4), (7), (8), (9), and noting that in equilibrium $\boldsymbol{p} = \boldsymbol{p}^{\,e}$; $g_i^s = 0$; $t_i = t_j$; $\boldsymbol{p} = t / \boldsymbol{a}_{pm} + \tilde{\boldsymbol{p}}$, $\forall j$, we get that the level of distortionary taxation when the FAs act non co-operatively is[5]:

$$t_i^{FPNC} = \boldsymbol{j}\,\tilde{g} \tag{10}$$

where

$$\boldsymbol{j} = \frac{\boldsymbol{a}_{gs}}{\left\{ \left[\left(\frac{1}{n(1 + \boldsymbol{a}_{pm})} \right) \left(\frac{\boldsymbol{a}_{pf}}{\boldsymbol{a}_{pm}} - 1 \right) \right] + 1 + \boldsymbol{a}_{gs} - \bar{c} \left(\frac{n-1}{n} \right) \right\}}$$

Let us now move on to the second scenario of co-operative fiscal policies. In this case each FA realises that, since governments are subject to identical incentives, any attempt to stimulate output *via* an increase in domestic expenditures is bound to fail. Yet, co-ordination exacerbates the time inconsistency problem, because each FA correctly anticipates the global effect of symmetric tax policies on inflation, but still neglects its adverse impact on expectations. Hence in this case we shall have that:

---

[5] In principle, one cannot rule out that the sign of (10) is negative, if (9) is positive and sufficiently large. For this to happen, the FAs must perceive that the combination of open-economy and B&B effects will more than compensate for the distortionary effects of taxation, and stimulate output. Given the relatively large number of EMU members, such an outcome would require an implausibly large strength of the open economy-effect. Therefore, this case is not discussed in the text. See appendix II for a discussion.

$$\frac{\partial x_i}{\partial t_i} = -1 + \frac{\partial p}{\partial t_i} = -1 + \frac{1}{(1 + a_{pm})} \tag{11}$$

Therefore, combining (3), (4), (7), (8) and (11) $p = p^e$; $g_i^s = 0$; $t_i = t_j$; $p = t/a_{pm} + \tilde{p}$, $\forall j$, we obtain the equilibrium solution for the tax rate:

$$t_i^{FPC} = f\tilde{g} \tag{12}$$

where

$$f = \frac{a_{gs}}{\left[\frac{1}{(1 + a_{pm})} \left(\frac{a_{pf}}{a_{pm}} - 1 \right) \right] + (1 + a_{gs})}$$

Subtracting (12) from (10) we can finally determine the sign of the tax difference under the two scenarios:

$$t_i^{FPNC} - t_i^{FPC} = \frac{(n-1) a_{gs} \tilde{g}}{n} f j \left\{ \left[\frac{1}{(1 + a_{pm})} \left(\frac{a_{pf}}{a_{pm}} - 1 \right) \right] + \bar{c} \right\} \tag{13}$$

The sign of (13) depends on the relative strength of two factors. On the one hand, the factor $\left[(a_{pf}/a_{pm} - 1)/(1 + a_{pm}) \right] < 0$, which affects the economy in case of fiscal co-operation, describes the perceived impact that the central bank response to a co-ordinated tax increase bears on the inflation and output components of the governments' loss function. On the other hand, the factor ($\bar{c}$) captures the strength of the familiar open-economy effect which obtains when fiscal policies are uncoordinated. Hence, a trade-off between co-ordination and non co-ordination is established due to the introduction of open economy effects. On the one hand, co-ordination is relatively inefficient because it worsens the time inconsistency of fiscal policy. On

the other hand, non co-ordination is relatively inefficient due to the open-economy effect. EMU countries are better off without fiscal co-ordination only if the ECB is weight-conservative[6] and open-economy effects are relatively small. Observe also that, since $\P\left[(n-1)/n\left(1+a_{pm}\right)\P j\right]/\P n > 0$, the difference $\left|t_i^{FPNC} - t_i^{FPC}\right|$ grows with n. B&B, who neglect open-economy effects, therefore draw the conclusion that non co-ordination becomes increasingly desirable as the union gets larger. Their intuition is simple: the strategic position of co-ordinated FAs *vis-à-vis* the ECB strengthens when n increases. Conversely, when open-economy effects from fiscal policy are sufficiently large, this result is entirely reversed. In this case $t_i^{FPNC} - t_i^{FPC} > 0$ and increasing in n. In fact, if the perceived output effects of an expenditure surprise are sufficiently strong, non co-ordinated governments will relax their domestic fiscal stances to increase the sub-optimal output level. In this case the reciprocal commitment problem affecting the FAs worsens when the union gets larger because public expenditure surprises are perceived to be more effective as n increases (recall equation 9). Finally, the degree of central bank conservatism contributes to determine which regime is preferable. In fact, fiscal policy co-ordination becomes increasingly desirable when the central bank aversion to inflation is relatively high. In particular, in the extreme case where $a_{pm} \to \infty$ the B&B effect disappears entirely. In Appendix II we provide details of a calibrated version of the model where co-ordination is desirable even if the central bank's degree of conservatism is relatively mild, such that the inflation bias would remain well above the 2 per cent level to be targeted by the ECB.

3.2 Inflation targeting

In section 3.1 we have shown that the degree of central bank conservatism has important implications for the choice of the fiscal policy regime. It is therefore obvious to extend our

---

[6] If $a_{pm} = a_{pf}$ co-ordination is always preferable. In this case the B&B effect disappears because the perceived output effect of an inflation surprise is matched by the loss from higher inflation.

analysis to a monetary regime where the central bank is assigned a contract endorsing an inflation target. At this purpose, following Svensson (1997) we rewrite (6) as:

$$V^{CB} = \frac{1}{2}\left\{ a_{pm}^{T}\left(p - p^{T}\right)^2 + \frac{1}{n}\sum_{i=1}^{n}(x_i)^2 \right\}$$

(14)

where $p^{T} \leq \tilde{p}, a_{pm}^{T} \geq a_{pf}$ define the central bank's preferences. Under these modified assumptions the ECB's reaction function becomes:

$$p = \frac{1}{1 + a_{pm}^{T}}\left\{ a_{pm}^{T}p^{T} + p^{e} + \frac{1}{n}\sum_{i=1}^{n}(t_i) \right\}$$

(15)

It follows that if:

$$p^{T} = \tilde{p} - \frac{1}{n a_{pm}^{T}}\sum_{i=1}^{n}t_i$$

(16)

the optimal inflation rate always obtains. Hence, if monetary policy is conducted according to (15) subject to (16), each FA in deciding its fiscal stance takes the inflation target as given, just as it does with expectations. Assuming that the inflation target is selected conditional upon the fiscal policy regime, straightforward calculations show that the equilibrium tax rates become as follows:

$$t^{p_{FPNC}^{T}} = x\tilde{g}$$

(17)

where

$$x = \frac{a_{gs}}{\left[1 + a_{gs} - \bar{c}\left(\frac{n-1}{n}\right) - \frac{1}{\left(1 + a_{pm}^{T}\right)n}\right]}$$

$$t^{p_{FPC}^{T}} = J\tilde{g} \tag{18}$$

where

$$J = \frac{a_{gs}}{\left[1 + a_{gs} - \frac{1}{\left(1 + a_{pm}^{T}\right)}\right]}$$

From (10), (12), (17) and (18), it is easy to see that if $a_{pm}^{T} \leq a_{pm}$, then $t^{p_{FPNC}^{T}} > t^{FPNC}$, $t^{p_{FPC}^{T}} > t^{FPC}$. Paradoxically, the time inconsistency problem affecting the FAs is now worsened. They in fact anticipate that a target brings down inflation. However, by taking the target as given, they still expect that systematic tax policies cause inflation surprises. Observe that (18) is derived from the first order condition (8), where it is shown that the cost of a monetary surprise is inversely related to the level of inflation. Therefore, by reducing such a level, the target induces the FAs to use their tax instrument more heavily.

From (17) and (18) we can finally determine the sign of the tax difference under the two scenarios:

$$t^{p_{FPNC}^{T}} - t^{p_{FPC}^{T}} = a_{gs}\tilde{g}\frac{(n-1)}{n}Jx\left[\bar{c} - \frac{1}{\left(1 + a_{pm}*\right)}\right] \tag{19}$$

where:

13

$$J = \cfrac{1}{1 + a_{gs} - \left[\cfrac{1}{n(1 + a_{pm}{}^*)}\right] - \tilde{c}\left(\cfrac{n-1}{n}\right)}$$

Two comments are in order. First, uncoordinated fiscal policies lead to higher taxes if the perceived relative-price (open-economy) effects are stronger than the perceived output effect of the central bank response to a co-ordinated tax increase. Second, an inflation targeting regime by definition no longer requires weight conservatism to stabilise prices. Hence, if $a_{pm}^{T} < a_{pm}$ the B&B effect is now more likely to dominate.

Summing up, inflation targets have been advocated to escape the credibility versus flexibility dilemma which is inherent to weight conservatism. However, when fiscal policymakers act as a Stackelberg leader another trade-off arises between systematic tax distortions and inefficient countercyclical monetary policies. Moreover, monetary delegation to a central bank who is not weight conservative may reverse the ranking between the two fiscal regimes considered here, but unambiguously implies larger fiscal distortions, irrespective of which fiscal regime is being implemented[7].

4. Fiscal and Monetary Policy Responses to Shocks

We now concentrate on the fiscal and monetary policy responses to shocks. For analytical convenience, we decompose disturbances into symmetric and purely asymmetric shocks, and analyse their effects separately.

a) Symmetric shocks (w_i)

---

[7] See Appendix II.

When fiscal policies lack co-ordination the stochastic component of the of the first order condition is given by:

$$\frac{\P V^{FA}}{\P t_i} - \left[\frac{\P V^{FA}}{\P t_i}\right]^e = a_{pf}\left[p - p^e\right]\frac{1}{(1+a_{pm})n} + \left[\frac{-w_i + (t - t^e)}{1 + a_{pm}} + w_i - (t - t^e)\right]$$

$$\left\{-\left[1 - \bar{c}\left(\frac{n-1}{n}\right)\right] + \frac{1}{n(1+a_{pm})}\right\} + a_{gs}\left[t - t^e\right] = 0 \tag{20}$$

with both terms $\dfrac{\P V^{FA}}{\P t_i}, \left[\dfrac{\P V^{FA}}{\P t_i}\right]^e$ singularly equal to zero. Condition (20) can be further

rearranged as:

$$\left[t - t^e\right]^{FPNC} = \left\{\frac{1}{1 + r^{FPNC}}\right\}w_i \tag{21}$$

where

$$r^{FPNC} = \frac{a_{gs}}{\dfrac{a_{pf}}{(1+a_{pm})^2 n} + \left[\dfrac{1}{1+a_{pm}} - 1\right]\left\{-1 + \bar{c}\left(\dfrac{n-1}{n}\right) + \dfrac{1}{n(1+a_{pm})}\right\}}$$

represents the marginal benefit/cost ratio of a tax increase which is perceived when fiscal policies are non co-ordinated. The term a_{gs} defines the marginal effect on expenditures, whereas the term

$$\frac{a_{pf}}{(1+a_{pm})^2 n} + \left[\frac{1}{1+a_{pm}} - 1\right]\left\{-1 + \bar{c}\left(\frac{n-1}{n}\right) + \frac{1}{n(1+a_{pm})}\right\}$$

describes the perceived effects on inflation and output.

Conversely, when fiscal policies are co-ordinated, we have:

$$\left[t - t^e\right]^{FPC} = \left\{\frac{1}{1 + r^{FPC}}\right\} w_i \qquad (22)$$

where

$$r^{FPC} = \frac{a_{gs}}{\dfrac{a_{pf}}{(1 + a_{pm})^2} + \left\{-1 + \dfrac{1}{(1 + a_{pm})}\right\}^2} \qquad \text{and}$$

$$\frac{a_{pf}}{(1 + a_{pm})^2} + \left\{-1 + \frac{1}{(1 + a_{pm})}\right\}^2$$

describes the actual effects on inflation and output.

From (21) and (22) it follows that:

$$\left[t - t^e\right]^{FPC} - \left[t - t^e\right]^{FPNC} = \frac{(n-1)a_{gs}a_{pm}}{n(1 + a_{pm})(1 + r^{FPNC})(1 + r^{FPC})q_1 q_2} \left\{\bar{c} + \left(\frac{a_{pf}}{a_{pm}} - 1\right)\frac{1}{(1 + a_{pm})}\right\} w_i \qquad (23)$$

where $q_1 = a_{gs} \big/ r^{FPNC}$ and $q_2 = a_{gs} \big/ r^{FPC}$.

It is interesting to observe that the same factors which determine the sign of (13) − i.e. the open-economy effect and the B&B effect under non co-ordination - now have exactly the

opposite impact on (23). Open-economy effects induce uncoordinated FAs to implement fiscal responses to shocks which are too cautious. The intuition behind this result is as follows. An adverse supply shock requires a tax reduction. Without co-ordination, each FA perceives that the tax fall a would also cause a negative public expenditure surprise. For this reason, perceived open-economy effects limit the incentive to stabilise output when fiscal policies are non co-ordinated. Without co-ordination, the B&B effect works in the opposite direction – i.e. tax policies become more interventionist, provided the ECB is weight conservative . The reason why this may happen is easily explained. Anticipation of a negative inflation surprise following a tax fall limits the incentive to use the fiscal instrument. Since under fiscal policy non co-ordination the ECB's responses are underestimated, each FA will use its tax instrument more heavily than in case of fiscal co-ordination.

Turning to welfare analysis, we start by observing that – *per se* – co-ordinated responses to shocks may appear to be always optimal. The intuition behind this claim is very simple. The previous section has shown that under co-ordination adverse effects on expectations arise due to lack of precommitment. By definition, however, responses to shocks do not matter for expectations. Therefore fiscal co-ordination, which allows to correctly anticipate the strength of the monetary policy responses to fiscal actions, should be always preferable. However, the order of preference may be reversed if a weight-conservative ECB implements inefficient monetary responses to symmetric shocks. In this case non co-ordinated fiscal stances which may look exceedingly interventionist would compensate for the central bank conservative policies. Such an outcome only obtains if the ECB is weight conservative, but its relative aversion to inflation is not too strong, so that the B&B effect dominates.

b) *Asymmetric shocks (m)*

When shocks are purely asymmetric, the FAs have no impact on inflation ($\P p / \P t_i = 0$) because, from the aggregate perspective of the ECB, their actions will cancel out. Furthermore, asymmetric tax responses will determine asymmetric expenditure levels generating an open-economy effect on output. Hence, co-ordinated tax reactions to asymmetric shocks yield:

$$\left[t - t^e \right]^{FPC} = \left\{ \frac{\left[1 - \bar{c} \left(\frac{n-1}{n} \right) \right]}{\left[1 - \bar{c} \left(\frac{n-1}{n} \right) \right]^2 + a_{gs}} \right\} m \tag{24}$$

By contrast, without co-ordination the stochastic component of the first order condition of the FA is:

$$\left[t - t^e \right]^{FPNC} = \left\{ \frac{\left[1 - \bar{c} \left(\frac{n-1}{n} \right) - \frac{1}{n(1 + a_{pm})} \right]}{\left[1 - \bar{c} \left(\frac{n-1}{n} \right) \right] \left[1 - \bar{c} \left(\frac{n-1}{n} \right) - \frac{1}{n(1 + a_{pm})} \right] + a_{gs}} \right\} m \tag{25}$$

In this case each FA does not take into account that $\P p / \P t_i = 0$ because asymmetric fiscal policies will cancel out at the aggregate level. As a result the output effect of a tax adjustment is underestimated, due to the misperception about the ECB response.

From (24) and (25) it follows that:

$$\left[t - t^e \right]^{FPC} - \left[t - t^e \right]^{FPNC} = J_1 J_2 \left\{ \frac{a_{gs}}{n(1 + a_{pm})} \right\} m \tag{26}$$

where

$$J_1 = 1 \Big/ \left\{ \left[1 - \bar{c} \left(\frac{n-1}{n} \right) \right]^2 + a_{gs} \right\}$$

$$J_2 = 1 \Big/ \left\{ \left[1 - \bar{c} \left(\frac{n-1}{n} \right) \right] \left[1 - \bar{c} \left(\frac{n-1}{n} \right) - \frac{1}{n(1 + a_{pm})} \right] + a_{gs} \right\}$$

The sign of (26) is certainly positive. Hence, non co-ordinated fiscal policies are excessively conservative. This happens because each FA wrongly anticipates that a tax reduction will be partly offset by a fall in inflation which, in fact, will never materialise.

Summing up, in section *(a)* we argued that in one special case fiscal non co-ordination may be desirable. By contrast, in the case of asymmetric shocks the picture is more clear-cut. In fact, the anticipation that the fiscal adjustment in one country triggers a monetary response will induce uncoordinated FAs to implement fiscal policies which are excessively cautious.

5. An Institutional Solution to the Fiscal Bias

So far our analysis has shown that, irrespective of the fiscal regime in place, inefficient macroeconomic policies originate from lack of commitment both *vis-à-vis* the private sector and amongst fiscal policymakers. The second best obtains only if all such requirements are satisfied.

Let us assume that monetary institutions can replicate the monetary precommitment rule[8]:

$$p = \tilde{p} - \frac{\sum_{i=1}^{n} \left[w_i - \left(t_i - t_i^e \right) \right]}{1 + a_{pf}} \tag{27}$$

At the same time, the precommitment tax rule internalises both the effects on the welfare losses of the other FAs and the impossibility of alleviating output distortions exploiting systematic monetary surprises:

$$
t_p = \frac{\boldsymbol{a}_{gs}\tilde{g}}{\left(1+\boldsymbol{a}_{gs}\right)} + \left\{ \frac{1}{1+\boldsymbol{a}_{gs}+\dfrac{\boldsymbol{a}_{gs}}{\boldsymbol{a}_{pf}}} \right\}\boldsymbol{w} + \left\{ \frac{\left[1-\bar{c}\left(\dfrac{n-1}{n}\right)\right]}{\left[1-\bar{c}\left(\dfrac{n-1}{n}\right)\right]^2+\boldsymbol{a}_{gs}} \right\}\boldsymbol{m} \quad {}^{9}
\tag{28}
$$

B&B (1998) suggest that the inefficiency of systematic tax policies could be removed by adjusting the fiscal policymarkers' aversion to inflation. Their analysis, however, neglects the inefficient stabilisation policies that such fiscal institutions would implement. In our view, alternative ways to influence the conduct of fiscal policy can be found along the lines of the contractualist approach that inspired the design of the SGP. Our proposal aims to bridge the gap between (27), (28) and the policy rules discussed in sections 3 & 4. Suppose, for instance, that each FA minimises the following loss function:

$$
V_{\tilde{g}*}^{FA} = \frac{1}{2}\left\{ \boldsymbol{a}_{pf}\left(\boldsymbol{p}-\tilde{\boldsymbol{p}}\right)^2 + x_i^2 + \boldsymbol{a}_{gs}(g_i-\tilde{g}*)^2 \right\}
\tag{29}
$$

---

[8] (27) is obtained if (6) is minimised internalising the effects on expectations and setting $\boldsymbol{a}_{pm} = \boldsymbol{a}_{pf}$.

[9] Subscript p stands for precommitment solution.

where $\tilde{g}^*$ is agreed conditional upon the monetary regime and on the fiscal scenario. If the Central Bank pursues an inflation target - i.e. $\boldsymbol{a}_{pm}^T = \boldsymbol{a}_{pf}, \boldsymbol{p}^T = \sum_{i=1}^{n} \frac{t_i^e}{n\boldsymbol{a}_{pf}}$ - and the FAs co-operate subject to the expenditure target

$$\tilde{g}^* = \tilde{g}\left\{1 - \frac{1}{(1+\boldsymbol{a}_{pf})(1+\boldsymbol{a}_{gs})}\right\} \tag{30}$$

the policy rules (27) and (28) are obtained.

If the inflation target cannot be enforced (see McCallum (1995) for a criticism of inflation targets), correcting the inflation bias requires a weight-conservative bank. Following Lohmann (1992) we posit that $\boldsymbol{a}_{pf} < \boldsymbol{a}_{pm} < \infty$. In this case, setting

$$\tilde{g}^* = \tilde{g}\left\{1 - \left(1 - \frac{\boldsymbol{a}_{pf}}{\boldsymbol{a}_{pm}}\right)\frac{1}{(1+\boldsymbol{a}_{pm})(1+\boldsymbol{a}_{gs})}\right\} \tag{31}$$

would at least ensure that $t^{e^{FPC}} = t_p^e$.

It would be straightforward to identify the optimal expenditure targets when the FAs manage to agree on expenditure targets but day-to-day co-operation proves unfeasible.

6. Concluding remarks

Deficit ceilings of the kind imposed by the SGP are designed to limit the inefficient intertemporal allocation of tax distortions. However, they cannot entirely solve the commitment

problem affecting the national FAs. These could in fact still loosen their fiscal stances by increasing the overall level of distortionary taxation. We showed that a credible and properly designed public expenditure target could usefully complement the SGP by directly addressing the issue of systematic fiscal distortions. Further research should address the technicalities related to the practical implementation of such fiscal targets. The challenge for institutional design is to limit the incentives to deviate from the target while still preserving flexible responses to shocks.

Acknowledgements

References

Arreaza, A., Sorenses, B.E. and Yosha, O., 1998. Consumption Smoothing through Fiscal Policy in OECD and EU Countries, NBER WP, 6372

Alesina, A and Tabellini, G., 1987. Rules and Discretion with non Co-ordinated Monetary and Fiscal Policies, Economic Enquiry, pp. 619-630

Beetsma, R.M.W.J. and Bovenberg, A.L., 1998. Monetary Union without Fiscal Co-ordination may discipline Policymakers, Journal of International Economics, 45, pp. 239-258

Beetsma, R.M.W.J. and Uhlig, H., 1997. An Analysis of the Stability Pact, CEPR Discussion Paper, No. 1669, July

Bryson, J.H., Jensen, H. and Van Hoose, D.D., 1993. Rules, Discretion, and International Monetary and Fiscal Policy Co-ordination, Open Economies Review, 4: pp. 117-132

Casella, A., 2000. Market Mechanisms for Policy Co-ordination: Tools for the EU, paper presented at the XV Annual Congress of the EEA, Bozen September 2000

Catenaro, M. , 1999. A Case for Fiscal Policy Co-ordination in Europe, University of Milan-Bicocca Working Paper Series, No. 23, June

Daniels, J.P. and Vanhoose, D.D., 1998. Two-Country Models of Monetary and Fiscal Policy: What Have We Learned? What More can We Learn?, Open Economies Review, 9: pp. 263-282

Dixit, A. and Lambertini, L , 2000a. Fiscal Discretion Destroys Monetary Commitment, mimeo UCLA

------------------ 2000b. Monetary-Fiscal Policy Interactions and Commitment Versus Discretion in a Monetary Union, mimeo UCLA

Hoeller, P., Louppe, M.O. and Vergriete P., 1996. Fiscal Relations within the European Union, OECD Working Paper, No. 163

Levine, P., 1993. Fiscal Policy Co-ordination under EMU and the Choice of the Monetary Instrument, Manchester School 41, pp.1-12, Supplement

Levine, P. and Brociner, A., 1994. Fiscal Policy Co-ordination and EMU, Journal of Economic Dynamics and Control 18, pp. 699-729

Levine, P. and Pearlman, J., 1998. Monetary Union: The Ins and the Outs of Strategic Delegation, London Business School Discussion Paper, No. 07-98 (forthcoming in the Manchester School)

Lohmann, S., 1992. Optimal Precommitment in Monetary Policy: Credibility Versus Flexibility, American Economic Review, pp. 273 - 286

McCallum, B.T., 1995. Two Fallacies Concerning Central Bank Independence, AER Paper and Proceedings, May, pp. 207-211.

Sibert, A., 1992. Government Finance in a Common Currency Area, Journal of International Money and Finance 11, pp. 567-578

Svensson, L.E.O., 1997. Optimal Inflation Targets, Conservative Central Banks, and linear Inflation Contracts, American Economic Review 87, pp. 98-114

van der Ploeg, F., 1990. Monetary Disinflation, Fiscal Expansion and the Current Account in an Interdependent World, CEPR Discussion Paper No. 366, January

----------------   1991. Budgetary Aspects of Economic and Monetary Integration in Europe, CEPR Discussion Paper No. 492, January

----------------   1993. Channels of International Policy Transmission, Journal of International Economics, 34, pp 245-267

Appendix I   Derivation of the Output Function

We assume that in each country the representative firm maximises $(1-t)PY_i - WL_i$, and that production is described by a Cobb-Douglas production function of the type:

$$Y = L^{1-b} \tag{A1}$$

where L is labour. Wage setters are assumed to have real wage targets and set one period nominal wage contracts at time t-1 to minimise deviations of the expected real wage from a zero baseline target (small letters denote logs):

$$E_{t-1}(U_i) = (w_i - p_i^c)^2 \tag{A2}$$

where p_i^c is the consumer price index defined as:

$$p_i^c = p_i + \frac{g}{n}\sum_{h=1}^{n}(p_h - p_i) \qquad\qquad i,h = [1,n] \tag{A3}$$

It is straightforward to derive a standard supply function for country i:

$$y_i^s = \frac{(1-b)}{b}(p_i - E(p_i^c) - t_i) \tag{A4}$$

On the other hand, the demand side can be derived in two ways, depending on the sign of the transmission of fiscal policy we are willing to account for. Our aim here is to show that our reduced form for output is invariant to the sign of the fiscal transmission. We start with a less traditional negative transmission - as described in van der Ploeg (1990) and Levine and Pearlman (1998) - originating from a real exchange depreciation in the domestic country. In this case we

can assume output as given by public expenditure and by the sum of domestic and foreign consumption (i.e. the consumption of domestic goods by foreign consumers):

$$Y_i^D = C_i + \frac{1}{(n-1)} \sum_{h=1;h\neq i}^{n} E_{ih} C_h^f + G_i \qquad (A5)$$

Log-linearising (A5) and expressing each variable as a proportional deviation from a deterministic baseline steady state ($\overline{X}; \forall X$) we get:

$$\frac{Y_i - \overline{Y}}{\overline{Y}} = \frac{\overline{C}}{\overline{Y}} \frac{C_i - \overline{C}}{\overline{C}} + \frac{\overline{C}^f}{Y} \left[\frac{1}{(n-1)} \sum_{h=1;h\neq i}^{n} \left(\frac{E_{ih} - \overline{E}}{\overline{E}} \right) + \frac{1}{(n-1)} \sum_{h=1;h\neq i}^{n} \left(\frac{C_h^f - \overline{C}^f}{\overline{C}^f} \right) \right] + \frac{\overline{G}}{\overline{Y}} \frac{G_i - \overline{G}}{\overline{G}} \qquad (A6)$$

For analytical simplicity, we can assume that the deviation of consumption from its baseline is strictly dependent on the proportional deviation of disposable income from its baseline level and the marginal propensity to consume. Hence, we can write the proportional deviation of consumption from its steady state value as:

$$\frac{C - \overline{C}}{\overline{C}} = \tilde{c} \frac{Y^{disp} - \overline{Y}^{disp}}{\overline{Y}^{disp}} \qquad (A7)$$

Observe now that, since a variation of disposable income depends upon a corresponding variation of taxation, in a balanced budget framework this is equivalent to a change of public expenditure. (A7) is therefore equivalent to:

$$c = \frac{C - \overline{C}}{\overline{C}} = -\tilde{c} \frac{TA - T\overline{A}}{T\overline{A}} = -\tilde{c} \frac{G - \overline{G}}{\overline{G}} = -\tilde{c} g \qquad (A8)$$

The combination of (A7) and A8) with (A6) yields the reduced form of output for the generic country i:

$$y_i^d = \frac{\overline{C}^f}{\overline{Y}} \left[\frac{1}{(n-1)} \sum_{h=1;h \neq i}^{n} e_h - \frac{\tilde{c}}{(n-1)} \sum_{h=1;h \neq i}^{n} g_h^f \right] + g_i \left[\frac{\overline{G}}{\overline{Y}} - \tilde{c} \frac{\overline{C}}{\overline{Y}} \right] \tag{A9}$$

Similarly, for country j we shall have:

$$y_j^d = \frac{\overline{C}^f}{\overline{Y}} \left[\frac{1}{(n-1)} \sum_{h=1;h \neq j}^{n} e_h - \frac{\tilde{c}}{(n-1)} \sum_{h=1;h \neq j}^{n} g_h^f \right] + g_j \left[\frac{\overline{G}}{\overline{Y}} - \tilde{c} \frac{\overline{C}}{\overline{Y}} \right] \tag{A10}$$

Hence, the expression for the real exchange rate between countries i and j in deviation form can be found by solving:

$$y_j^s - y_i^s = y_j^d - y_i^d \tag{A11}$$

This yields:

$$e_{ij} = \left\{ \frac{\dfrac{1-b}{b} + \dfrac{\overline{G}}{\overline{Y}} + \dfrac{\tilde{c}}{\overline{Y}} \left(\dfrac{\overline{C}^f}{n-1} - \overline{C} \right)}{\dfrac{1-b}{b} + \dfrac{\overline{C}^f}{(n-1)\overline{Y}}} \right\} (g_j - g_i) \tag{A12}$$

Combining (A12) with (A4) and (A3) we finally get our reduced form for output:

$$y_i = \frac{(1-b)}{b}\left[p - p^e - t_i + g\left(\frac{\dfrac{1-b}{b} + \dfrac{\overline{G}}{\overline{Y}} + \dfrac{\tilde{c}}{\overline{Y}}\left(\dfrac{\overline{C}^f}{n-1} - \overline{C} \right)}{\dfrac{1-b}{b} + \dfrac{\overline{C}^f}{(n-1)\overline{Y}}} \right)\left(g_i - \frac{1}{n}\sum_{h=1}^{n} g_h \right) \right] \qquad (A13)$$

with $p - p^e = p^c - E(p^c)$.

To get (3) multiply both members of (A13) for $b/(1-b)$ and add a random shock. This gives:

$$x_i = p - p^e - t_i - \overline{c}g_i^s - e_i \qquad (A14)$$

where:

$$x_i = b(1-b)/y_i$$

$$g_i^s = g_i - \frac{1}{n}\sum_{h=1}^{n} g_h$$

$$\overline{c} = g\left(\frac{\dfrac{1-b}{b} + \dfrac{\overline{G}}{\overline{Y}} + \dfrac{\tilde{c}}{\overline{Y}}\left(\dfrac{\overline{C}^f}{n-1} - \overline{C} \right)}{\dfrac{1-b}{b} + \dfrac{\overline{C}^f}{(n-1)\overline{Y}}} \right) \qquad (A15)$$

It is important to observe that $0 < \overline{c} < 1$ in our framework. In fact, straightforward calculations show that for the opposite to be true we would need:

$\dfrac{\overline{G}}{\overline{Y}} > \tilde{c}\dfrac{\overline{C}}{\overline{Y}} + \dfrac{(1-g)}{g}\left(\dfrac{1-b}{b} \right) + \tilde{c}\dfrac{\overline{C}^f}{(n-1)\overline{Y}}$. This is clearly unrealistic since prima facie evidence on

distributive shares and the import content of national consumption suggests that in European

countries $\frac{1-g}{g}\frac{1-b}{b}>1$.

We now complete our exercise by assuming a more standard Mundell-Fleming transmission

for fiscal policy. At this purpose we replace (A9) with the log-linerarised demand function:

$$y_i^d = \frac{1}{(n-1)}\sum_{h=1;h\neq i}^{n}\left\{r_1 e_{i,h} + r_2 y_h^d\right\} + r_3 g_i \tag{A16}$$

where $r_i (i=1,3)$ measure the change of domestic income to the variation of, respectively,

the exchange rate, foreign income and domestic public consumption. As before, we can

compute $y_j^d - y_i^d = y_j^s - y_i^s$ so as to get an expression for the real exchange rate:

$$e_{ij} = \frac{\dfrac{r_3}{1+r_2/(n-1)}+\dfrac{1-b}{b}}{\dfrac{r_1}{1+r_2/(n-1)}+\dfrac{1-b}{b}}\left(g_j - g_i\right) = d\left(g_j - g_i\right) \tag{A17}$$

which, substituted in (A4) gives:

$$y_i = \frac{(1-b)}{b}\left(p - p^e - t_i + gd\left(g_i - \frac{1}{n}\sum_{h=1}^{n}g_h\right)\right) \tag{A18}$$

The structure of (A18) is identical to the one of (A13) and therefore leads to the same kind

of reduced form for output. This allows us to conclude that, even when fiscal policy maintains

its traditional positive spillover effect, if the monetary authorities are able to perfectly stabilise

the demand shocks - standard assumption in the Barro-Gordon models -, the only way to raise output is via the exchange rate channel. In both cases, this leads fiscal policymakers to spend more than the socially optimal level.

Appendix II   Calibrations

The results of our simulation exercise have been summarised in Graph 1 (dotted lines stand for co-ordinated variables). This is obtained by letting the inflation aversion of the ECB (as captured by the parameter a_{pm} represented on the horizontal axis) from 0.5 to infinity. The baseline calibrations used for our simulation exercise are as follows:

$n = 11$ (number of EMU members), $b = 0.3$, $\bar{c} = 0.25$, $a_{pf} = 0.5$, $a_{gs} = 0.8$, $\tilde{g} = 0.25$, $\dfrac{\overline{C}}{\overline{Y}} = 0.6$,

$\dfrac{\overline{G}}{\overline{Y}} = 0.2$.

Graph 1
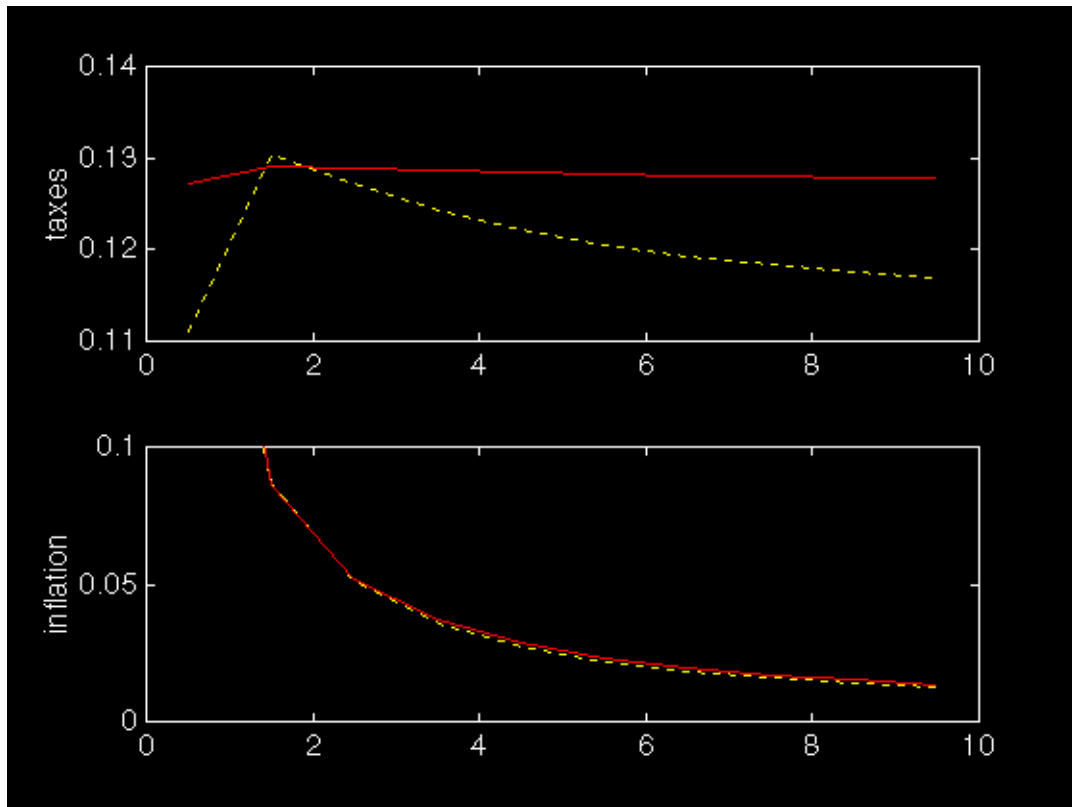
Comments on Graph 1

In line with our theoretical results, simulations show that the ranking of the fiscal regimes is affected by the ECB weight conservatism. However, it turns out that non co-operation is desirable only for a range of a_{pm} values such that the equilibrium inflation rate will be unacceptably high. To reverse this result, the open-economy effect should become implausibly small, i.e. $\bar{c} \leq 0.13$.