

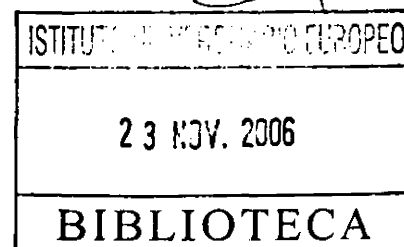
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ESSAYS ON FISCAL POLICY IN A MONETARY UNION

Luca Onorante

Thesis submitted for assessment with a view to obtaining
the degree of Doctor of the European University Institute



EUROPEAN UNIVERSITY INSTITUTE
Department of Economics

Essays on fiscal policy in a monetary union

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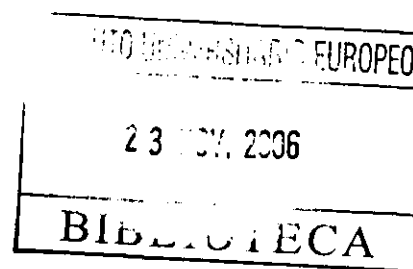
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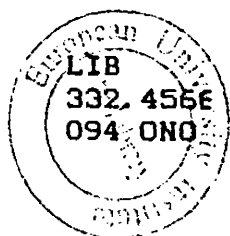
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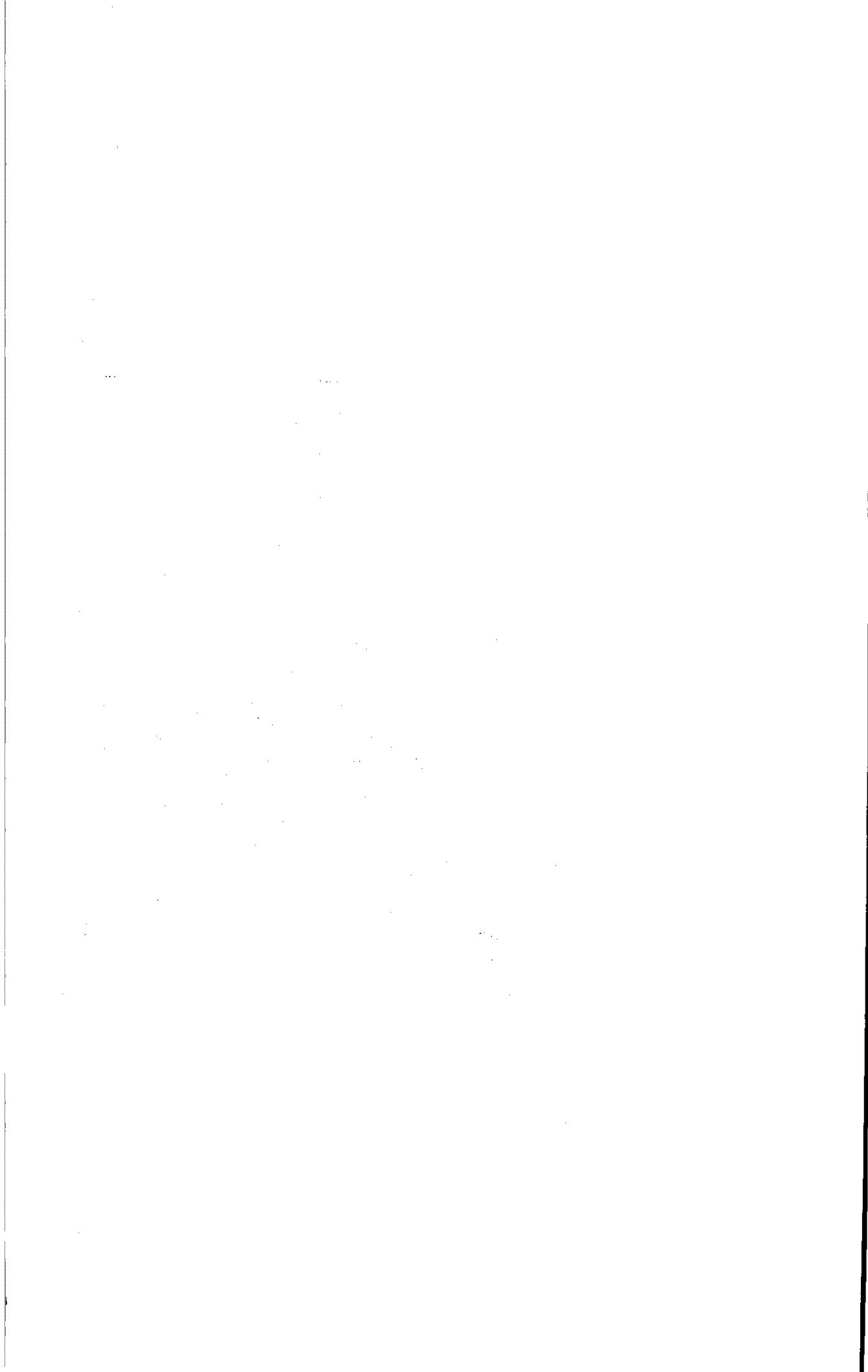
This thesis is also dedicated to my family, my father who always supported me and encouraged me in a perfect grandmother-style, my mum, who always supported me in front of my father, my brother Simone, and La Maestra, my elementary school teacher and adoptive aunt, who dealt violently with the mildest criticism against my person. It is also dedicated to my very old friends and to persons who have been very important for me, Luigi, Paolo, Simona, Roberto, Carlo, Nicola, Francesca, Silvia, Fatima and Julia, and to Isabelle, the Belgian surrealist.

A final thanks to Valérie, a very special French historian: she does not even hate economists.

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Introduction



Introduction

The economic and monetary union (EMU) is characterized by a framework for economic policy-making in Europe which is unique. While the single monetary policy is oriented towards a Union-wide objective, namely the maintenance of price stability, the other policy areas involving fiscal and wage policies largely remain the competence of national governments and other national actors.

This thesis investigates some of the mechanisms of propagation of asymmetric shocks in a monetary union and the effect that they may have on the conduction of policies and ultimately on macroeconomic variables. In the context of the European Monetary Union (EMU), and without any pretension to be exhaustive, the question is addressed of whether the current framework of policy coordination, based on a common monetary policy oriented to price stability, national autonomy of fiscal policies within common budgetary rules and wage policies determined at the national level, is appropriate in ensuring macroeconomic stabilization.

The focus on asymmetric shocks is due to the specific importance they have in a monetary union. In the case of symmetric shocks, the situation is not very different from that of a country which has its own currency. On the other hand, the effects of asymmetric shocks on policies and macroeconomic outcomes in a monetary union was (and probably is) not yet completely understood. It is partially because of this lack of understanding that the presence of big asymmetric shocks was used by economists as a criterion to decide whether a country should join the EMU.

As of fiscal policy, there are some changes related to the introduction of the common monetary policy that may lead national policy-makers towards a more intensive use of fiscal policies after the beginning of the EMU. First, there are no longer national monetary and exchange rate policies to respond to country-specific shocks, and fiscal policies can be used as a substitute for those. Second, if policy-makers fail to take a long-term view, countries might be more inclined to run deficits in a monetary union. This is due to the fact that it is primarily the country relaxing its budgetary constraints that enjoys the short-term benefits of deficits, whereas the negative consequences for the level of interest rates are more limited in a monetary union and affect all member countries (the so called "common pool problem"). Third, the disappearance of exchange rate risks within a monetary union reduces the

sanctioning role of financial markets, as reflected in bond yield spreads. The passage from national monetary policies to the EMU could then imply a change in behavior of the fiscal authorities.

The fiscal rules laid down in the Treaty of Maastricht and the Stability and Growth Pact (SGP) set a limit to government deficits with the objective of safeguarding the credibility of monetary policy both in the long term, by preventing excessive public debt build-up, and in the short run by keeping deficits low, thus reducing the risk of an unbalanced ex post policy mix. This would make the monetary union viable by ensuring low inflation and economic stability and protecting the European Central Bank from potential pressure for debt bailouts coming from the national governments.

Ex post, and in accordance with the theoretical predictions, it appears that, despite the existence of these fiscal rules, a tendency to fiscal activism arose after the introduction of the Euro. There is a clear difference in the conduct of fiscal policies between the period before the decision was taken on which countries would initially participate in the single currency (1992-1997) and the period thereafter (1998-2003). In the first period government deficits were strongly reduced, as mandated by the Maastricht Treaty, and the previous trend of large and persistent budgetary imbalances and increasing public debt ratios was reversed. In the second period (1998-2003) fiscal policy only partially met the objectives of the Stability and Growth Pact: while many countries had reached sound budgetary positions by 2000, a number of countries undertook insufficient consolidation at the time of robust economic growth and even relaxed their fiscal policies, with the result that fiscal imbalances remained or re-emerged. Debt ratios remained very high in a number of countries.

The first two papers deal with some of the mechanisms specific to a MU that may justify fiscal rules. The final paper provides an empirical assessment of the fiscal rules of the stability and growth pact (SGP).

The first paper focuses on the specific problems that a Central bank has to deal with in a monetary union hit by economic shocks in order to fulfill the goal of price stability. The interaction of the governments and the central bank (CB) is addressed in a game theoretical framework. First, the conditions in which the national governments

are able to put pressure on the CB are made explicit. Then the mechanism of transmission of national shocks through the common monetary policy is analyzed, highlighting not only the existence of the common pool problem, but also the multiplication of national disturbances to the whole union through monetary externalities (a sort of "domino effect").

The model shows that, relative to the one country case, in a MU fiscal activism is always bigger and the capacity of the central bank to keep inflation close to targets is much smaller¹. As for fiscal rules, the main question addressed is whether a greater fiscal coordination reduces or increases the capacity of the monetary authority to reduce the volatility of inflation. Formal and informal, discretionary ("positive") and rule-based ("negative") coordination of national fiscal policies and their interactions are examined as possible solutions of the game.

The paper concludes that the main point is not how much fiscal coordination is there, but the form it takes. It turns out that a mix of informal political coordination and binding rules is the one that best preserves the independence of the CB. As of negative (rule-based) coordination, it is shown that a simple change in the definition of "excessive deficit" to focus on country-specific, cyclically adjusted targets can at the same time allow more stabilization of output after a shock and a better control of inflation by the CB.

The second paper emphasizes the role of wages. It relates fiscal activism with entry in the MU, as the first paper, but in addition the role of labor markets as multipliers of fiscal biases is explored. This mechanism is also typical of a monetary union, in which monetary policy does not respond to national variables.

The paper finds a relevant role for structural differences in the national labour markets on fiscal activism and on monetary policy. Furthermore, the common monetary policy has potentially asymmetric effects, which depend on the size of the different countries in the union and the structure of the national wage setting process.

The model makes a stronger case in favor of fiscal rules and of limits to fiscal deficits within a MU. It shows that fiscal constraints which limit the size of national

¹ An important generalization compared with most of the literature is that a common inflation rate is not imposed, therefore accounting for the inflation differentials observed in the EMU.

deficits are effective in re-establishing monetary dominance. They also ensure an ex-post policy mix of stability-oriented monetary and fiscal policies and moderate wage inflation. Another way of dealing with asymmetric shocks in the model would be, of course, some convergence across countries in the structure of labour markets.

Finally, the paper addresses the related question of whether a reduction of public deficits before the adoption of the euro, as suggested by the Maastricht criteria, is a necessary or useful step. It concludes that the process of deficit reduction should, indeed, be completed before entry.

The final paper is an empirical assessment of the effects of the SGP on the European fiscal policies after the beginning of phase 3 of the EMU. It also looks at the effect of the recently implemented revision of the SGP on the European economy.

A set of structural VARs, one for each euro area country, is estimated. The VARs are identified via long run restrictions that are relatively uncontroversial and compatible with most theoretical models of fiscal policy, including the theoretical ones of the thesis; they also take into account the effect of monetary policy in order to avoid misspecification. The estimated models are then used for assessing the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact both in its old and its reformed version.

The investigation highlights a number of facts. First, fiscal policy has had in the past a limited smoothing effect on the cycle. Second, the rules of the Stability and Growth Pact have had overall a limited effect in keeping fiscal discipline. The modified rules of the Pact are thus likely to give the governments only a limited extra leeway to reduce the variability of the cycle.

The papers contained in the thesis constitute a far-from-exhaustive analysis of the problems of fiscal policy coordination in a monetary union. However, they provide interesting insights. They analyze explicitly some of the problems that may arise in a monetary union, such as the “domino effect” of fiscal policies that may lead to more interventionism, the temptation for policy-makers to use the fiscal lever after entry into the monetary union and the role of monetary externalities and labor markets in magnifying such incentives. An empirical assessment of the importance of these factors is provided in the final paper. Furthermore, these phenomena are shown to be

related to structural factors such as the rigidity of labor markets and the size of a country in the monetary union, thus providing some empirically testable implications. Finally, the effect of different forms of coordination of fiscal policies, either positive coordination or negative (rule based) coordination is analyzed in conjunction with these structural characteristics. The empirical chapter, however, suggests that the importance of different fiscal rules may have been overestimated. A more detailed summary of the findings will be presented in the conclusions of the thesis.

Chapter 1

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Interaction of fiscal policies on the Euro area: how much pressure on the ECB?

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Abstract

Since the Helsinki European Council of December 1999, a process of increased coordination of fiscal policies in the area of the Euro seems to be on its way. In this paper I examine this process from the point of view of the independence of the European central Bank (ECB).

The interaction of the governments and the ECB is addressed in a game theoretical framework. First, the conditions under which the national governments are able to put pressure on the ECB are made explicit. Then the main question is addressed: would a greater fiscal coordination reduce or increase the capacity of the monetary authority of targeting long run inflation?

Formal and informal, discretionary (positive) and rule-based (negative) coordination and their interactions are examined as possible solutions of the game. I conclude that the main point is not how much fiscal coordination is there, but the form it takes. It turns out that a mix of informal political coordination and binding rules is the one that best preserves the independence of the ECB. For negative coordination, it is shown that a simple change in the definition of "excessive deficit" can at the same time allow more stabilization of output after a shock and a better control of inflation by the ECB.

JEL Classification: C7; E0; E3; E6; H5.

Keywords: European Monetary Union, European Central Bank, game theory, fiscal policy, monetary policy, policy coordination.

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1 Introduction

Since the Helsinki European Council of December 1999, a process of increased coordination of fiscal policies in the area of the Euro seems to be on its way. In this paper I examine this process from the point of view of the independence of the European central Bank (ECB).

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Formal and informal, discretionary (positive) and rule-based (negative) coordination and their interactions are examined as possible solutions of the game. I conclude that the main point is not how much fiscal coordination there is, but the form it takes. It turns out that a mix of informal fiscal coordination and binding rules is the one that best preserves the independence of the ECB.

In the present paper I try to determine which kind of coordination would allow the ECB to pursue its statutory goal of price stability. I start from the definition of "best environment" as the one in which the ECB does not need to intervene to counteract exogenous or policy induced shocks. In such an ideal world, the fiscal policy stabilizes national output and unemployment, while the central bank takes care of the common price stability.

In a world hit by shocks, the governments tend to act in order to stabilize the domestic economy. In doing so, it is natural for them to take into account the foreseeable reaction of their central bank¹. While this strategic interaction has been described in the case of one country, the possible outcome of the interplay of multiple fiscal authorities with a common Central Bank is not completely understood yet. In the rest of the paper I address this issue, and try to answer to the following questions: which is the degree of fiscal coordination that best relieves the ECB from short-run stabilization and allows it to concentrate on long run inflation targeting? And should this coordination be based on binding rules (negative coordination) or discretionary common decisions (positive coordination), or both?

¹In many European countries governments did not limit themselves to taking into account the reaction of their monetary authority to the fiscal policy, but went as far as directly influencing the monetary policy by forcing the central bank to monetize the national debt. Such an explicit pressure is nowadays explicitly ruled out by the statute of the ECB.

1.0.1 The short story of European fiscal coordination

The current policy framework of the EMU presents a strong and unique asymmetry between the management of fiscal and monetary policies. The single monetary policy is run by a unique decision-maker (the European Central Bank) with a clear "primary objective" (price stability); by contrast, the fiscal policies remain in the hand of the Member States, with no objective specified by the Treaty. The only instrument of positive coordination of fiscal policies is the Broad Economic Policy Guidelines (BEPG), non binding recommendations prepared each year by the Commission and adopted by the ECOFIN Council. On the negative coordination side, the Stability and Growth Pact (SGP) is backed by sanctions in the case of "excessive deficits". The SGP allows the ECB to "play on the safe side" by putting a strong limit to the discretionary power of the national governments to conduct an independent fiscal policy.

The prospective scenarios The Helsinki European Council of December 1999 adopted the conclusions of an ECOFIN Council Report pleading for a strengthening of economic policy coordination during Stage Three of Economic and Monetary Union (EMU). Broadly speaking, increased coordination should include 1) a greater sharing of information among the member states, 2) a greater positive coordination and 3) a progressive reduction of the importance of negative (rule-based) coordination.

The principle of informing the other members of the euro area and the Commission before adopting an economic policy measure should form part of a set of "rules of conduct" elaborated by the Commission in consultation with the ECB. Furthermore, regular meetings would be held between the ECB President, the President of the Eurogroup and the representative of the Commission in the Council of Governors of the ECB.

While a literal interpretation of the Treaties impedes the formation of a formal governing body exclusively dedicated to fiscal coordination among the Euro countries, it would be certainly possible to increase the powers of the Eurogroup within the Economic and Financial Committee, by transforming it into a permanent working party and increasing the frequency of its meetings. Short of a Treaty change, the formal power of the Eurogroup could also be strengthened to the extent allowed by the "closer cooperation" clauses².

One should notice, however, that reinforced cooperation would not, even in the opinion of the Commission, determine the end of negative coordination (e.g. the SGP), but only a diminution of its importance.

²The reinforced co-operation procedures are based on Articles 43, 44 and 45 of the Treaty of the Union and Article 11 of the EC Treaty.

The terms of the debate Like any other Central bank, the ECB faces the conflicting objectives of long-run price stability and short-run stabilization of the economy in the presence of shocks. Unlike any other Central Bank, the ECB does not face a single fiscal authority, but 12 different ones. In such unprecedented framework the consequences in terms of pressure on the ECB are difficult to assess, and there is no unanimity of opinions. It is then not surprising that the Helsinki Council has revived the existing debate about coordination of fiscal policies, and that no agreement exist.

The first supporter of strong fiscal coordination is the European Commission. The advantage of coordination would be that active fiscal policy is recovered for stabilization. Also, it is perceived by some that there is a need for fiscal coordination to ensure credibility of long-term commitments to macroeconomic stability.

On the other hand, a consistent part of the economic profession tends to be skeptical about the need for such a move. Many economists think that coordinated fiscal policies would place a greater burden on the monetary authority. A more intense coordination could lead to 'Keynesian style' fine-tuning of fiscal policies across the member states, and this would force the ECB to intervene in the policy mix and to pay too much attention to cyclical stabilization, neglecting the objective of long run price stabilization.

The reported declarations by members of the Board of Directors of the European Central Bank (ECB) seem to proceed along both lines of reasoning: on the one hand, a stronger coordination between euro countries could be a potential threat to the independence of the ECB; on the other, it could reduce the level of political uncertainty resulting from a situation where economic policies are pursued independently by a large number of institutions. On this point even the ECB does not seem to dislike the idea of a "credible interlocutor".

It is the opinion of this paper that this question can be addressed only by analyzing the strategic interaction of the various policymakers. The paper is structured as follows: section 2 describes the model and clarifies the hypotheses that underline the idea of "fiscal policies putting pressure on the ECB"; it finally provides a closed form solution for the model. Section 3 examines the consequences of different levels of positive and negative coordination and their interactions. The results are also illustrated via a simulation of a monetary union of 12 countries whose weights are equal to those into the EMU. The conclusions follow. The mathematical appendix provides a more complete characterization of the results of the paper.

Some literature The issue of coordination in a monetary union is explicitly addressed in Dixit and Lambertini (2000), Bosca and Orts (1991), Van Aarle and Huart (1997), Beetsma and Bovenberg (1995) and in a game theory framework by Diaz-Roldan (2000).

Gatti and Van Wijnbergen (2002) examine the conditions for fiscal restraint to emerge as Nash equilibrium in the game between fiscal authorities in a monetary union. Bayoumi and Eichengreen (1993) and the literature on the Optimum Currency Areas in their bibliography are a good starting point for the analysis of the shocks that may hit a monetary union.

Beetsma and Bovenberg (1995) study the Nash equilibrium between fiscal and monetary authorities in a monetary union, focusing on common and idiosyncratic supply shocks. The focus on supply disturbances only allows them to claim that monetary unification enhances welfare only if the central bank is substantially *less* conservative than society, and analyze the role of international fiscal transfers. In a different paper Beetsma and Bovenberg (1995b) also study the case of fiscal dominance and argue that monetary union disciplines fiscal policies.

A paper extremely close to the present one but with different conclusions is the one by Dixit and Lambertini (2003). The authors analyze the interaction of a central bank and several fiscal authorities in a monetary union using a model which is very close to the one of this paper. They analyze the scenarios of monetary dominance (the central bank "moves first" or in other words it is able to commit), Nash equilibrium (both fiscal and monetary authorities play Nash), and complete coordination of fiscal and monetary policies. As in this paper, the essential hypothesis underlying their results is the agreement between the central bank and the fiscal authorities on the desirable levels of output and inflation. Their conclusion are however quite different: the optimal outcome is always attained, even in absence of any fiscal constraints. This result is driven by the absence of any bias of the fiscal authorities.

Some differences in the setup of the model make this paper a complement to Dixit and Lambertini (2003) in several ways. First, I also focus on stabilization of idiosyncratic shocks when the desirable output and inflation levels are common but assume that the national governments put a greater weight on smoothing unemployment. Second, the players in my model cannot directly observe the shocks, but only their effects on macro variables. This feature is intentional and I believe it leads to more direct policy implications: after all, the shocks do not come with a label. Third, and most important, I analyze the case of fiscal dominance, when the fiscal authorities can form expectations (backward induct) on the reaction of the central bank. I explain in the rest of the paper why this case is particularly relevant in the EMU. Finally, I emphasize the role of rule-based coordination of fiscal policies ("negative coordination") and the interaction between positive and negative coordination, which is a distinctive characteristic of the European framework.

The legal framework in which coordination must arise in the EMU is spelled out in the Treaty of Maastricht, discussed in Buiter, Corsetti and Roubini (1993), Von Hagen and

Eichengreen (1996), and of course in European Commission (1991). The conclusions of this paper about the rigidity of the SGP are similar to those in Eichengreen (1996).

2 The model

In a simple monetary union hit by exogenous shocks, the single central bank and N national fiscal authorities interact to achieve low inflation and full employment. The interaction between the agents is modeled with a game theory model solvable by backward induction, in which the national governments are able to put pressure on the ECB by running their fiscal policies after an economic shock. The focus is on stabilization after a shock, not on reputational issues of the players, therefore the game is static.

The preferences of national governments differ from those of the central bank because of the greater weight put on smoothing unemployment³. The governments in all participating countries have identical preferences. The model is one of short horizon, therefore the effect of fiscal and monetary policy on inflation and unemployment is described by two simple demand equations with fixed expectations of the public.

To keep notation simple, only two governments are explicitly represented. Government j can be seen as the weighted average of all other participating countries as seen by government i . This simplification does not alter the symmetric equilibrium of the model.

In the first section the game is described and solved for the general case. The equilibrium conditions are then used in the second part to analyze some different scenarios.

The first-best monetary policy The ECB has two, conflicting objectives: long-run inflation targeting (primary objective) and short-run stabilization of the Euro area. The more the ECB can neglect stabilization, the better it can concentrate on the other goal. For this reason it is enough to model explicitly the short-run preferences for stabilization. These preferences should be interpreted as the trade-off between inflation and unemployment that the ECB considers consistent with long-run price stability. The optimal “working environment” for the ECB is then the one in which it does not have to intervene to correct what are, in terms of its preferences, “errors of the national governments”. More specifically:

- it does not need to intervene to offset the inflationary effects of an excessive expenditure of the governments, where “excessive expenditure” is the expenditure that implies more inflation than the ECB would like given the exogenous shock.

³Given the short term characteristics of the model a greater weight on unemployment can also be interpreted as a greater *speed* of desired adjustment.

- it does not need to intervene because of the lack of action of the national governments. This may seem unlikely in the model, because the preferences of the national fiscal authorities are relatively more concerned about unemployment, but this eventuality may arise in presence of inflexible constraints to fiscal policy such as the ones implemented in the SGP. It will be shown that under some circumstances these constraints can prevent the member states from coping with asymmetric shocks⁴ and put the burden of the intervention on the ECB.

The meaning of "pressure on the ECB" The generic worry that the governments can influence the ECB "hides" many other assumption, that is important to make explicit in order to check their likelihood. I shall briefly outline these hypotheses here.

1. Backward induction: the governments must be able to form expectations about the reaction of the ECB and take them into account when formulating fiscal policy. In the jargon of game theory, the governments "move first".
2. The ECB can have preferences that are quite conservative, but they must also to some extent include unemployment. When the ECB is committed to the exclusive targeting of prices⁵ there is no scope for putting pressure on it because there is no trade off between prices and unemployment in its best response. The two first years of EMU have clearly shown that employment is a relevant variable in the ECB policy decisions⁶.
3. The national fiscal authorities are relatively more concerned about increases in unemployment than the ECB. In absence of this "inflation bias" the problem of pressure on the ECB does not exist. It has been correctly stated that the case for fiscal coordination (and more in general for macroeconomic coordination) is weak when the ECB and the fiscal authorities "keep the house in order" acting on their own. At a closer look, the absence of inflation bias is not realistic. The expression "keep their houses in order" does not only imply that the fiscal authorities do not deviate from "prudent"

⁴A relevant problem is when the shocks come from outside or inside the monetary union. It is assumed here that there is consensus among the players on the relevant variables to watch, and the preferences of the players are expressed in terms of these variables. This is not an essential feature of the model and this aspect is therefore assumed away, focusing the attention only on the interaction of the players.

⁵Other solutions may exist. For instance, the Reserve Bank of New Zealand excludes from the targeted inflation the effect of government sales taxes. This can be seen as an attempt to limit the influence of the government.

⁶Employment could be included as a predictor of future inflation. In this case it would appear as if the ECB was concerned by employment.

behavior because of short run political incentives. It also amounts to assuming that the national governments show the same little concern about unemployment than a conservative central bank. This assumption does not seem to be observed in practice in the EU countries⁷. In the rest of the paper, the governments have an inflation bias.

4. Monetary policy is assumed to be relatively more efficient on prices than fiscal policies⁸. This simply means that the institution relatively more concerned about prices (the ECB) has been assigned the instrument that best controls inflation. A situation of misallocation of instruments would lead to the absence of equilibrium.

Other hypotheses of the model are there simply to improve clarity and tractability.

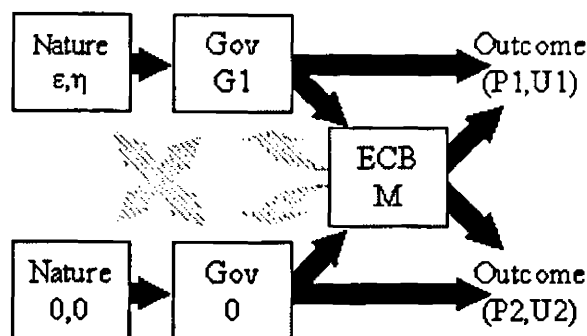
The game aims at describing the interaction among public agents in responding to shocks. Each economy is then described by the same two simple equations of prices and unemployment. The interesting time horizon being the very short period, the expectations of the public are kept fixed. Finally, I want to concentrate on the effects of monetary policy and monetary externalities, therefore I neglect the direct fiscal externalities and assume that the different countries are linked only by the common monetary policy: in other words, each national fiscal policy has direct effects in the domestic market only, and indirect effects abroad through monetary policy. The minimization of these indirect effects is at the center of the attention of the present work.

The sequence of moves At the beginning of the game the market is in *equilibrium*, where equilibrium is defined as the situation where all agents (*ECB* and *Gs*) are playing their best responses, the common target values for prices and unemployment are met and there is no shock. The moves are as follows: first, the national market are hit by independent shocks to prices and/or to employment; second, the national governments use the fiscal lever, and finally the central bank sets the monetary policy. The structure of preferences of the agents is common knowledge, therefore the game allows for backward induction, i.e. the national governments take into account the foreseeable reaction of the central bank while setting their optimal policies.

⁷One should notice that a bigger concern for unemployment of the fiscal authorities does not need to arise from corruption or political cycles; while the ECB has a mandate oriented towards price stability, national governments are elected and their preferences should reflect those of the population.

⁸In reality it is enough that the governments believe this when they move, but this would complicate the description of the game. While hypothesis 4 is different from the more commonly used Phillips curve, one can easily show that the latter would not give any incentive to the fiscal authorities to put pressure on the ECB. While this case is perfectly possible, most economists seem to believe that this pressure is a real risk.

The order of the moves



The order of the players has been chosen to reflect both the capacity of influencing each other that is observed in real world and (as argued in the previous section) the only interesting case. In the first two years of EMU, the policy of the ECB has been attentive to both inflation and unemployment levels, while the influence of the ECB on member states was limited to speeches, with the SGP as the only binding institution. If the ECB is not uniquely committed to price stability it is reasonable to assume that, as long as the governments have some freedom in the use of fiscal policy, they can take into account a possible reaction of the ECB⁹. The order of play then reflects the relations of power among agents. A second interpretation could be that the ECB is “faster to react”, in the sense that it can change policy much more frequently than the national governments; this greater flexibility allows the ECB to follow any change in fiscal policies with an appropriate response. Under this interpretation, the order of players reflects a sequence in time.

2.1 The national markets

All national markets are identical in structure, but may have different inflation and unemployment levels and different sizes. Each of them is affected by public policies in the following stylized way¹⁰:

$$P = p_m M + p_g G + \varepsilon \quad (1)$$

$$U = -u_m M - u_g G + \eta \quad (2)$$

where P, U, M, G indicate the deviations of prices, unemployment, money supply, fiscal expenditure from target values, and ε and η are I.I.D. shocks to prices and to unemployment.

⁹The SGP is a (very imprecise) way to take away such freedom from the governments.

¹⁰It is important to notice that no single inflation level across the union is imposed.

The choice of assigning the shocks directly to the macro variables is unusual, as most of the literature prefers to have well-identified supply and demand shocks (e.g. Buti, 2003, Beetsma and Bovenberg, 1995) or shocks the parameters of the model (Dixit and Lambertini, 2003). However, this formulation is intentional. Shocks do not come with a label, and their nature (supply, demand or parameter shock) has not been recognized at the time the agents play their strategies. Therefore, I found the idea of shocks to quantities which are observable to the players more interesting to develop.

The target values are common to the ECB and the national governments, but the former is less inclined to short-run output stabilization (hypothesis 3). All other letters are positive parameters.

Hypothesis 4 implies:

$$\frac{p_m}{u_m} > \frac{p_g}{u_g}$$

This condition simply states that monetary policy has a comparative advantage in controlling prices, and fiscal and monetary instruments have correctly been allocated.

2.2 The ECB

In models solvable by backward induction it is often convenient to start from the player who moves last, in this case the central bank (*ECB*). The reason is that the strategy of the ECB is taken into account by the governments (*G*), while the play of *G* is already known to the ECB when it moves.

The ECB runs the monetary policy for the whole union. The monetary policy is common and has symmetrical effects in all countries (given that they have identical structures).

The preferences of the ECB are defined over union aggregates:

$$L_{ECB}(M, G, \varepsilon, \eta) = [P(M, G, \varepsilon)]^2 + \beta [U(M, G, \eta)]^2 \quad (3)$$

where the variables without a subscript are the weighted average of the N participating countries:

$$M = \sum_{i=1}^N \lambda_i M_i$$

$$G = \sum_{i=1}^N \lambda_i G_i$$

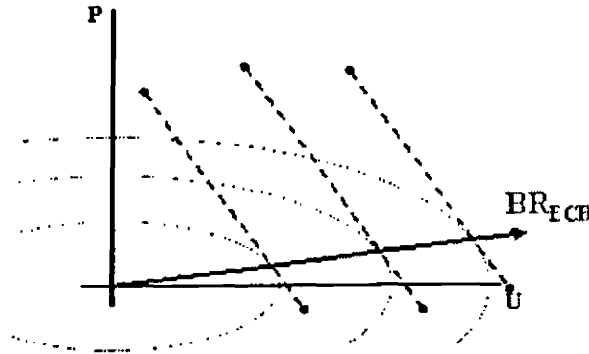
$$\varepsilon = \sum_{i=1}^N \lambda_i \varepsilon_i$$

$$\eta = \sum_{i=1}^N \lambda_i \eta_i$$

$$\text{with } \sum_{i=1}^N \lambda_i = 1$$

The parameter β expresses the relative aversion of the ECB to inflation and unemployment.

Preferences and Best Response of CB



The Best response of the ECB can be expressed as follows (see appendix):

$$M(G, \varepsilon, \eta) = -\mu_g \left(\sum_{i=1}^N \lambda_i G_i \right) - \mu_e \left(\sum_{i=1}^N \lambda_i \varepsilon_i \right) + \mu_h \left(\sum_{i=1}^N \lambda_i \eta_i \right)$$

Or in a condensed representation:

$$M(G, \varepsilon, \eta) = -\mu_g G - \mu_e \varepsilon + \mu_h \eta$$

$$\text{with } \mu_g = - \left[\frac{1}{p_m^2 + \beta u_m^2} \right] (-\beta u_m u_g - p_g p_m)$$

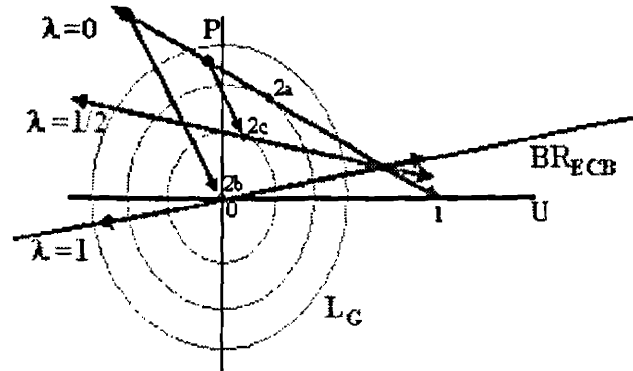
$$\mu_e = - \left[\frac{1}{p_m^2 + \beta u_m^2} \right] (-p_m)$$

$$\mu_h = + \left[\frac{1}{p_m^2 + \beta u_m^2} \right] \beta u_m \text{ all positive.}$$

The best strategy of the ECB is to deflate in response to an increase of expenditure by the governments (G) and to an exogenous increase of prices ε , and to support employment when a negative shock η hits it.

The term in squared brackets is the reciprocal of the responsiveness of the target variables to a policy change and determines the size of the intervention. The ECB intervenes according to the slope of its Phillips curve (u_m/p_m) and to the preferences β . Observe that when only one or some countries of weight λ_i are hit by a shock or adopt a policy change, the ECB will move proportionally from the perceived situation to its BR line. This implies that each governments faces a backward-induction "budget constraint" that does not coincide with the BR of ECB unless $\lambda_i = 1$. As an example, the locus of equilibria chosen by a backward inducting government is pictured below for $\lambda = \{0, 1/2, 1\}$.

Size and possible equilibria



2.3 The governments

In this section the best response function of the national governments is calculated in the most general framework. This will lead to some cumbersome notation, but it has the advantage of encompassing all the other situations as special cases.

In the general situation (symmetric information) each government is not constrained in the choice of its fiscal stance and is aware of the structure of the model and of the moves of nature (the shocks in all participating countries). Thus, each government is able to form expectations about the moves of its peers and (by backward induction) about the move of the ECB¹¹, and acts accordingly.

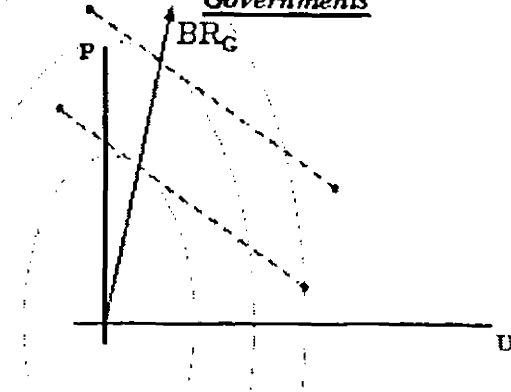
The loss function of each government i is

$$L_{Gi}(M_i, G_i, \varepsilon_i, \eta_i) = [P_i(M_i, G_i, \varepsilon_i)]^2 + \alpha [U_i(M_i, G_i, \eta_i)]^2 \quad (4)$$

and (hypothesis 3) the government cares about unemployment more than the ECB, therefore $\alpha > \beta$.

¹¹ The move of ECB is the only variable of interest for the government because it affects the payoff of its strategy, while the fiscal policies of the other countries do not have direct domestic effects but only indirect externalities coming from the reaction of the ECB.

Preferences and Best Response of the Governments



Solving the FOC for G_i (in appendix), one obtains the BR function of government i :

$$G_i(\eta_i, \eta_j, \varepsilon_i, \varepsilon_j, G_j) = \Omega * \left\{ \begin{aligned} &+ [(-\lambda_i p_m \mu_h) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (1 - \lambda_i u_m \mu_h)] \eta_i \\ &+ [(-\lambda_j p_m \mu_h) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_j u_m \mu_h)] \eta_j \\ &- [(1 - \lambda_i p_m \mu_e) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_i u_m \mu_e)] \varepsilon_i \\ &- [(-\lambda_j p_m \mu_e) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_j u_m \mu_e)] \varepsilon_j \\ &+ [(p_m \mu_g \lambda_j) (-\lambda_i p_m \mu_g + p_g) + \alpha (\lambda_i u_m \mu_g - u_g) (-u_m \mu_g \lambda_j)] G_j \end{aligned} \right\}$$

with

$$\Omega = \left[\frac{1}{(\lambda_i u_m \mu_g - u_g)^2 \alpha + (-\lambda_i p_m \mu_g + p_g)^2} \right]$$

Fortunately this will be the most complicated expression in the paper. In order to grasp the intuition one has to take into account that the reaction of the ECB is automatically taken into account in the expression above, while those of the other players are not (and they explicitly appear as arguments). This difference in treatment is due to the fact that the governments move simultaneously.

One extreme case ($\alpha = 0$) is ruled out by hypotheses 2 and 3, but it is useful to consider it for the purpose of exposition. If G_i cares only about inflation (that is, if it is even more conservative than the ECB) a fiscal restriction will follow a shock to domestic or foreign unemployment because the comparatively "weak" ECB is going to allow some more inflation. The same is true after a domestic price shock only partially offset by the ECB.

A fiscal expansion follows a foreign price shock simply because the ECB restriction is not welcome.

A government uniquely concerned about the internal level of employment ($\alpha \rightarrow \infty$) always increases spending after a shock to unemployment. This reaction is somehow smoothed because the government knows that the ECB will take part of the burden of the intervention ($1 - \lambda_i u_m \mu_h$). If the shock arises in another country, the expected monetary expansion of the ECB ($-\lambda_j u_m \mu_h$) leads to fiscal consolidation. The same is true (with different signs, because the expected reaction of the ECB goes in the other direction) for a shock to prices; the ECB will restrict the quantity of money, and this calls for fiscal expansion.

This coefficient γ_g is the indirect externality reaction to the fiscal expansion of other members. In appendix it is shown that hypothesis 4 implies that this parameter can take values between 0 and 1 (not included)¹². This conditions ensures the existence of the Subgame Perfect Equilibrium¹³.

Finally, a shorter notation is introduced for the complex expenditure function of the generic government i : this function represents the BR of a government free to move, aware of the fact that the ECB will move next and informed about the shocks in all participating countries.

$$G_i = (\gamma_e \varepsilon_i + \gamma_h \eta_i) + (\gamma_e^f \varepsilon_j + \gamma_h^f \eta_j) + \gamma_g G_j \quad (5)$$

With $\gamma_e < 0, \gamma_h > 0, \gamma_e^f > 0, \gamma_h^f < 0$ and $0 < \gamma_g < 1$ under the hypotheses of the model. The sign of the coefficients is derived analytically in appendix.

3 Five possible scenarios

The proposals for coordination are of two kinds: positive coordination and negative coordination. Positive coordination consists of regular meetings in which the policy responses are coordinated on a case-by-case basis, negative coordination consists of rules laid down at the beginning and then followed throughout. By applying restrictions to the general model solved in section 2, we can analyze the following scenarios, ranked from minimal to maximal positive coordination and contrasted with negative coordination:

¹²In the game the coefficient γ_g represents the (negative) reaction of G_i to the (negative) reaction of ECB to the variation in G_j . This is sometimes referred to as "domino effect" of fiscal policies.

¹³Technically, one has a Nash Equilibrium of a reduced form game between governments, with the reaction function of the ECB factored in their objective function. This corresponds to the Subgame Perfect Equilibrium of the original game.

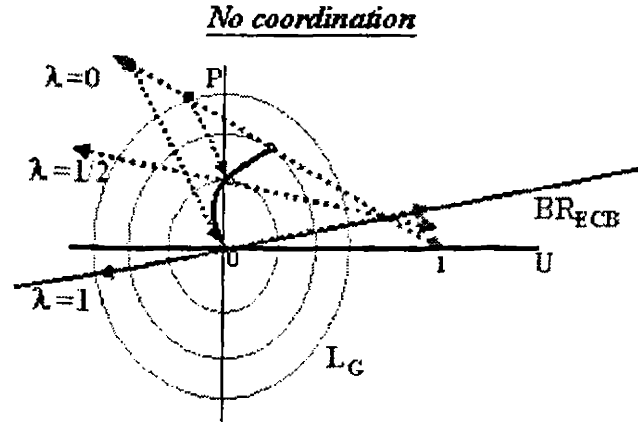
- no coordination and autonomous fiscal policies. The fiscal authorities in the different countries are free to fit their policies to their country's specific needs, and no interaction (neither informal nor formal) is relevant;
- positive coordination via sharing of information (informal cooperation). A loose form of cooperation among fiscal authorities could take the form of periodical informal meetings. Such meetings would foster information exchange, without committing any of the participants to specific policies. The Euro-12 group seems to be a good example of such an institution;
- positive coordination through formal mechanisms. In the context of an increased cooperation, for example within a reinforced version of the BEPG (Broad Economic Policy Guidelines), one could have formal meetings in which the fiscal stance of the participating countries would be decided. The decisions taken in these meetings would then be binding for all Euro members;
- negative coordination: SGP;
- negative coordination: an ECB-based, alternative SGP. If the ECB has to be free from pressure, it must be able to impose its preferences on the national member states. The proposal is that the "alternative SGP" should be based on the declared preferences of the Central Bank, and the member states should comply with those requirements as they do with the current SGP. Such an arrangement would bring the ECB out of its role of Stackelberg follower and allow it to neglect most of the stabilization issue.

The current framework of the EMU includes the SGP and positive informal cooperation.

3.1 No coordination

When no coordination is possible and the exchange of information is scarce, one government is not able to forecast the policies of the others.

In our model this implies that each government takes the a priori expected value of the shocks for the others, that is zero. Also, when the shocks are not known abroad, all the participating governments can only assume that the others will be inactive. This leads to a very simple behavior: each government reacts as if it was the only one hit by a shock.



An asymmetric shock with no coordination The outcome of a shock in country i when there is no coordination or exchange of information is

$$G_i = (\gamma_e \varepsilon_i + \gamma_h \eta_i)$$

$$\begin{aligned} P_i &= p_m M(\lambda_i G_i, \lambda_i \varepsilon_i, \lambda_i \eta_i) + p_g G_i + \varepsilon_i \\ &= (p_g \gamma_h + p_m \mu_h \lambda_i - \lambda_i p_m \mu_g \gamma_h) \eta_i + (1 + p_g \gamma_h - p_m \mu_e \lambda_i - \lambda_i p_m \mu_g \gamma_h) \varepsilon_i \end{aligned}$$

$$\begin{aligned} U_i &= -u_m M(\lambda_i G_i, \lambda_i \varepsilon_i, \lambda_i \eta_i) - u_g G_i + \eta_i = \\ &= (u_m \mu_g \lambda_i \gamma_h + 1 - u_m \mu_h \lambda_i - u_g \gamma_h) \eta_i + (u_m \mu_g \lambda_i \gamma_e - u_g \gamma_e + u_m \mu_e \lambda_i) \varepsilon_i \end{aligned}$$

$$G_j = 0$$

$$\begin{aligned} P_j &= p_m M(\lambda_i G_i, \lambda_i \varepsilon_i, \lambda_i \eta_i) = \\ &= (-\lambda_i p_m \mu_g \gamma_h + p_m \mu_h \lambda_i) \eta_i + (-p_m \mu_g \lambda_i \gamma_e - p_m \mu_e \lambda_i) \varepsilon_i \end{aligned}$$

$$\begin{aligned} U_j &= -u_m M(\lambda_i G_i, \lambda_i \varepsilon_i, \lambda_i \eta_i) = \\ &= (u_m \mu_g \lambda_i \gamma_h - u_m \mu_h \lambda_i) \eta_i + (u_m \mu_g \lambda_i \gamma_e + u_m \mu_e \lambda_i) \varepsilon_i \end{aligned}$$

$$\begin{aligned} M^0 &= M(\lambda_i G_i, \lambda_i \varepsilon_i, \lambda_i \eta_i) = \\ &= (-\mu_g \lambda_i \gamma_h + \mu_h \lambda_i) \eta_i + (-\mu_g \lambda_i \gamma_e - \mu_e \lambda_i) \varepsilon_i \end{aligned}$$

Prices and unemployment outcomes for the union are the weighted average of national values with weights λ_i and $\lambda_j = (1 - \lambda_i)$.

In case of an asymmetric shock in country i , both prices or unemployment raise after intervention of the players¹⁴; the solution for both $\varepsilon_i > 0, \eta_i > 0$ is, for every $\lambda \in (0, 1)$ ¹⁵,

¹⁴The prices are totally smoothed if $\lambda_i = 1$, which can be interpreted as the one country case or a totally common shock. When $\lambda_i = 0$ the result is (trivially) zero as well.

¹⁵Once again $\lambda_i = 1$ and $\lambda_i = 0$ imply that the shocks have no effect on prices and unemployment.

($P > 0, P_i > 0, P_j < 0; U > 0, U_j > 0; M^o < 0$). One should remark that the sign is not uniquely determined for U_i . This is not surprising: the picture above shows that U_i can be either positive or negative depending on the value of λ_i . Our computer simulations show, however, that for realistic values of the parameters it takes a value of λ_i very close to 1 to have negative values¹⁶.

3.2 Positive coordination

In its strictest definition, positive coordination implies the implementation of a fiscal policy for the EU as a whole by a collegial "decision-making body", whose decisions would be binding for all. This is the typical mode of operation of the common monetary policy in the ECB Council, and it has been suggested as a long-term objective for coordination in the framework of the "closer cooperation" clauses.

As stated before, the likely scenario for the very short term seems to be limited to a greater sharing of information in search for decisions based on consensus. This is the weakest form of positive coordination, and is analyzed first.

3.2.1 Informal cooperation

It has been proposed that cooperation could be informal, in the respect of the existing treaties that impede formal coordination among a subgroup of EU members. This informal cooperation could for example increase the sharing of information about the situation in the different countries, without reaching the point of concertation of policies¹⁷. In this section it will be clear that, even though the sharing of information is generally perceived to be a positive factor among economists, this need not be the case in a strategic environment.

A shock with informal cooperation The new equilibrium following a shock will be the Nash equilibrium of the reduced form game, where the BRs of the two governments intersect. The complete expression of the Nash equilibrium is reported in appendix. After

¹⁶In computer simulations with $p_m = 2, p_g = u_g = u_m = 1, \alpha = 1.25, \beta = 0.75$ it takes a value as big as $\lambda_i = 0.85$ to have a negative U_i as consequence of a shock in either η_i or ϵ_i . The biggest country in Europe is Germany, whose share in the EU GDP is only slightly above 30%.

¹⁷The macroeconomic data are usually collected by independent statistical agencies, and become known to the public at a later stage (ex post check). It is therefore assumed that the data are truthfully revealed to the partners.

as asymmetric shock in country i , the outcome is for country i

$$\begin{aligned}
G_i &= \frac{(\gamma_e \varepsilon_i + \gamma_h \eta_i) + \gamma_g (\gamma_e^f \varepsilon_i + \gamma_h^f \eta_i)}{1 - \gamma_g^2} \\
P_i &= \left(p_m \lambda_i \mu_h + \frac{p_g (\gamma_h + \gamma_g \gamma_h^f) - p_m \mu_g \left[(\lambda_i \gamma_h + \lambda_j \gamma_h^f) + (\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g \right]}{1 - \gamma_g^2} \right) \eta_i + \\
&\quad + \left(1 - p_m \lambda_i \mu_e + \frac{p_g (\gamma_e + \gamma_g \gamma_e^f) - p_m \mu_g \left[(\lambda_i \gamma_e + \lambda_j \gamma_e^f) + (\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g \right]}{1 - \gamma_g^2} \right) \varepsilon_i \\
U_i &= \left(u_m \lambda_i \mu_e + \frac{u_m \mu_g \left[(\lambda_i \gamma_e + \lambda_j \gamma_e^f) + (\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g \right] - u_g (\gamma_e + \gamma_g \gamma_e^f)}{1 - \gamma_g^2} \right) \varepsilon_i \\
&\quad + \left(1 - u_m \lambda_i \mu_h + \frac{u_m \mu_g \left[(\lambda_i \gamma_h + \lambda_j \gamma_h^f) + (\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g \right] - u_g (\gamma_h + \gamma_g \gamma_h^f)}{1 - \gamma_g^2} \right) \eta_i
\end{aligned}$$

and for country j

$$\begin{aligned}
G_j &= \frac{(\gamma_e^f \varepsilon_i + \gamma_h^f \eta_i) + \gamma_g (\gamma_e \varepsilon_i + \gamma_h \eta_i)}{1 - \gamma_g^2} \\
P_j &= \left(\frac{p_g (\gamma_e^f + \gamma_g \gamma_e) - p_m \mu_g \left[(\lambda_i \gamma_e + \lambda_j \gamma_e^f) + (\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g \right]}{1 - \gamma_g^2} - p_m \lambda_i \mu_e \right) \varepsilon_i + \\
&\quad + \left(p_m \lambda_i \mu_h + \frac{p_g (\gamma_h^f + \gamma_g \gamma_h) - p_m \mu_g \left[(\lambda_i \gamma_h + \lambda_j \gamma_h^f) + (\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g \right]}{1 - \gamma_g^2} \right) \eta_i \\
U_j &= \left(\frac{u_m \mu_g \left[(\lambda_i \gamma_e + \lambda_j \gamma_e^f) + (\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g \right] - u_g (\gamma_e^f + \gamma_g \gamma_e)}{1 - \gamma_g^2} + u_m \lambda_i \mu_e \right) \varepsilon_i \\
&\quad + \left(\frac{u_m \mu_g \left[(\lambda_i \gamma_h + \lambda_j \gamma_h^f) + (\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g \right] - u_g (\gamma_h^f + \gamma_g \gamma_h)}{1 - \gamma_g^2} - u_m \lambda_i \mu_h \right) \eta_i
\end{aligned}$$

and for the common monetary policy:

$$\begin{aligned}
M^N &= M(\lambda_i G_i + \lambda_j G_j, \lambda_i \varepsilon_i, \lambda_i \eta_i) = \\
&= \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g + \lambda_i \gamma_h + \lambda_j \gamma_h^f \right) \mu_g + \mu_h \lambda_i \right) \eta_i \\
&\quad + \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g + \lambda_i \gamma_e + \lambda_j \gamma_e^f \right) \mu_g - \mu_e \lambda_i \right) \varepsilon_i
\end{aligned}$$

This result can be compared with the one of no cooperation. In the previous case, the initial response to the shock $(\gamma_e \varepsilon + \gamma_h \eta)$ was also the final outcome. Here, the initial

shock "spreads around" through monetary externalities. First, each government is informed about the shocks occurring abroad, and keeps them into account $(\gamma_e^f \varepsilon_j + \gamma_h^f \eta_j)$; then, the reaction of the partners is also considered (square brackets). Finally, the whole numerator is multiplied by $1/(1 - \gamma_g^2)$ because of the interaction of players.

The ECB intervention can also be compared with the one of the precedent case (no exchange of information). For example, in case of an asymmetric unemployment shock in i the difference in intervention is

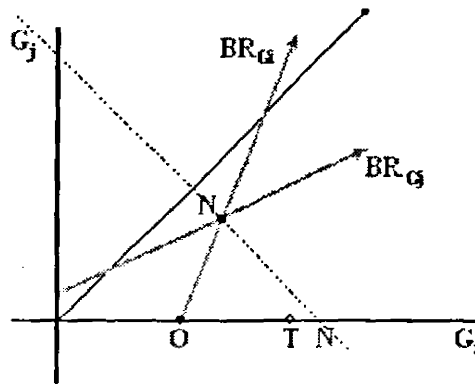
$$M^N - M^o = -\frac{1}{1 - \gamma_g^2} \mu_g \left((\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g + \lambda_i \gamma_h \gamma_g^2 + \lambda_j \gamma_h^f \right) \eta_i$$

which can be shown to be positive for $\lambda_i \in (0, 1)$ by substituting in the definitions. A similar conclusion applies to an inflation shock in i . When the different governments are aware of each other's moves but they cannot coordinate, the ECB is forced to show more activism.

The signs of the variables in equilibrium are not unique as in the first case, and depend on λ_i . Substitution in the definition leads to the following signs: for $\lambda_i \in (0, 1)$ we have $(P_i > 0, P_j < 0; U_j > 0; M^N < M^o < 0)$. If the country is the smaller one, $\lambda_i \in (0, 1/2)$, then $(P > 0; U > 0, U_i > 0)$, for bigger values of λ_i it is true that $(P < 0; U < 0)$. As in the previous case, U_i remains indeterminate although generally positive.

A graphic comparison The example of an asymmetric shock in country i is shown in the figure below. The difference in overall fiscal expansion can be seen on a graph (G_i, G_j) by tracing a diagonal line that reports the total expansion on the G_i axis: the distance between the quantities (O) and the point (N) is the increase in expenditure above the non cooperation case, which would be realized if the interaction terms $(\gamma_g, \gamma_e^f$ and $\gamma_h^f)$ were zero. The interaction between the two G s is due to the fact that country j observes the shock in i and anticipates the ECB restriction to the fiscal expansion in i , therefore j expands in order to offset it. This in turn is anticipated by i , and the fiscal expansion is amplified, and so on. The result is an increase in expenditure both in the case of an exogenous increase in prices or unemployment.

Exchange of information



3.2.2 Formal coordination

In the context of formal fiscal coordination, the fiscal authorities “act as if they were one”, observe the average shocks to the whole union and compute the optimal policy response as if they were a single government¹⁸. Total coordination leads exactly to the same outcome as the one country case, where the shocks are completely smoothed at the union level. As usual, the complete characterization of the solution is in the appendix. The outcome of an asymmetric shock in country i is:

$$\begin{aligned}
 G^T &= \lambda_i (\tilde{\gamma}_e \varepsilon_i + \tilde{\gamma}_h \eta_i) \\
 P &= p_m M + p_g G + \lambda_i \varepsilon_i = 0 \\
 U &= -u_m M - u_g G + \lambda_i \eta_i = 0 \\
 G_i &= \lambda_i G^T \\
 P_i &= -p_g \lambda_j \lambda_i (\tilde{\gamma}_e \varepsilon_i + \tilde{\gamma}_h \eta_i) + \lambda_j \varepsilon_i \\
 U_i &= u_g \lambda_j \lambda_i (\tilde{\gamma}_e \varepsilon_i + \tilde{\gamma}_h \eta_i) + \lambda_j \eta_i \\
 G_j &= \lambda_j G^T \\
 P_j &= -p_g \lambda_i^2 (\tilde{\gamma}_e \varepsilon_i + \tilde{\gamma}_h \eta_i) - \lambda_i \varepsilon_i \\
 U_j &= u_g \lambda_i^2 (\tilde{\gamma}_e \varepsilon_i + \tilde{\gamma}_h \eta_i) - \lambda_i \eta_i \\
 M^T &= (-\mu_g \tilde{\gamma}_h + \mu_h) \lambda_i \eta_i + (-\mu_g \tilde{\gamma}_e - \mu_e) \lambda_i \varepsilon_i
 \end{aligned}$$

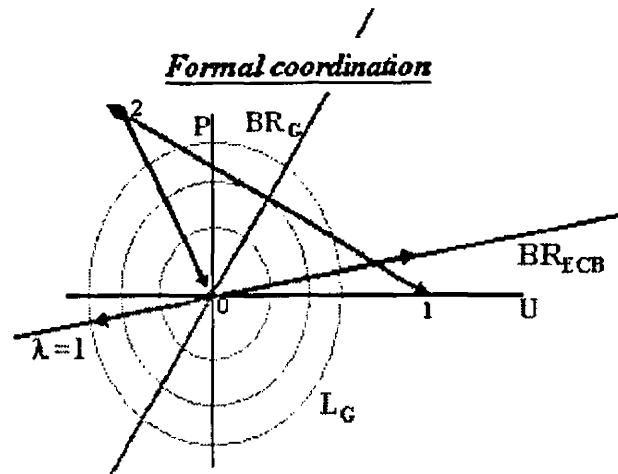
where $\tilde{\gamma}_e, \tilde{\gamma}_h$ are the closed-economy equivalents of γ_e and γ_h ¹⁹.

¹⁸ The weights used to calculate the aggregate shocks are assumed to be the same the ECB uses when it has to compute its policy response; this assumption is not unrealistic (the weights could be the national GDPs for example) and allows for a clearer exposition, but it is in no way essential.

¹⁹ The closed economy equivalents can be calculated by setting λ_i to unity. Their analytical expression is

Both in case of a symmetric shock or an asymmetric shock in country i , prices or unemployment remain unaltered at the aggregate level. After a price shock ($\varepsilon_i > 0$), for every $\lambda_i \in (0, 1)$, then ($P = 0, P_i > 0, P_j < 0; U = U_i = U_j = 0; M^T < 0$). After an increase in unemployment ($\eta_i > 0$), for every $\lambda_i \in (0, 1)$, then ($P = P_i = P_j = 0; U = 0, U_i > 0, U_j < 0; M^T < 0$). In both cases, the shock is partially translated to the other country, while the consequences on the other variable are zero.

The involvement of the ECB in the stabilization is of the same order of magnitude of informal cooperation. The total smoothing of disturbances is due to the fact that now the response of the ECB is completely internalized, and therefore the joint fiscal authority can decide on which point of the ECB Best Response it wants to be positioned. The following picture shows that the only point in which the BR of G and ECB intersect is the origin.



Subgame Perfect Equilibrium and Nash Equilibrium One obvious objection would be that the backward induction story is not really credible in this case, because a reinforced Eurogroup would evolve in something similar to a equal interlocutor to the ECB. As a matter of fact, when the decision about fiscal policy is taken "as if" there was a single authority, the backward induction solution always coincides with the Nash Equilibrium (NE) between G s and ECB. In this simple game it does not make a difference whether the ECB moves last (Subgame Perfect Equilibrium) or at the same time (Nash Equilibrium), because in both cases the final outcome is total smoothing of shocks, in the only place where the two BR intersect. For the one country case (or the Eurogroup case) the "order of the moves" is irrelevant.

$$\tilde{\gamma}_e = \frac{|-p_g|}{u_g^2 \alpha + p_g^2}, \quad \tilde{\gamma}_h = \frac{\alpha u_g}{u_g^2 \alpha + p_g^2}$$

3.3 Negative coordination

Negative coordination denotes commonly agreed rules to prevent fiscal policy from overburdening the monetary policy. Currently, the Stability and Growth Pact prevents the emergence of large public deficits and the resulting threat to price stability. In the following section the implemented SGP will be compared with a different one to show that it is far from being optimal, both from the point of view of stabilization and from the point of view of the ECB.

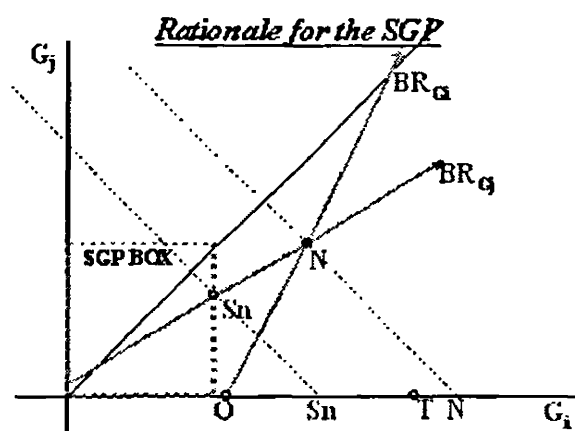
3.3.1 The “Stability and Growth Pact” (SGP)

The SGP implies that the level of fiscal expansion is bounded above by a fixed level, say by \bar{G} for the whole union. When the constraint is not binding the solution is one of those described above. Given that the governments are relatively more concerned about unemployment than the ECB, the result of letting them act freely would always be a restrictive policy by ECB. The rationale of the SGP is to limit the potential involvement of ECB in short run smoothing by putting a cap on the fiscal expansion that governments are allowed to do. In the case of no cooperation²⁰,

$$\begin{aligned} G_i &= \min [(\gamma_e \varepsilon_i + \gamma_h \eta_i), \bar{G}] \\ G_j &= \min [(\gamma_e \varepsilon_j + \gamma_h \eta_j), \bar{G}] \\ M^S &= -\mu_g (\lambda_i G_i + \lambda_j G_j) - \mu_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \mu_h (\lambda_i \eta_i + \lambda_j \eta_j) \\ &\geq -\mu_g \bar{G} - \mu_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \mu_h (\lambda_i \eta_i + \lambda_j \eta_j) \end{aligned}$$

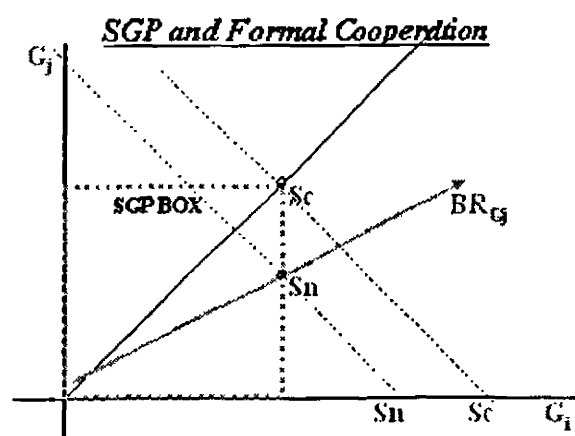
The following picture shows the rationale for the SGP. After a shock in i that leads to O , the interaction among governments would produce N as final outcome. If the SGP limits the expansion of each of them, the total fiscal expansion is limited to S_n (the maximum permitted by the Pact for country i , the BR to i for country j).

²⁰The case of informal cooperation is not analytically exposed because the argument follows exactly the same line. The only difference is that the cap on the deficit is more useful because it has the additional effect of limiting the strategic escalation of deficits typical of the NE.



Interaction with positive coordination An important point to stress is that negative coordination (upper bounds to fiscal expansion, like in the SGP) becomes less effective if coupled with *formal* positive coordination. This means that the SGP could be formally maintained but would lose some of its potential should the member states move to a formalized process of fiscal coordination.

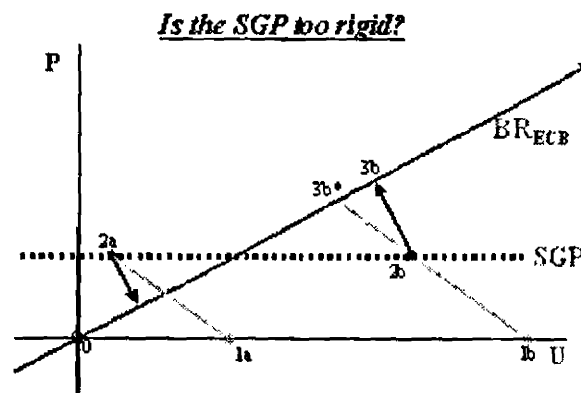
The expected value of the restriction of the SGP is a measure of the potential protection that the ECB can receive from the constraints of the Pact. In appendix it is proved that this value is lower when formal coordination is put into place. The reason is that, in absence of formal cooperation, the limit binds every country separately, while in formal coordination the pact only controls the overall quantity G^T . When the policies are commonly run, all the countries run the same (percentage) deficit, no matter what their private shock can be, and all hit the constraint at the same time or not at all. In other words, the fiscal authorities borrow from each other the unused margins of freedom.



These results are shown analytically in appendix. Here it is important to notice that

the result is extremely general: the power of a negative constraint like the SGP is always and considerably weakened when the fiscal authorities can act together ($S_c > S_n$ always). Positive formal coordination weakens de facto the existing negative coordination.

Perverse effects of the SGP The SGP could (surprisingly) also lead to a greater activism of the ECB: in the case of a big unemployment shock, the ECB could have incentives to increase the quantity of money in presence of insufficient fiscal reaction. The figure below shows that in presence of a strong disturbance in unemployment the ECB could decide to increase the quantity of money ($2b \rightarrow 3b$) because the SGP constrains the national governments. The picture also shows that the fixed cap to fiscal expenditure implemented in the SGP favors those countries which have been hit by a light disturbance over those who really would need to use the fiscal lever even according to the conservative judgement of the ECB. While the more "lucky" countries hit by a small shock are allowed to provoke "unnecessary" inflation ($2a$), those in real need are forced to wait in ($2b$) for an intervention ($2b \rightarrow 3b$) of the ECB. Such intervention cannot be given for granted, because it depends on the overall situation in the union; furthermore, it would be costly because the monetary stance has more effect on prices than on unemployment. Point ($3b$) has more inflation and more unemployment than ($3b^*$).



Given the experience of the national governments before Maastricht became binding, it is certain that the fiscal discipline imposed by the SGP contributes to limit the extent of short run interventions of the ECB. Still, it appears to be an extremely rigid device, first because it imposes arbitrary limits, and then because it has the unpleasant consequence of allowing unnecessary expansion by some while impeding the necessary intervention where this would be necessary.

3.3.2 Comparing the SGP with a "Flexible SGP"

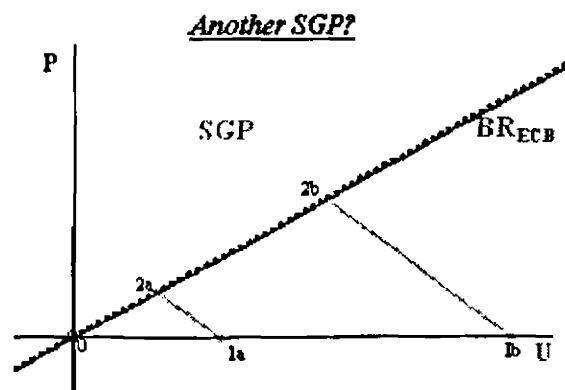
The SGP can be compared with a similar one based on different criteria. Suppose that the ECB communicates its preferences in terms of "maximum inflation allowed for each variation in unemployment" (β). Every member state is then constrained to adopt a fiscal policy that, according to the commonly agreed model, keeps the target variables within the limits announced by the Central Bank. In other words, the limit ($G_i = \bar{G}$) on fiscal expansions is replaced by

$$\hat{G}_i \text{ s.t. } [P_i(G_i, \varepsilon_i, \eta_i) = \beta \cdot U_i(G_i, \varepsilon_i, \eta_i)] \quad \forall i$$

The excessive deficit procedure can be applied to non complying states exactly as in the current SGP.

The resulting policies follow directly from the setup and do not need calculations. Take as an example a shock that increases prices or unemployment. The national governments, being more prone to accommodate shocks, always use the whole discretionary margin allowed by the Pact. By doing this, they perfectly substitute the ECB in the short-run stabilization function. The ECB then does not need to react to inflationary pressures and is able to concentrate on the long run stability of prices.

From the point of view of equity, this criterion has also the advantage of allowing those countries that are hit by bigger shocks a larger margin of intervention. On the other hand, there is no monetary spillover that can possibly amplify the effects of the original shock and the responses of the governments; the propagation of shocks of the Nash Equilibrium is stopped at the first stage.



3.4 The interaction of positive and negative coordination

In the following section a simulation illustrates how elements of positive and negative coordination interact.

A monetary union of 12 countries is simulated. The countries have weights that corresponds to the GDPs of the countries that participate in the EMU. As in the theoretical part, I focus on the monetary externalities, therefore all the countries have the same structure ($p_m = 2$, $p_g = u_g = u_m = 1$) that respects the required hypothesis of allocation of instruments.

For each country and each period I create a shock to prices and one to employment. All the shocks are drawn from standardized normal distribution and they are I.I.D. A series of Monte Carlo experiments is then run in order to see which framework imposes to the ECB the bigger quantity of short term stabilizing interventions. The results are summarized in the table below where the different levels of positive coordination (rows) interact with more or less binding SGP fixed limits. For every combination the mean and variance of the fiscal activism of a country with weight 0.17 (like Italy) are reported. In the following row the activism of the ECB is described. Finally, where applicable I reported the percentage of cases in which the SGP actually constrained the fiscal policy of the country.

Coordination	No SGP		SGP 2		SGP 1	
	Exp	Var	Exp	Var	Exp	Var
None						
Fiscal	.02	.50	-.01	.50	-.08	.47
Monetary	0	0	0	0	.01	0
% cut	-		0.4%		6.7%	
Nash						
Fiscal	0	1.65	-.10	1.38	-.31	.96
Monetary	0	.50	.07	.39	.21	.24
% cut	-		3.5%		25%	
Formal						
Fiscal	-.01	.87	0	.97	-.09	.74
Monetary	0	.34	0	.37	.06	.31
% cut	-		3.2%		15.6%	

The main problem is when the ECB feels it has to intervene (to abandon its long run policy) to contrast what it perceives to be an excessive inflation of the Union. A more detailed report (on restrictive monetary policy only) is presented in the table below. The same table (in graphical form) also appears in the conclusions.

Size of negative interventions			
	No SGP	SGP2	SGP1
None	19	21	15
Nash	289	231	96
Formal	251	240	210

The overall size of the ECB restrictions in 1000 trials

The first observation is that the theoretical case of no-cooperation no-information produces very small fiscal responses compared to the others. In this case the SGP does not have a role, and one can see that setting the ceiling \bar{G} to 2 and then to 1 changes very little the outcome.

The simulation illustrates the theoretical predictions; in absence of SGP, the fiscal expansions implies an involvement of the ECB in short-run stabilization that is not only one order of magnitude bigger than the no-cooperation case, but also bigger than the case of formal coordination. On the other hand, the SGP effectively constrains the deficit of the member countries in a way that limits the involvement of the central bank (from 289 to 96 in the right table).

The SGP becomes almost irrelevant when the countries can act as if they were one; the ceiling \bar{G} limits the involvement of the ECB from 251 to 210 and cannot do better, because the fiscal authorities are now able to coordinate in a way that allows them to take full advantage of the freedom to spend left by the Pact.

4 Conclusions

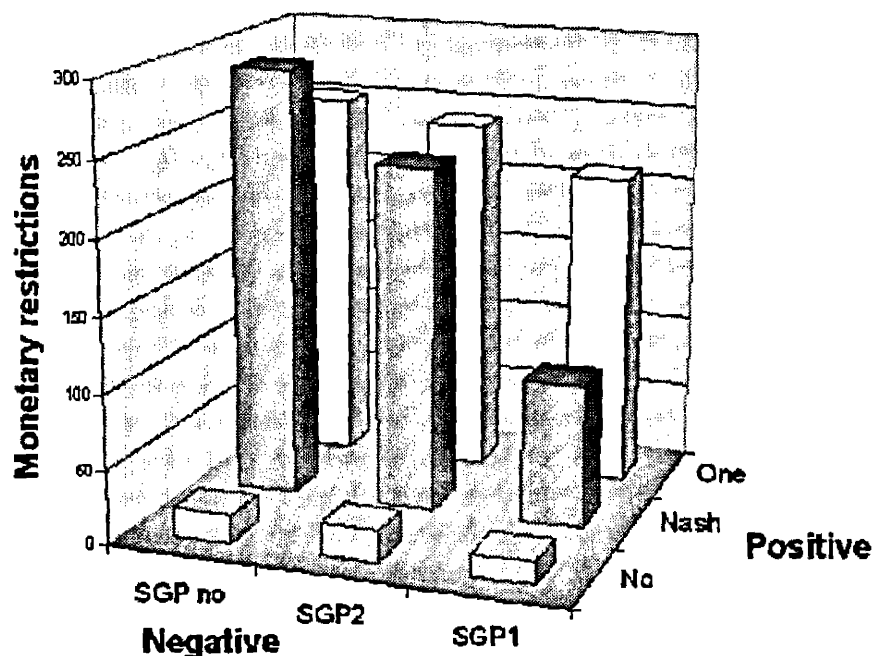
In the present paper the question of which form of fiscal coordination would imply the least stabilizing effort by the ECB has been addressed. From the analytical development of the game, it appears that two main forces enter into play:

- on the one hand, the awareness of the interplay of fiscal policies and monetary policies by the players can start quite complex interactions, that lead to the multiplication of the initial disturbances and to their propagation to the whole union through monetary externalities. Information without coordination leads to policy induced instability.
- on the other hand, a complete coordination would internalize such effects and avoid propagations, while giving back to the fiscal authorities at least one degree of freedom in fiscal policy to counteract common disturbances. The game outlined the risk that complete coordination may weaken the SGP.

- In the case of formal coordination, both the SGP and the NE imply pressure on the ECB and the complete smoothing of shocks. This result contradicts the common wisdom according to which policy coordination comprising both fiscal and monetary authorities would imply a lot of pressure on the ECB, while formal fiscal coordination alone would not.

Negative coordination is somewhat simpler, and the rules of the game are decided once and for all, therefore it is easier to apply. For these reason it has probably been chosen to ensure limited liability of the ECB in a strategic context which was not (and probably still isn't) completely understood. The simulations underline both the importance of negative coordination and the danger that an excessive positive coordination could make it ineffective; as on can observe, the SGP is effective in reducing the involvement of the ECB, *unless* the fiscal decisions are formally coordinated.

The present limits stated in the SGP seem somewhat inflexible; to the extent that the SGP is designed to limit the liability of the ECB, it should be also designed according to the preferences of the ECB itself. A simple example showed that more flexibility can be granted in such a way to obtain at the same time more stabilization and more independence of the Central Bank.



4.1 Possible extensions

The goal of the paper was to outline a very specific mechanism that may determine an unforeseen level of pressure on the ECB, along with a larger use of fiscal policy, should stronger fiscal coordination be implemented in the EMU. Many extensions of the model that would make it more realistic are therefore excluded. Some of them would be important to add a realistic flavour to the model.

The first natural extension would be to allow for different preferences not only on smoothing, but also on the target level of unemployment.

The current formulation of the model considers interactions between countries only via the effect of fiscal policies on the single monetary policy. International externalities of fiscal policy (for example via trade linkages) could be also introduced, and their effect would smooth the skeptical conclusions about positive coordination. A number of conclusions (e.g. the domino effect, the negative implications of exchange of information) would then depend on empirical relevance of the two channels. We neglected them here for clarity of exposition and because their effect somehow adds up to the one described.

Structural differences in the national markets is probably the most interesting extension. This will be the object of a forthcoming paper, in which these differences are introduced in the form of a third category of players, worker's unions.

Many other extensions are possible. However, they are probably better dealt with in separate papers.

5 APPENDIX

5.0.1 First order condition for the ECB

By total differentiation of the FOC derived from (3), the locus of the optimal response of the ECB is described by:

$$\left(\sum_{i=1}^N \lambda_i P_i \right) = -\beta \frac{\frac{\partial u}{\partial m}}{\frac{\partial p}{\partial m}} \left(\sum_{i=1}^N \lambda_i U_i \right) \quad (6)$$

Given that the ECB is the last player, $\frac{\partial u}{\partial m} / \frac{\partial p}{\partial m}$ is simply $\frac{-u_m}{p_m}$.

5.0.2 First order condition for government G_i

The differentiation of the first order condition

$$\begin{aligned} (+p_g - \lambda_i (p_m \mu_g)) [p_m M(G, \varepsilon, \eta) + p_g G_i + \varepsilon_i] = \\ = -\alpha (\lambda_i (u_m \mu_g) - u_g) (-u_m M(G, \varepsilon, \eta) - u_g G_i + \eta_i) \end{aligned}$$

for each of the governments leads to:

$$P_i = -\alpha \frac{\frac{\partial u_i}{\partial g_i}}{\frac{\partial p_i}{\partial g_i}} U_i \quad (7)$$

From the definitions of P, U and $M(\cdot)$, and using backward induction:

$$\begin{aligned} \frac{\partial p_i}{\partial g_i} &= \frac{\partial}{\partial g_i} (p_m M(G, \varepsilon, \eta) + p_g G_i + \varepsilon_i) = +p_g - \lambda_i p_m \mu_g \\ \frac{\partial u_i}{\partial g_i} &= \frac{\partial}{\partial g_i} (-u_m M(G, \varepsilon, \eta) - u_g G_i + \eta_i) = \lambda_i u_m \mu_g - u_g \end{aligned}$$

5.0.3 The symmetric Nash equilibrium

$$\begin{aligned} G_i &= \frac{(\gamma_e \varepsilon_i + \gamma_h \eta_i) + (\gamma_e^f \varepsilon_j + \gamma_h^f \eta_j) + \gamma_g [(\gamma_e \varepsilon_j + \gamma_h \eta_j) + (\gamma_e^f \varepsilon_i + \gamma_h^f \eta_i)]}{1 - \gamma_g^2} \\ G_j &= \frac{(\gamma_e \varepsilon_j + \gamma_h \eta_j) + (\gamma_e^f \varepsilon_i + \gamma_h^f \eta_i) + \gamma_g [(\gamma_e \varepsilon_i + \gamma_h \eta_i) + (\gamma_e^f \varepsilon_j + \gamma_h^f \eta_j)]}{1 - \gamma_g^2} \\ M &= M(\lambda_i G_i + \lambda_j G_j, \lambda_i \varepsilon_i + \lambda_j \varepsilon_j, \lambda_i \eta_i + \lambda_j \eta_j) = \\ &= \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_i \gamma_h + \lambda_j \gamma_h^f) \gamma_g + \lambda_i \gamma_h^f + \lambda_j \gamma_h \right) \mu_g + \mu_h \lambda_j \right) \eta_j \\ &\quad + \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_i \gamma_h^f + \lambda_j \gamma_h) \gamma_g + \lambda_i \gamma_h + \lambda_j \gamma_h^f \right) \mu_g + \mu_h \lambda_i \right) \eta_i \\ &\quad + \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_i \gamma_e + \lambda_j \gamma_e^f) \gamma_g + \lambda_j \gamma_e + \lambda_i \gamma_e^f \right) \mu_g - \mu_e \lambda_j \right) \varepsilon_j \\ &\quad + \left(-\frac{1}{1 - \gamma_g^2} \left((\lambda_j \gamma_e + \lambda_i \gamma_e^f) \gamma_g + \lambda_i \gamma_e + \lambda_j \gamma_e^f \right) \mu_g - \mu_e \lambda_i \right) \varepsilon_i \end{aligned}$$

5.0.4 Formal coordination

$$\begin{aligned} G^T &= \tilde{\gamma}_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \tilde{\gamma}_h (\lambda_i \eta_i + \lambda_j \eta_j) \\ M^T &= (-\mu_g \tilde{\gamma}_h + \mu_h) (\lambda_i \eta_i + \lambda_j \eta_j) - (\mu_e + \mu_g \tilde{\gamma}_e) (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) \\ P &= p_m M + p_g G + (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) = 0 \\ U &= -u_m M - u_g G + (\lambda_i \eta_i + \lambda_j \eta_j) = 0 \\ G_i &= \lambda_i G^T \\ P_i &= -p_g \lambda_j [\tilde{\gamma}_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \tilde{\gamma}_h (\lambda_i \eta_i + \lambda_j \eta_j)] + \varepsilon_i - (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) \\ U_i &= u_g \lambda_j [\tilde{\gamma}_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \tilde{\gamma}_h (\lambda_i \eta_i + \lambda_j \eta_j)] + \eta_i - (\lambda_i \eta_i + \lambda_j \eta_j) \\ G_j &= \lambda_j G^T \\ P_j &= -p_g \lambda_i [\tilde{\gamma}_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \tilde{\gamma}_h (\lambda_i \eta_i + \lambda_j \eta_j)] + \varepsilon_j - (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) \\ U_j &= u_g \lambda_i [\tilde{\gamma}_e (\lambda_i \varepsilon_i + \lambda_j \varepsilon_j) + \tilde{\gamma}_h (\lambda_i \eta_i + \lambda_j \eta_j)] + \eta_j - (\lambda_i \eta_i + \lambda_j \eta_j) \end{aligned}$$

5.1 Calculation of some signs

These signs are important in that they allow more complex calculations later.

Some basic identities The first equation is just a different version of the hypothesis $\frac{p_m}{u_m} > \frac{p_g}{u_g}$; when $z = 0$ the relation holds with equality, when z is positive the hypothesis is true with strict inequality. The other identities are the same seen before.

$$\begin{aligned} p_m &= (1 + z) u_m \frac{p_g}{u_g} \\ \mu_g &= - \left[\frac{1}{p_m^2 + \beta u_m^2} \right] (-\beta u_m u_g - p_g p_m) \\ \mu_e &= - \left[\frac{1}{p_m^2 + \beta u_m^2} \right] (-p_m) \\ \mu_h &= + \left[\frac{1}{p_m^2 + \beta u_m^2} \right] \beta u_m \\ \lambda_j &= 1 - \lambda_i \end{aligned}$$

Effect of expenditure on prices $\text{Sign} (-\lambda_i p_m \mu_g + p_g) =$
 $\text{sign} -p_g \frac{\lambda_i u_g^2 \beta + \lambda_i p_g^2 + 2\lambda_i p_g^2 z + \lambda_i z \beta u_g^2 + \lambda_i p_g^2 z^2 - p_g^2 - 2p_g^2 z - p_g^2 z^2 - \beta u_g^2}{p_g^2 + 2p_g^2 z + p_g^2 z^2 + \beta u_g^2}.$

The numerator of the fraction is $(\beta u_g^2 + p_g^2 + 2p_g^2 z + z \beta u_g^2 + p_g^2 z^2) (\lambda_i - 1)$ always negative. Therefore the coefficient is always positive.

Effect of expenditure on unemployment $\text{Sign} (\lambda_i u_m \mu_g - u_g) =$
 $\text{sign} -u_g \frac{-\lambda_i u_g^2 \beta - \lambda_i p_g^2 - \lambda_i p_g^2 z + p_g^2 + 2p_g^2 z + p_g^2 z^2 + \beta u_g^2}{p_g^2 + 2p_g^2 z + p_g^2 z^2 + \beta u_g^2}.$

The numerator is equal to $(1 - \lambda_i) (\beta u_g^2 + p_g^2 + p_g^2 z) + p_g^2 z + p_g^2 z^2$ always positive. Therefore the coefficient is negative

A shock to unemployment less the intervention of the ECB $\text{Sign} (1 - \lambda_i u_m \mu_h) =$
 $(1 - \lambda_i) \beta u_g^2 + p_g^2 + 2p_g^2 z + p_g^2 z^2$ is always positive.

A shock to prices less the intervention of the ECB $\text{Sign} (1 - \lambda_i p_m \mu_e) =$
 $\text{sign} - \frac{-p_g^2 - 2p_g^2 z - p_g^2 z^2 - \beta u_g^2 + \lambda_i p_g^2 + 2\lambda_i p_g^2 z + \lambda_i p_g^2 z^2}{p_g^2 + 2p_g^2 z + p_g^2 z^2 + \beta u_g^2}.$

The numerator of the fraction is $(p_g^2 + 2p_g^2 z + p_g^2 z^2) (\lambda_i - 1) - \beta u_g^2$ always negative. Therefore the coefficient is always positive.

5.2 Coefficients of government reaction function when the allocation of instruments is indifferent

$$G_i = (\gamma_e \varepsilon_i + \gamma_h \eta_i) + (\gamma_e^f \varepsilon_j + \gamma_h^f \eta_j) + \gamma_g G_j$$

Sign of the coefficient of η_i : the parameter is always positive

$$\begin{aligned} & \text{Sign } (-\lambda_i p_m \mu_h) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (1 - \lambda_i u_m \mu_h) \\ &= \text{sign } -(-\lambda_i p_g^2 \beta + p_g^2 \alpha - \alpha \lambda_i u_g^2 \beta + \alpha \beta u_g^2) (-1 + \lambda_i) \frac{u_g}{p_g^2 + \beta u_g^2} \end{aligned}$$

Knowing that

$(-\lambda_i p_g^2 \beta + p_g^2 \alpha - \alpha \lambda_i u_g^2 \beta + \alpha \beta u_g^2) = (1 - \lambda_i) \alpha \beta u_g^2 + p_g^2 (\alpha - \lambda_i \beta) > 0$ is true, the whole parameter is positive.

Sign of the coefficient of η_j : the parameter is always negative

$$\begin{aligned} & (-\lambda_j p_m \mu_h) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_j u_m \mu_h) = \\ & (p_g^2 + \alpha u_g^2) (\lambda_i - 1) \beta u_g \frac{\lambda_j}{p_g^2 + \beta u_g^2} < 0 \text{ always.} \end{aligned}$$

Sign of the coefficient of ε_i : the sign of the coefficient of ε_i depends on the size of the expected reaction of the ECB to the shock ε_i , that is on λ_i . When the size of the country is small enough the sign is negative.

$$\begin{aligned} & \text{Sign } -[(1 - \lambda_i p_m \mu_e) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_i u_m \mu_e)] = \\ & \text{sign } -(-p_g^2 - \beta u_g^2 + \lambda_i p_g^2 + \alpha \lambda_i u_g^2) (-1 + \lambda_i) \frac{p_g}{p_g^2 + \beta u_g^2} = \\ & \text{sign } (-p_g^2 - \beta u_g^2 + \lambda_i p_g^2 + \alpha \lambda_i u_g^2) = (p_g^2 + \alpha u_g^2) \lambda_i - (p_g^2 + \beta u_g^2) \\ & \text{negative when } \lambda_i \text{ is small enough (unless } \lambda_i \text{ is very close to one).} \end{aligned}$$

Sign of the coefficient of ε_j : the parameter is always positive

$$\begin{aligned} & -[(-\lambda_j p_m \mu_e) (-\lambda_i p_m \mu_g + p_g) - \alpha (\lambda_i u_m \mu_g - u_g) (-\lambda_j u_m \mu_e)] = \\ & = -(p_g^2 + \alpha u_g^2) (\lambda_i - 1) p_g \frac{\lambda_j}{p_g^2 + \beta u_g^2} > 0 \text{ always positive.} \end{aligned}$$

Sign of the coefficient of G_j : the parameter is always positive

$$\begin{aligned} & \text{Sign } +[(p_m \mu_g \lambda_j) (-\lambda_i p_m \mu_g + p_g) + \alpha (\lambda_i u_m \mu_g - u_g) (-u_m \mu_g \lambda_j)] = \\ & = -(p_g^2 + \alpha u_g^2) (\lambda_i - 1) \lambda_j > 0 \text{ always positive} \end{aligned}$$

The coefficient of G_j is less than one if $z > 0$. The coefficient of G_j is less than one if and only if the expression below is negative:

$$\begin{aligned} & [(p_m \mu_g \lambda_j) (-\lambda_i p_m \mu_g + p_g) + \alpha (\lambda_i u_m \mu_g - u_g) (-u_m \mu_g \lambda_j)] \\ & - \left((\lambda_i u_m \mu_g - u_g)^2 \alpha + (-\lambda_i p_m \mu_g + p_g)^2 \right) \end{aligned}$$

The lambdas sum up to one, so the expression can be rewritten as

$$(-(\lambda_i u_m \mu_g - u_g) (u_m \mu_g - u_g)) \alpha + (-\lambda_i p_m \mu_g + p_g) (p_m \mu_g - p_g)$$

or

$$(\lambda_i \beta u_g^2 + \lambda_i p_g^2 + \lambda_i z p_g^2 - p_g^2 - 2z p_g^2 - z^2 p_g^2 - \beta u_g^2) z p_g^2 (1 + z) \frac{\alpha u_g^2 + p_g^2}{(p_g^2 + 2z p_g^2 + z^2 p_g^2 + \beta u_g^2)^2}$$

When the zeta is zero (the condition on instruments holds only with equality) the whole expression is zero and the coefficient is exactly one. No NE exists.

When zeta is positive, then the relevant term for the sign is

$$(\lambda_i \beta u_g^2 + \lambda_i p_g^2 + \lambda_i z p_g^2 - p_g^2 - 2z p_g^2 - z^2 p_g^2 - \beta u_g^2) = \\ -z^2 p_g^2 + (-2p_g^2 + \lambda_i p_g^2) z + (\beta u_g^2 + p_g^2) (\lambda_i - 1)$$

this part has negative sign. Therefore the coefficient is strictly less than one, and the NE exists in the case of positive informal cooperation.

5.3 Positive formal coordination weakens the SGP

This appendix shows that negative coordination (upper bounds to fiscal expansion, like in the SGP) becomes less effective if coupled with formal positive coordination.

Suppose the union-wide limit to the deficit is \bar{G} , and call the actual deficits G_i and G_j . The density function of (G_i, G_j) is $f(G_i, G_j)$.

In absence of formal cooperation (no cooperation or simple exchange of information) the limit binds every country separately, therefore the national caps are $(\lambda_i \bar{G}, \lambda_j \bar{G})$. The restriction imputable to the operation of the SGP is

$$(G_i - \lambda_i \bar{G}) \text{ if } G_i > \lambda_i \bar{G} \\ (G_j - \lambda_j \bar{G}) \text{ if } G_j > \lambda_j \bar{G}$$

When there is formal coordination, the pact only controls the overall quantity G^T . This can be seen by observing that in formal coordination $G_i = \lambda_i G^T$ and $G_j = \lambda_j G^T$ always, therefore when $G^T \leq \bar{G}$ it is also verified that $G_i \leq \lambda_i \bar{G}$ and $G_j \leq \lambda_j \bar{G}$.

The restriction imputable to the operation of the SGP is then

$$(G_i + G_j - \bar{G}) \text{ if } G_i + G_j \leq \bar{G}.$$

The expected value of the restriction of the SGP is a measure of the potential protection that the ECB can receive from the constraints of the Pact. This value is lower when formal coordination is put into place.

To show this, the space (G_i, G_j) is partitioned in

$$C = \{(G_i, G_j) : G_i + G_j \leq \bar{G}\},$$

$$A = \{(G_i, G_j) : G_i > \lambda_i \bar{G}\},$$

$$B = \{(G_i, G_j) : G_j > \lambda_j \bar{G}\}$$

$$D = A \setminus C$$

$$E = C \setminus B$$

$$F = A \cup B$$

$$G = C \setminus A$$

$$H = B \setminus C$$

Then the expected value of the restriction imposed by the Pact is

$$\begin{aligned}
E_{No} (G_i + G_j - \bar{G}) &= \int_{D \cup E \cup F} (G_i - \lambda_i \bar{G}) \cdot f() dG_i dG_j \\
&\quad + \int_{F \cup G \cup H} (G_j - \lambda_j \bar{G}) \cdot f() dG_i dG_j \\
E_{Formal} (G_i + G_j - \bar{G}) &= \int_{E \cup F \cup G} (G_i + G_j - \bar{G}) \cdot f() dG_i dG_j \\
&= \int_{E \cup F \cup G} [(G_i - \lambda_i \bar{G}) + (G_j - \lambda_j \bar{G})] \cdot f() dG_i dG_j \\
E_{No} - E_{Formal} &= \int_D (G_i - \lambda_i \bar{G}) \cdot f() dG_i dG_j + \int_H (G_j - \lambda_j \bar{G}) \cdot f() dG_i dG_j \\
&\quad - \int_E (G_j - \lambda_j \bar{G}) \cdot f() dG_i dG_j - \int_G (G_i - \lambda_i \bar{G}) \cdot f() dG_i dG_j
\end{aligned}$$

All integrals in the last expression are positive, excepted those defined over E and G and the one defined over F which is zero. Then the sum is always positive.

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Chapter 2

Fiscal, monetary and wage policies in a MU: is there a need for fiscal rules?*

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Abstract

In this paper, I examine the interaction of monetary, fiscal and wage policies and their effects on prices in a Monetary Union (MU). The model shows that, relative to the one country case, in a MU fiscal activism is always bigger and the capacity of the Central bank to keep inflation close to targets is much smaller. Furthermore, the common monetary policy has potentially asymmetric effects, that depend on the size of the different countries in the union and the structure of the national wage setting process.

Fiscal constraints on the national fiscal budgets are effective in re-establishing monetary dominance in a MU. They also ensure an ex-post policy mix of stability-oriented monetary and fiscal policies and moderate wage inflation. Some convergence in the structure of labor markets may, however, still be necessary.

1 Introduction

The much discussed fiscal criteria in the Stability and Growth Pact come from fears that the EMU may increase fiscal activism. Two arguments are usually set forth in the debate to support this position, namely opportunistic behavior by national governments and the need for coping with structural differences at the national level.

Surprisingly, the study of the strategic behaviour of policymakers is normally limited to fiscal authorities and federal central bank, with no reference to the third important determinant of inflation and unemployment, the behavior of national wage setters.

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In this paper, I examine the interaction of monetary, fiscal and wage policies and their effects on prices in a monetary union hit by economic shocks. The theoretical model shows that fiscal activism is related with both entry in the monetary union and with structural differences in the national labour markets, and analyses in detail the effect of both factors. The inclusion of labour markets allows me to deal with some questions that are central in the agenda of both politicians and economists. The traditional result that entry in a monetary union increases the incentives to use discretionary fiscal policy is reinforced by the explicit inclusion of unions. The chapter also suggests that fiscal constraints on government deficits appear essential in a monetary union when the wage component is taken into due consideration. As for acceding countries, it concludes that the process of deficit reduction should be completed before entry, as suggested by the Maastricht criteria. Finally, it is shown that different structures of national labour markets make monetary policy more difficult in a monetary union than in the one-country case.

More specifically, this paper argues that :

- First and most important, fiscal activism is always increased by entry in the monetary union. This conclusion does not depend on any switch in preferences, and should be considered as an inevitable fact for any country joining a monetary union.
- The capacity of the Central bank to keep inflation close to targets without continuous interventions is much smaller in a monetary union than in the one country case. The most conservative central bank can reduce, but not eliminate, this problem. Therefore, a process of previous reduction of public deficits and inflationary pressures by new members also favours a monetary policy oriented to price stability.
- The former two points imply that a strategy of convergence in public finances prior to entry in a monetary union may be preferable both for the acceding country and the stability of the existing monetary union. Entry in a monetary union should be a decision that the candidate countries take on the basis of economic fundamentals. For Europe, the Maastricht deficit criterion requires to achieve low levels of public deficit before entry in the EMU.
- The effects of the common monetary policy are influenced by the structure of the national wage-setting process. As in Calmfors and Driffil (1988), decentralized wage bargaining produces higher wage inflation and unemployment in a country. Mechanisms to eliminate the externalities in the wage setting process could be beneficial.
- In a monetary union, constraints on the national fiscal budgets are effective in re-establishing monetary dominance. They also ensure an *ex-post* policy mix of stability-oriented monetary policy, sustainable fiscal policies and moderate wage inflation.

- From the methodological point of view, the paper takes into account the structural break of entering a monetary union and provides an analytical and conceptual framework for assessing the potential causes for asymmetry in a monetary union.

The structure of the paper is as follows. Section 2 presents and describes the model in detail. The solution of the game between fiscal, monetary and wage-setting authorities is provided in section 3, both with explicit expectations and with backward induction. Section 4 presents the main results and deals with the policy implications of the model. Finally, section 5 summarizes the findings.

2 The model

2.1 Description of the model

The illustrative model is a simple linear-quadratic, one-shot game. My choice of a game theory model is motivated by the relevance of the Lucas critique in the context of the paper. One important implication of the Lucas critique is that any structural change in a part of an economic system also changes the behaviour of all other agents. In the case of a Monetary Union, the transfer of monetary policy at a supra-national level implies that one cannot expect the unions and the government to behave in the same way as before, even if their preferences remain exactly the same. I consider a Barro-Gordon type of model and concentrate on a country belonging to a monetary union. Some basic hypotheses of the model are described here.

I assume some structural parameters of labour markets as given, because there are no signs of a very rapid change of the national labour market as a consequence of the EMU, and even less of the creation of an EU-wide labour market.

The model focuses on stabilization of the cycle, not on systematic biases. Therefore, I follow the assumption of Dixit and Lambertini (2003) that the long run targets are agreed among the different players and the tastes differ on stabilization only. Even under this optimistic scenario the dynamics are quite rich, and several problems arise.

The central bank of a monetary union reacts to union-wide economic indicators, and its actions may propagate shocks from one country to the others. Similarly, fiscal policy has spillovers on neighbouring countries. I am neglecting both monetary and fiscal externalities in order to allow a simple treatment of the strategic interaction of the players. For a paper taking into account the "Domino effect" of fiscal policies caused by monetary externalities, see Onorante (2004).

In the model, both workers' unions and fiscal authorities have a larger preference for output stabilization than the federal central bank¹. I believe this

¹In the European Monetary Union this hypothesis is certainly reasonable, as the main statutory objective of the Eurosystem is to maintain price stability.

hypothesis is justified in Europe by the statute of the ECB. To ensure a simpler model I assume that the governments have totally delegated the objective of inflation stabilization to the federal central bank. This parametrization is not restrictive, as its relaxation does not alter the qualitative results of the model.

Finally, and purely for explanatory purposes, the article uses a reduced form description of the economies and focuses in the examples on the case which is most perceived to be problematic, an asymmetric shock to output that cannot be dealt with by the common monetary policy.

The common monetary policy is decided by a federal central bank. The central bank is interested in union-wide inflation \tilde{p} and (possibly) output \tilde{y} , both expressed as deviations from targets, and seeks to minimize the following loss function:

$$\min_{\tilde{r}} L_{CB} = (\tilde{p}^2 + \beta \tilde{y}^2) \quad (1)$$

The parameter β expresses the relative aversion of the central bank to inflation and unemployment. Setting the parameter $\beta = 0$ implies strict inflation targeting as described in Svensson (1999), while flexible inflation targeting would imply $\beta > 0$ ².

The central bank chooses a union-wide policy variable \tilde{r} , such as a nominal interest rate, after observing the deviations from targets of inflation and output of the whole union. Variables with a tilde denote union-wide aggregates. A union-wide variable is defined as the weighted sum of the corresponding national variables with the weights ϕ denoting the size of each country in the monetary union: $\tilde{x} = \sum_i \phi_i x_i$, $\{\phi_i : \sum_i \phi_i = 1\}$

The national fiscal policy is decided by the government, seeking to minimize a loss function including national (without tilde) output y and deficit g , both expressed in deviations from targets³:

$$\min_g L_G = (y^2 + \gamma g^2) \quad (2)$$

² According to Svensson, the central bank is a strict inflation targeter when it assigns zero weight to output stabilization and therefore adjusts its instrument such that the conditional inflation forecast equals the inflation target. A flexible inflation targeter assigns a positive weight to output stabilization and as a consequence adjusts the conditional inflation forecast gradually towards the inflation target. The model presented in this paper allows for the two kinds of central bank, but cannot obviously reproduce the relative dynamics due to its static setup.

³ The inclusion of g both as a target variable and instrument is a slight abuse of notation. A variable which is a goal and an instrument can be better represented as two variables in a 1 to 1 relationship, in which the instrument perfectly controls the target variable. The use of a single letter is to keep the notation simple. The economic intuition for the inclusion of deficit as a goal is analogous to the popular argument of interest rate smoothing for central banks: changing drastically the deficit level has a cost. The target deficit can be justified on many grounds. For example, it can be thought of as a deficit level which ensures sustainability, as excessive deficits lead to accumulation of debt and possibly to insolvency.

conditional to the observed shocks and wage policies, and backward inducting on the central bank. The parameter γ expresses the relative preference for deficit stabilization. The target variable p is not included because the goal of price stability has been assigned to the central bank for the whole union⁴. I will explicitly model only one country, with weight ϕ in the monetary union.

The national wages are determined as the outcome of a decentralized bargaining process. For tractability, I suppose that in the country there are $1/\psi$ identical unions, each of them representing a fraction ψ of workers. Each union $j = 1, 2, \dots, 1/\psi$ minimizes a loss function of the form

$$\min_{w_j} L_{Uj} = (y^2 + \omega (w_j - p)^2) \quad (3)$$

including deviations from target unemployment y and real wage inflation $(w_j - p)$ of the workers it represents. The collective outcome (symmetric Nash Equilibrium) of the decentralized wage negotiation is the level of wages w in the country:

$$\begin{aligned} w &= \sum_j \psi_j w_j \\ &= w_j \quad \forall j \end{aligned} \quad (4)$$

The national macro variables (inflation and output) are linearly related to the output shock (η), the price shock (ε), the growth rate of wages (w) and the policy instruments (g, \bar{r}). Expectations are set in advance, therefore the aggregate supply curve is upward sloping. As a consequence, monetary, fiscal, and wage policies affect output and inflation by moving aggregate demand. The reduced form equations are:

$$\begin{aligned} y &= g - \bar{r} - \lambda w + \eta \\ p &= g - \bar{r} + \lambda w + \varepsilon \end{aligned} \quad (5)$$

where \bar{r} is the union-wide interest rate chosen by the central bank, g is the fiscal policy stance of the national government, w is the national wage level, η and ε are observable shocks to revenue and prices⁵ and $\lambda < 1$ is a structural parameter describing the effect of wage inflation on price inflation. The appendix shows that the equations are compatible with a standard AS-AD model.

The assumption that fiscal and monetary policy are perfect substitutes follows Nordhaus (1994). This assumption is obviously a simplification and ignores

⁴Governments are assumed to have no independent price targets. Governments may still have relative price targets, as these affect competitiveness. This aspect is not developed here, and could be a useful extension of the model.

⁵The players in the model cannot observe the shocks, but only their effects on the macro variables. This is intentional in the model, and leads in my opinion to more direct policy implications, as the nature of shocks (demand, supply) cannot be observed in real time.

relevant second order effects such as the different effect that fiscal and monetary policy have on interest rates, exchange rates, and sectoral prices. However, I have shown in Onorante (2004) that a more general setup would not change the qualitative conclusions.

The order of the moves has been chosen in a way that most reflects the actual setup of EMU. In a game between unions, fiscal and monetary authorities, the participants have some understanding of the strategy of the others. As a consequence, at each step of the game the players will take as given the preceding decisions and form expectations (backward induct) on the following ones. I will then discard the simplest case, the Nash Equilibrium, in which each authority takes as given the decisions of the others, because I consider it little more than a theoretical case. I analyze instead the case of fiscal dominance, when the fiscal authorities can form expectations (backward induct) on the reaction of the central bank. This case is particularly relevant in the EMU⁶.

I chose the following order of the moves: a shock η or ε comes first, the workers' unions determine (each of them playing Nash to the others) the national wage level w , then the national fiscal policy g is decided, finally the central bank observes the union-wide aggregates and chooses \hat{r} accordingly.

The choice of letting the central bank move last is quite common in the literature, and easy to justify. First, monetary policy makers often have a coherent and understandable strategy that explicitly depends on macro variables, while fiscal policy tends to be more erratic and depend on elections, personalities and coalitions, but hardly on moral suasion by the central bank. Also, monetary policy is comparatively fast in reacting to external changes in the economy, including changes in the fiscal stance of member states, while fiscal policy is the result of a long process of negotiation by policymakers and hardly qualifies as a variable that the central bank can directly influence in the short run.

The choice of letting the unions play before the fiscal authority comes from similar considerations: first, there may be (and normally there are) many unions in a country, and their reactions are therefore more difficult to anticipate than those of the fiscal policy. Second, wages are normally determined for many years and the contracting process is much more dispersed and slower than the one leading to fiscal policy.

⁶This is often referred to in the literature as fiscal dominance. Indeed, one of the objectives of the SGP is to prevent fiscal dominance, safeguarding the credibility of monetary policy both in the long term, by protecting the European Central Bank from potential pressure for debt bailouts coming from the national governments, and in the short run by keeping deficits low (Artis and Winkler, 1998).

Monetary dominance of a single central bank over many fiscal authorities in a monetary union is even less realistic than the Nash Equilibrium.

3 Solution of the model

3.1 The role of expectations

The Central Bank reacts to the effect on union-wide variables. In case of an asymmetric shock ε or η in a country with weight $\phi \in (0, 1]$ in the union, the aggregate variables react as:

$$\begin{aligned}\hat{y} &= \phi(g - \lambda w + \eta) - \bar{r} \\ \hat{p} &= \phi(g + \lambda w + \varepsilon) - \bar{r}\end{aligned}\quad (6)$$

Solving the Central Bank's minimization problem gives the following expression for r :

$$\bar{r} = \phi(g + \alpha_1 \lambda w + \alpha_2 (\varepsilon + \beta \eta)) \quad (7)$$

with $\alpha_1 = \frac{(1-\beta)}{1+\beta}$, $\alpha_2 = \frac{1}{1+\beta}$. The interest rate decreases in the event of a negative output or inflation shock unless the central bank is a pure inflation targeter ($\beta = 0$) and always increases in response to a fiscal expansion. The response to an increase in the wage level is generally ambiguous, but positive for reasonable values of the parameters ($\beta < 1$), that is unless the central bank cares more about output than about prices. Finally, the reaction of the central bank is proportional to the size of the country in the monetary union.

The national government targets the national aggregates

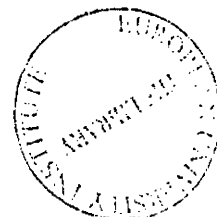
$$\begin{aligned}y &= g - \bar{r}^e - \lambda w + \eta \\ p &= g - \bar{r}^e + \lambda w + \varepsilon\end{aligned}\quad (8)$$

and the resulting fiscal policy is

$$g = \frac{1}{1+\gamma} (\bar{r}^e + \lambda w - \eta) \quad (9)$$

The fiscal authority faces a cost in changing the fiscal stance. Hence, the multiplier outside the parentheses is smaller than one, and decreasing in γ , the parameter that indicates the cost of discretionary fiscal policy moves. The fiscal policy stance is eased if a negative shock hits the economy, in order to compensate for the additional unemployment coming from an excessive wage inflation, or to smooth the domestic real effects of an expected monetary tightening.

Finally, wages are set by unions playing Nash with each other. The Nash equilibrium describes the solution under no cooperation: each union in the country plays as if the other unions had decided their wages already. As a consequence, the effects of a wage increase on macroeconomic variables perceived by the average union are given by $\lambda\psi$: the smaller the size ψ of the union, the



less the effect of a wage increase on prices and unemployment will be taken into consideration.

$$\begin{aligned} y &= (g^e - \tilde{r}^e) - \lambda\psi w + \eta \\ p &= (g^e - \tilde{r}^e) + \lambda\psi w + \varepsilon \end{aligned} \quad (10)$$

the resulting wage inflation is

$$w = \frac{(\omega + \lambda\psi - \omega\lambda\psi)(g^e - \tilde{r}^e) + (1 - \lambda\psi)\omega\varepsilon + \lambda\psi\eta}{(\lambda\psi - 1)^2\omega + (\lambda\psi)^2} \quad (11)$$

3.2 Results with Backward Induction

This section shows the solution of the model when expectations are formed by backward induction. The central bank moves last, after observing the moves of all the other players:

$$\tilde{r} = \phi(g + \alpha_1\lambda w + \alpha_2(\varepsilon + \beta\eta)) \quad (12)$$

For all possible values of ϕ (excluding 1) the federal central bank lowers the interest rates in response to a negative shock and increases them in response to wage inflation and public deficit. The size of the intervention is proportional to ϕ .

The Government observes η , ε and w and backward inducts on the central bank. Substituting (12) into the expectations of (9) one obtains the expression for fiscal policy:

$$g = (1 - \phi) \frac{(\phi\alpha_1 + 1)\lambda w + (\phi\alpha_2\beta - 1)\eta + \phi\alpha_2\varepsilon}{(1 - \phi)^2 + \gamma} \quad (13)$$

For all possible values of ϕ (excluding 1) the backward inducting government eases the fiscal stance in response to a negative output shock, a positive price shock or an increase in nominal wages. In the one country case ($\phi = 1$) the central bank was able to discipline the fiscal authority and to influence the expectations of the wage setters; in a monetary union part of this power is lost.

The unions backward induct on both central bank and government, therefore (12) and (13) are substituted into (11) in order to obtain the expression for the wages:

$$\begin{aligned} w = & \frac{\omega(-\xi g_2 + \phi\xi g_2 + \phi\alpha_2\beta)(P_w - 1) + (\phi\xi g_2 + \phi\alpha_2\beta - \xi g_2 - 1)Y_w}{\omega(1 + \phi\xi g_1\psi + \phi\alpha_1\lambda\psi - \lambda\psi - \xi g_1\psi)(P_w - 1) + (\phi\xi g_1\psi + \phi\alpha_1\lambda\psi + \lambda\psi - \xi g_1\psi)Y_w} \tilde{r} \\ & + \frac{\omega(-\xi g_3 - 1 + \phi\xi g_3 + \phi\alpha_2)(P_w - 1) + (-\xi g_3 + \phi\xi g_3 + \phi\alpha_2)Y_w}{\omega(1 + \phi\xi g_1\psi + \phi\alpha_1\lambda\psi - \lambda\psi - \xi g_1\psi)(P_w - 1) + (\phi\xi g_1\psi + \phi\alpha_1\lambda\psi + \lambda\psi - \xi g_1\psi)Y_w} \varepsilon \end{aligned}$$

with

$$\begin{aligned}\frac{dy}{dw} &= \frac{d}{dw} ((g-r) - \lambda\psi w + \eta) = \left(\left(\frac{dg}{dw} - \frac{dr}{dw} \right) - \lambda\psi \right) \\ &= Y_w = (1-\phi)^2 (g_1\psi) + \lambda\psi (\alpha_1 - 1)\end{aligned}$$

and

$$\begin{aligned}\frac{dp}{dw} &= \frac{d}{dw} ((g-r) + \lambda\psi w + \epsilon) = \left(\left(\frac{dg}{dw} - \frac{dr}{dw} \right) + \lambda\psi \right) \\ &= P_w = (1-\phi)^2 (g_1\psi) - \lambda\psi (\alpha_1 - 1)\end{aligned}$$

and $\xi = (1-\phi)$. The equations above are the complete solution of the model with backward induction. In order to get a better intuition of its economic implications, the next section highlights some specific issues.

4 Results and policy implications

4.1 Entering the monetary union

Before entering the monetary union, the country can be thought of as belonging to a monetary union with itself only. The outcomes are thus described by (14) and (13) under the assumption that $\phi = 1$. When $\phi = 1$,

$$\begin{aligned}w &= -\frac{(-\lambda\psi(\alpha_1 - 1) - 1)\omega\alpha_2\beta + (-1 + \alpha_2\beta)(-\alpha_1\lambda\psi - \lambda\psi)}{\lambda^2\psi^2(\alpha_1 + 1)^2 + (1 + \lambda\psi(\alpha_1 - 1))^2\omega}\eta \quad (15) \\ &\quad -\frac{(-\lambda\psi(\alpha_1 - 1) - 1)\omega(-1 + \alpha_2) + \alpha_2(-\alpha_1\lambda\psi - \lambda\psi)}{\lambda^2\psi^2(\alpha_1 + 1)^2 + (1 + \lambda\psi(\alpha_1 - 1))^2\omega}\epsilon \\ g &= 0 \\ r &= \alpha_1\lambda w + \alpha_2(\epsilon + \beta\eta)\end{aligned}$$

and the macro outcomes are

$$\begin{aligned}y &= -(1 + \alpha_1)\lambda w + (1 - \alpha_2\beta)\eta - \alpha_2\epsilon \\ p &= (1 - \alpha_1)\lambda w + (1 - \alpha_2)\epsilon - \alpha_2\beta\eta\end{aligned} \quad (16)$$

Comparing the previous equations with (13), one can immediately see that the structure of policy interaction differs fundamentally. Before entering the monetary union, the national central bank is always able to "discipline" fiscal policy according to its own preferences (in this case, $g = 0$)⁷. An even stronger

⁷The one-country stabilization result comes from the fact that the central bank reacts in such a way to completely offset the fiscal move, thus imposing the amount of stabilization given by its own preferences.

Variance of fiscal interventions after unit shock

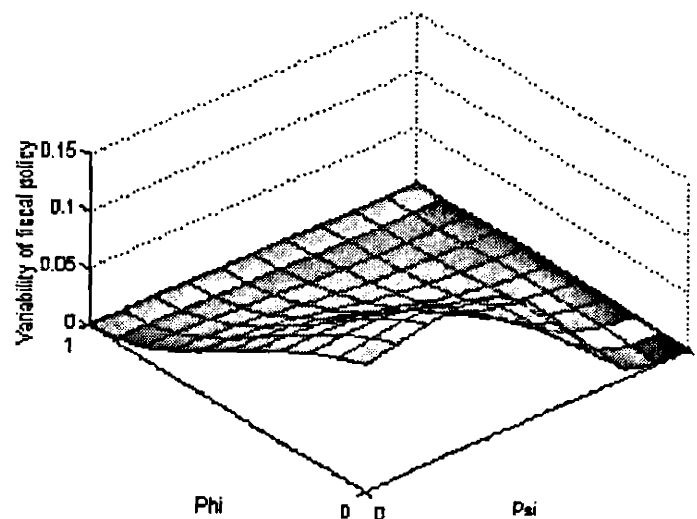


Figure 1: variance of fiscal interventions after a unit shock

The results for the one country case (equations 15 and 16) are confirmed by the simulation: for every level of centralization of wage bargaining, the central bank is able to fully control the fiscal policy, and the variability is then zero. When the country enters the monetary union (lighter band at $\phi = 0.1$) this effect of discipline is maintained only if the wage bargaining is centralized ($\psi = 1$) so that wage setters internalize the effect of higher wages on prices. The more the wage is determined by decentralized bargaining, the more fiscal policy intervenes actively to offset the unemployment that arises as externality.

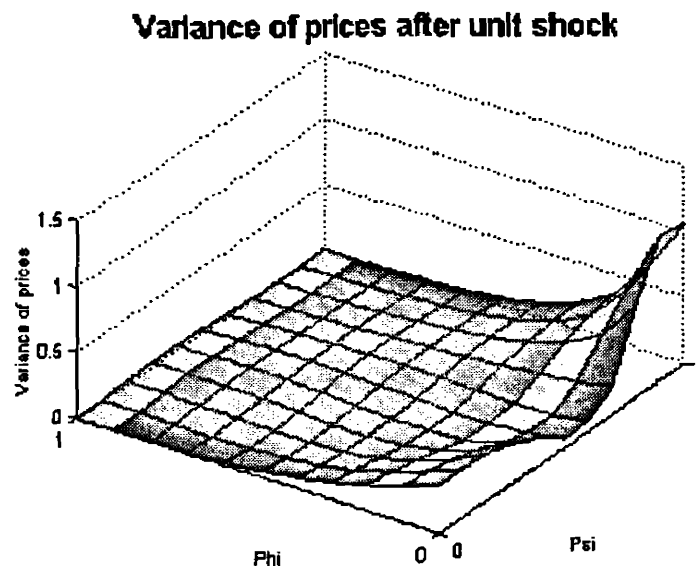


Figure 2: variance of prices after a unit shock

The results on price variability are consistent with the previous findings. In the one country case, the variance of prices is extremely limited (Figure 2; notice again the $\phi = 1$ lighter stripe). In a monetary union, prices are driven by two different forces: on the one hand, fiscal policy takes advantage of the reduced capacity of the central bank to respond, and this increases prices. On the other hand, a centralized wage setting is able to limit the inflation of wages (and thus prices) accordingly, while this is not true of decentralized bargaining. The interaction of these two forces produces the u-shaped stripe at $\phi = 0.1$. The variance is minimal when the two forces offset each other, maximal if wages are reduced (one union, $\psi = 1$) or fiscal policy is expanded in order to preserve employment after a high wage increase ($\psi = 0$).

A general conclusion could be that the federal central bank of a monetary union has more problems in controlling inflation than a national central bank. The possibility of free riding by the national governments and the incapacity of the federal central bank to target individual national imbalances makes interventions less efficient and increases the variability of inflation.

4.3 Which type of federal central bank?

In the model, a country belonging to a monetary union knows that the central bank targets only aggregate quantities, and is ready to take advantage of the opportunity to free ride when possible. The result that in a monetary union the central bank cannot fully control the development of prices should not, however, lead to the conclusion that the profile of the central bank is irrelevant. The central bank can "present itself to the public" as belonging to one of three

types: a "soft" central bank uses an active Taylor rule, including both inflation and unemployment in its objective function ($\beta > 0$); a "hard central bank" is a pure inflation targeter ($\beta = 0$); the central bank is "passive" if monetary policy is taken as given by the other players ($\phi = 0$).⁸ As a matter of fact, a pure inflation targeter can be shown to be preferable to a 'passive central bank'.

Figure 3 compares the "soft" central bank ($\beta > 0$) with the pure inflation targeter ($\beta = 0$). The plot is the absolute difference in the variance of prices, the colors highlight when the variance is smaller in the case of an active central bank (white color) or in the case of pure inflation targeting (dark areas).

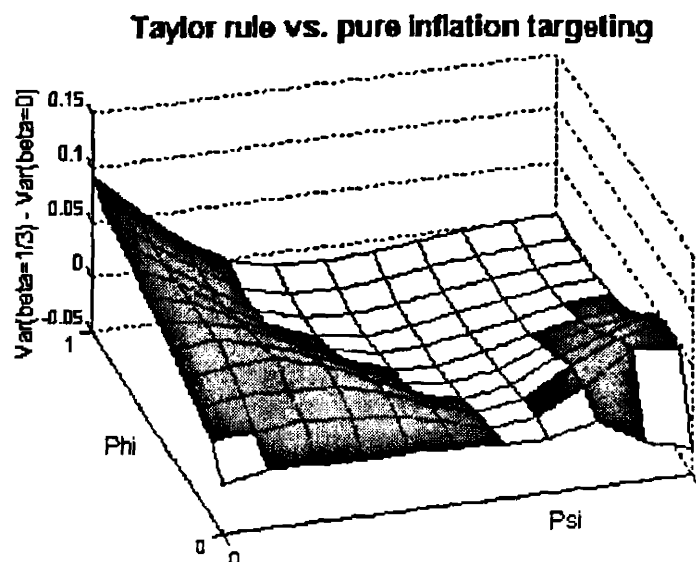


Figure 3: Taylor rule vs pure inflation targeting

The picture shows the fundamental role played by the labour market. When wage contracting is strongly decentralized (ψ close to zero), a central bank committed to "punish" the inflationary effect of excessive wages always obtains a low variance of inflation. This is not always true if the labor market is centralized enough.

The role of ϕ is also extremely important: in the one country case ($\phi = 1$, far away edge of the graph), there are many values of ψ for which the central bank can target both inflation and unemployment. The case is different in a monetary union (ϕ small, near edge of the graph), because the inefficiencies of a decentralized labor market are multiplied by the opportunistic behavior of the fiscal authorities. Pure inflation targeting appears then to be the best option

⁸ Another way to define the passive monetary policy is to say that the CB acts as if the country had weight zero in the union. Since the reaction is proportional to the size of the country, this amounts to saying that the CB does not react at all.

to reduce the variability of inflation for almost all labor market structures. Incidentally, the gain is biggest in absolute values for those countries whose ϕ lies between 10 and 20 per cent (like many countries belonging to the EMU).

The final question is whether the central bank should try to persuade the national governments to consider its policy as given, or whether it should cultivate the image of a strict inflation targeter. Figure 4 provides a clear-cut answer to this question by showing the difference in price variance obtained under the two regimes. The darker area highlights the points in which the difference is close to zero, all the other values are negative.

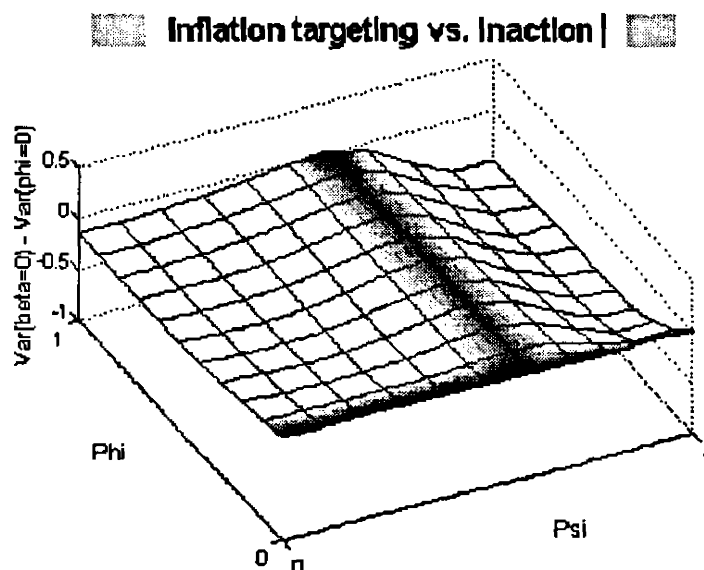


Figure 4: inflation targeting versus inaction

As expected, a very small country (near edge of the graph) is indifferent between the two regimes, because the central bank does not react to its domestic variables in any case. Another narrow indifference set is located around the value of ψ in which the effects of fiscal and wages policies exactly offset each other. Its exact location depends on the specific parametrization of the simulation. In every other case, inflation targeting is strictly superior to inaction in the control of inflation variability.

A general conclusion could be that the central bank of a monetary union does not have the same choice that a national central bank would face. The possibility of free riding by the national governments and the incapacity of the central bank to target national imbalances individually impose pure inflation targeting as the regime that best allows to keep inflation under control.

4.4 The effect of fiscal constraints

In Europe, the consideration that a monetary union may multiply the effects of any deficit bias led to the establishment of the fiscal criteria in the Stability and Growth Pact. The budgetary rules aim at tying the governments' hands and insulating the central bank from possible pressures arising from undisciplined members of the union. The Pact states that the ratio of the annual government deficit to gross domestic product (GDP) must not exceed 3%. When the threshold is reached, expanding fiscal policy will not be possible. Without loss of generality, and in order to simplify the notation, we set the threshold to zero ($g = 0$) in the model.

Are fiscal constraints really necessary in a monetary union? The answer provided by Figure 5 shows the final effect on inflation of a shock when fiscal policy is free to act. the relevant case is when ϕ is small, that is whe the country is part of a monetary union. It can be seen that in case of a centralized labour market ($\psi = 1$) the shock has a limited impact on prices. However, when ψ is smaller the interaction of policies leads to an increase in the final prices that further deteriorates the competitive position of the country affected. At least in these cases fiscal constraints would be beneficial.

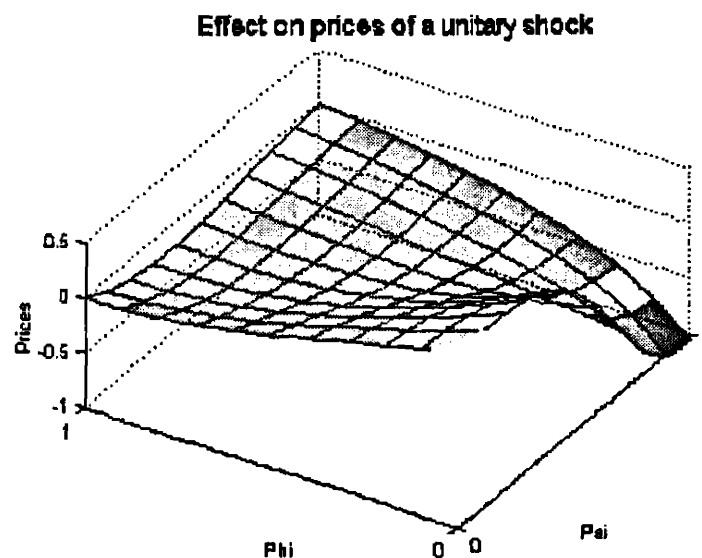


Figure 5: effect on prices of a unitary shock

A further look at figure 2 confirms that the inflation is more difficult to control in a monetary union than in the one country case. The answer seems therefore decidedly positive.

Are fiscal criteria really helpful? Consider how fiscal policy affects the dynamics of wages (with backward induction on the central bank) and ex post

monetary policy: from (11) and (7) and imposing $g = 0$ one obtains for every $\psi, \phi < 1$ that

$$\begin{aligned} \frac{dr}{dg} &= \phi > 0 \\ \frac{dw}{dg^e} &= \frac{(\phi - 1)(-\omega + \omega\lambda\psi - \lambda\psi)}{(\omega - \omega\lambda\psi + \lambda\psi)\phi\alpha_1\lambda + \lambda^2\psi^2 + (\lambda\psi - 1)^2\omega} > 0 \end{aligned} \quad (17)$$

Equations (17) show the fundamental role played by the constraints to fiscal policy in allowing the federal central bank to control inflation. Removing the fiscal bias influences both the *ex post* monetary policy and disciplines the *ex ante* wage dynamics; the effect is even larger if one considers that an unconstrained fiscal policy would respond positively to wage inflation. One should notice that even though the model has been built on symmetric loss functions for all the players, the fiscal constraints become binding only on the inflationary side, and they never impede budget consolidation when necessary. The effect of the fiscal constraints is implicit coordination characterized by lower deficits, low interest rates and inflation under control. Once again there is not an explicit welfare analysis in the paper, but there is a strong consensus in the literature (for example Nordhaus, 1994) that an equilibrium of sustainable fiscal policies and loose monetary policy is to be preferred to a combination of loose fiscal and tight monetary policy.

5 Conclusions

The paper develops a model of policy interactions in a monetary union, focusing on wage dynamics, fiscal and monetary activism and their consequences on inflation. The simple⁹ model is capable of grasping and expliciting the strategic interactions of the different policymakers, and to highlight some relevant problems that are central in the current policy debate.

The following conclusions emerge:

- First and most important, fiscal activism is always increased by entry in the monetary union. This conclusion does not depend on any switch in preferences, and should be considered as an inevitable fact for any country joining a monetary union.
- The capacity of the Central bank to keep inflation close to targets is much smaller in a monetary union than in the one country case. Furthermore, the model shows that the unique monetary policy can lead to very different price dynamics in different countries of the union. A conservative central bank can reduce but not eliminate this problem.

⁹The model is simple because the agents agree on the long run targets and their preferences differ on the degree of stabilization only.

- The former two points imply that a strategy of convergence in public finances prior to entry in a monetary union may be preferable both for the acceding country and the stability of the existing monetary union. Entry in a monetary union should be a decision that the candidate countries take on the basis of economic fundamentals. For Europe, the Maastricht deficit criterion requires to achieve low levels of public deficit before entry in the EMU.
- The effects of the common monetary policy are influenced by the structure of the national wage setting process. The model shows that some convergence in the structure of labor markets could be useful. Mechanisms to eliminate the externalities in the wage setting process could also be beneficial.
- Fiscal constraints are necessary and useful in a monetary union, as they are effective in re-establishing monetary dominance. They also ensure an *ex-post* policy mix of stability-oriented monetary policy, sustainable fiscal policies and moderate wage inflation.
- From the methodological point of view, the paper takes into account the structural break of the EMU and provides an analytical and conceptual framework for assessing the potential causes for asymmetry in the monetary union.

The goal of the paper was not to take into account all possible factors, but to disentangle a relevant mechanism of interaction among players which is typical of a monetary union. The conclusions cannot be considered as absolute statements, as they may not be valid in the context of a different modelization. There are several directions in which the paper could be developed.

Most importantly, the preferences of the agents are extremely simplified and could be enriched by adding systematic biases for the national governments and the unions, in order to obtain results that are valid for the steady state and not only for the cyclical fluctuations. Alternatively, an asymmetry in the preferences of the governants in responding to a positive or a negative shock could be explicitly modeled.

The current formulation of the model considers only the interactions between fiscal and wage policies of one country and the single monetary policy. International externalities of fiscal policy (for example via trade linkages) could be also introduced. Other relevant phenomena, such as the exchange rate of the common currency, differences in tastes between the countries, may affect the results in various ways. However, this would imply modeling explicitly at least a second country, therefore they are neglected for clarity of exposition.

These remain interesting topics for future research.

6 Appendix

Here I show the derivation of from a simple AD-AS framework with rational expectations formed before the shocks are observed.

Demand and supply can be represented as:

$$\begin{aligned}y^d &= -p + \phi(g - r) + e^d \\y^s &= (p - p^e) - \lambda w + e^s\end{aligned}$$

where all the variables are expressed in difference from targets (m, g, w) or long run levels (y, p). The demand and supply shocks are e^d and e^s , λ is a fixed parameter, which shows that the wage inflation is reflected on inflation (with a coefficient $\lambda < 1$, since wages are only one of the production factors in the economy).

The reduced form is obtained by solving for the equilibrium ($y^d = y^s$), fixing the expectations ($p^e = 0$) and rescaling the equations:

$$\begin{aligned}y &= \phi(g - r) - \lambda w + (e_d - e_s) \\p &= \phi(g - r) + \lambda w + (e_d + e_s)\end{aligned}\tag{18}$$

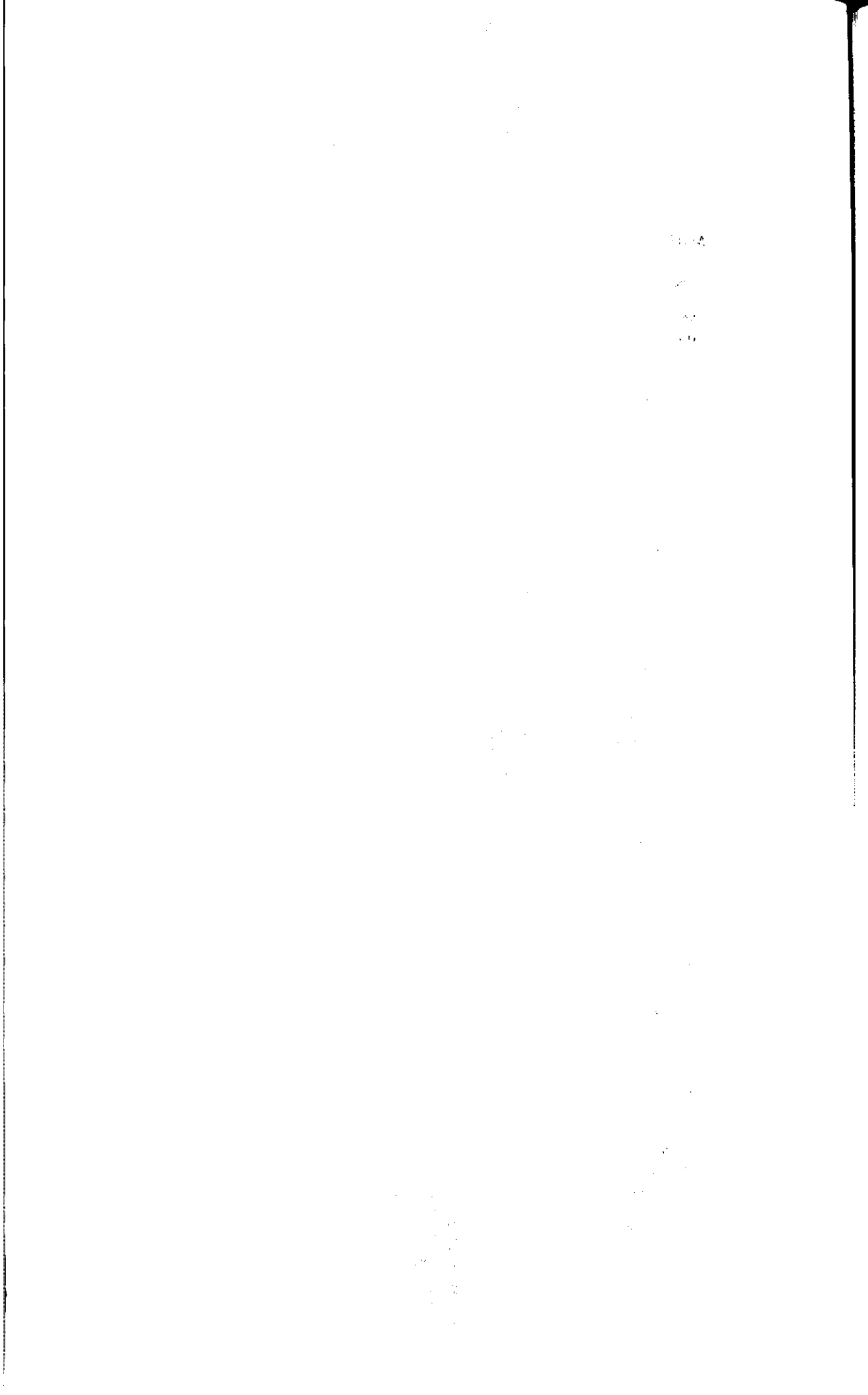
After renaming the parameters, one obtains the final equations (5).

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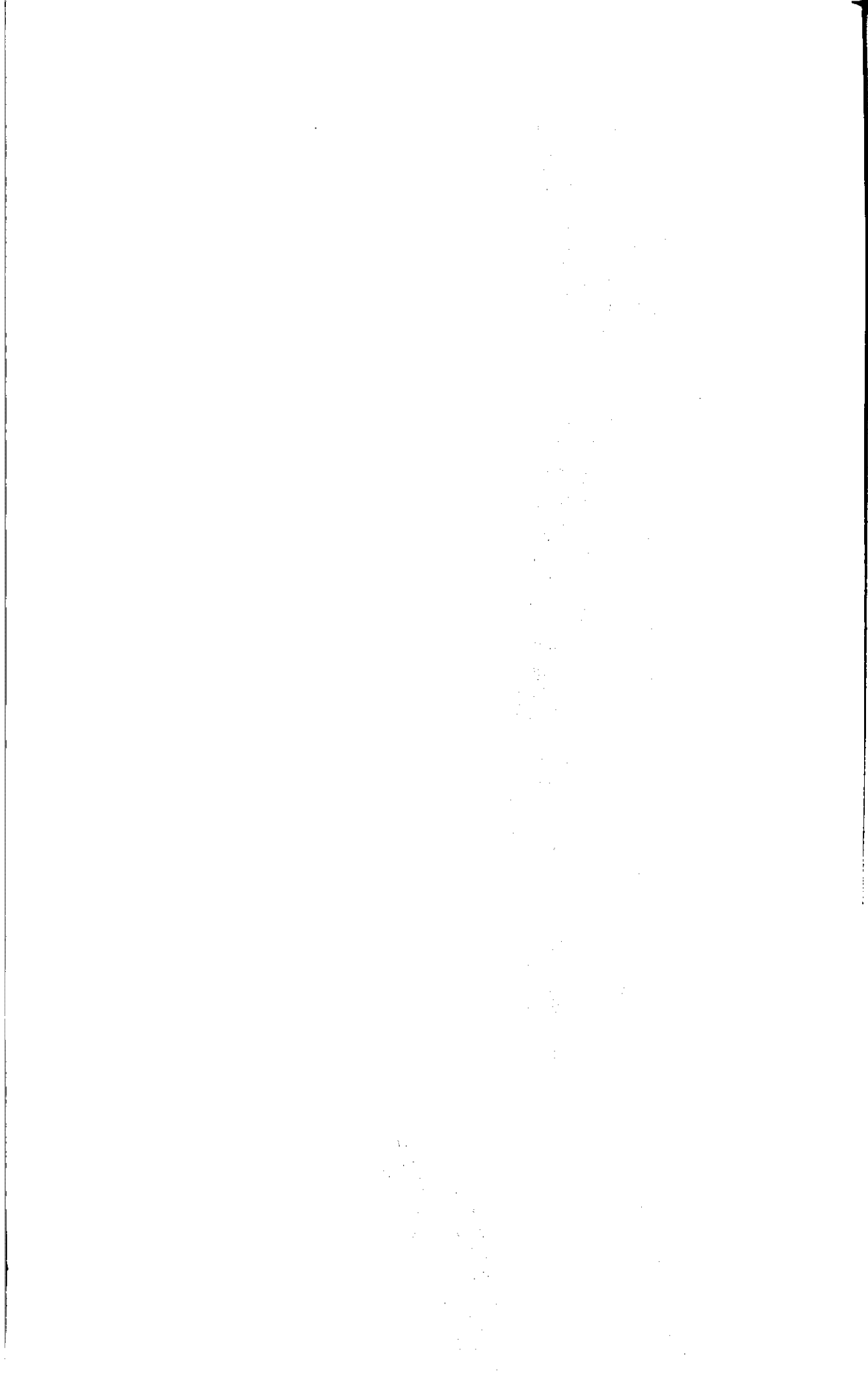
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Chapter 3



The economic importance of fiscal rules*

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November 15, 2006

Abstract

The present paper provides an assessment of the effect of the recent revision of the Stability and Growth Pact (SGP) on the European economies. A set of structural VARs, one for each eurozone country, is estimated. The estimated models are then used to assess the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact in its old and reformed versions.

The investigation suggests that fiscal policy has had in the past a limited smoothing effect on the cycle, and therefore the cost of the old rules in the corrective arm of the Pact was also limited. As for the reform of the Pact, the analysis is overall supportive of the new country-specific Medium Term Objectives. The modified rules of the Excessive deficit procedure are likely to give the governments only a limited extra leeway to reduce the variability of the cycle.

Keywords: European Monetary Union, Stability and growth Pact, fiscal-monetary interactions.

JEL codes: E61, E62, E63.

1 Introduction

Only few years since the start of EMU, the Stability and Growth Pact (SGP) has undergone an extensive process of revision. The present paper provides an assessment of the effect of this revision on the European economy. A set of structural VARs, one for each eurozone country, is estimated. The VARs are identified via long run restrictions that are relatively uncontroversial and compatible with most theoretical models of fiscal policy; they also take into account the effect of monetary policy in order to avoid misspecification. The estimated models are then used to assess the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact in its old and reformed versions.

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The investigation highlights a number of facts. First, fiscal policy has had in the past a limited smoothing effect on the cycle. Second, the rules of the Stability and Growth Pact have had overall a limited effect on fiscal discipline. The modified rules of the Pact are thus likely to give the governments only a limited extra leeway to reduce the variability of the cycle.

The paper is organized as follows. Section 2 presents some historical and economic background on the fiscal policy constraints established by the Maastricht Treaty and the SGP and tries to explain why the latter entered into its recent crisis. Section 3 briefly describes the proposed reform of the Stability and Growth Pact. Sections 4 and 5 focus on methodological aspects such as the description of the model and the related literature. Section 6 assesses whether, in the past, discretionary fiscal policy has been effective in smoothing the economic cycle, or whether a procyclical component has prevailed, thus increasing the amplitude of the cycle. Section 7 estimates the effect that the reform of the Pact may have on the variability of the cycle and on the public finances. Section 8 concludes.

2 Economic and historical background

The fiscal rules laid down in the Treaty of Maastricht and the Stability and Growth Pact (SGP) are the result of a perception that qualification for participation in the monetary union would remove the incentive to conduct disciplined fiscal policies. The main objective of the SGP is to safeguard the credibility of monetary policy both in the long term, by preventing excessive public debt build-up, and in the short run by keeping deficits low, thus reducing the risk of an unbalanced ex post policy mix (Artis and Winkler, 1998). This in turn would make the monetary union viable by ensuring low inflation and economic stability and protecting the European Central Bank from potential pressure for debt bailouts coming from the national governments.

According to Bini-Smaghi, Padoa-Schioppa and Papadia (1994), the binding thresholds on deficit and debt were adopted on the ground that market discipline alone would not have a sufficient disciplinary effect on the public finances of the countries in the euro area. The approach adopted in the Maastricht criteria and reiterated in the Stability and Growth Pact associated binding nominal thresholds with a procedure for assessing excessive deficits which provided for margins of discretion, thus mediating between the two extreme views advocating on the one side strict binding rules and on the other simple reliance on market imposed discipline.

The threshold values were chosen somewhat arbitrarily. The debt ceiling of 60% was simply more or less the Community average, and was not intended as a limit of acceptability for the debt, but simply as a threshold after which changes in debt become relevant and a close look at the deficit is necessary. The deficit ceiling of 3% of GDP, although broadly compatible with the 60% deficit ratio and a nominal growth of 5%, was criticized as being potentially too strict and inflexible. However, the excessive deficit procedure was supposed to provide the

necessary margins for discretion. All the alternative proposals were rejected on practical grounds; the so-called "golden rule" required a strict and harmonized differentiation between current and capital expenditure which was not available at the time; a proposal for assessing the budgetary position over a number of years was rejected on the ground that it would be heavily based on intentions for the future rather than on measurable facts. In the end, the limits were set on nominal annual figures.

After only few years since the start of EMU, the SGP has undergone an extensive process of revision. This may appear surprising, as the Maastricht criteria, very similar to those in the SGP, were never put into discussion. Three elements may help to explain this difference.

First, the economic outlook was quite favorable in the second phase of the EMU (1998-2001). The improvement in balances experienced until 1999 was largely due to the favorable economic upswing, and the structural surpluses turned out to be insufficient to allow the automatic stabilizers to work fully through the recession which started in 2001. As a result, some countries adopted a restrictive pro-cyclical fiscal stance in order to respect the 3% threshold despite the economic slowdown, possibly increasing its amplitude.

Second, the structure of incentives has changed. While the possibility of being excluded from participation in the EMU proved to be a powerful incentive to support fiscal restraint, the stick of the sanctions provided by the excessive deficit procedure of the SGP is relatively weak and uncertain. Calculations by Von Hagen (2002) suggest that after entry to the Union most countries, and especially the big ones, abandoned the process of fiscal consolidation. As a result, many EMU participants have expanded their budgets in good times, thus hitting the 3% deficit during the recent economic stagnation.

Finally, the experience of the first years of EMU has highlighted that the SGP rules have not been correctly implemented in the conduct of fiscal policies. The correct or incomplete implementation can be attributed to several factors, some of which are summarized by Buti and Giudice (2002). First, the requirement of budgets close to balance or in surplus in the medium run is confronted with a lack of consensus of how an output gap, and therefore a structural balance, should be measured. As a result, the only binding (nominal) rule in the SGP makes it intrinsically asymmetric in that it sanctions excessive deficits but does not provide incentives for fiscal consolidation in good times. Second, in the presence of current expenses that are difficult to cut, the balanced budget requirement may result in an insufficient level of investment. More generally, Buiter and Grafe (2001) remark that the enforcement of uniform nominal deficit and debt rules may cause problems for EU members whose initial conditions or medium term growth and inflation rates are different from the EU average. This problem is particularly relevant for the new member states, whose catch-up process may imply a need for higher public investment in infrastructures.

Finally, respect for the 3% deficit threshold of the Treaty does not explicitly address nor automatically ensure sustainable public finances¹, and may in theory

¹For instance, one-off measures can be used by the national governments as substitutes

still expose the ECB to the “unpleasant monetaristic arithmetic” of Sargent and Wallace (1981).

3 The reformed SGP

The European Council of 22-23 March 2005 agreed on a reform of the Stability and Growth Pact. The Pact includes two Council regulations: Regulation 1466/97 on the strengthening of budgetary surveillance and coordination of economic policies (the “preventive arm”) and Regulation 1467/97 on the excessive deficit procedure (the “corrective arm”). Both legal texts have been amended in accordance with the report endorsed by the Council. Thus, the reform implies changes to both the preventive and the corrective arms of the Stability and Growth Pact.

The main agreed amendments under the preventive arm are:

- The Stability and Growth Pact lays down the obligation for Member States to adhere to the medium-term objective (MTO) for their budgetary positions of ‘close to balance or in surplus’ (CTBOIS). In the new formulation the medium-term budgetary objective should be differentiated for individual Member States, to take into account the diversity of economic and budgetary positions and developments as well as of fiscal risk to the sustainability of public finances. The medium-term budgetary objectives may diverge from CTBOIS for individual Member States². They must provide a safety margin with respect to the 3 % of GDP government deficit ratio and ensure rapid progress towards sustainability; taking this into account, they shall allow room for budgetary manoeuvre and public investment. For euro area and ERM2 Member States, budgetary objectives shall be specified within a defined range between – 1 % of GDP and balance or surplus, in cyclically adjusted terms³, net of one-off and temporary measures.
- The adjustment effort towards the medium-term objective consists of an annual adjustment in cyclically adjusted terms, net of one-off and temporary measures, of 0.5% of GDP as a benchmark. The Commission should issue “policy advice” to encourage Member States to stick to their adjustment path.
- When defining the adjustment path towards the MTO major structural reforms which have direct long-term cost saving effects, including by raising potential growth, will be taken into account. A safety margin with

for structural changes in the budget, and issues as ageing population are at the moment not considered.

²The adoption of new, looser medium term targets implicitly recognizes the lack of rationale of the close to balance or in surplus requirement which, if respected, would drive the debt ratios to zero or even to negative values.

³The production function approach of the European Commission provides a common framework for calculating CABs. For a description of the Commission's production function approach, see Denis, C., K. McMorrow and W. R ger (2002)

respect to the 3% reference value must, however, be maintained at all times.

Changes in the corrective arm will include:

- A change in the growth threshold for applying the exceptional circumstances, that is for exempting a member state from the 3% deficit ceiling. The Treaty stipulates that deficits above 3% of GDP will be regarded as excessive unless they are expected to be exceptional and temporary. A deficit above 3% of GDP is to be considered exceptional and temporary if an unusual event beyond the control of the Member State or a "severe economic downturn" has driven the excessive deficit. In the previous Stability and Growth Pact the "severe economic downturn" was defined as an annual fall of real GDP of at least 2%⁴. In the new formulation of the Pact, a deficit over the reference value may be considered exceptional if it results from a negative growth rate or from an accumulated loss of output during a protracted period of very low growth relative to potential⁵.
- In its recommendations the Council shall request that a Member State in excessive deficit achieves a minimum annual improvement of at least 0,5% of GDP as a benchmark, in its cyclically adjusted balance net of one-off and temporary measures, in order to ensure the correction of the excessive deficit within the deadline set in the recommendation.
- "Other relevant factors" to be taken into account in Commission reports under Article 104(3) of the Treaty are to include developments in the medium-term economic position, and in the medium-term budgetary position. Consideration will also be given to any other factors that the Member State concerned deems relevant. Special consideration will be given to any excess over the reference value that reflects the implementation of pension reforms.
- The political commitment to reduce government debt would be reaffirmed. The debt surveillance framework would be strengthened by clarifying in qualitative terms the concept of "sufficiently diminishing and approaching the reference value at a satisfactory pace" for the debt ratio and agreeing on a well-specified framework for its assessment. It is unclear, however, whether a commitment in qualitative terms can be considered a reinforcement of the debt criterion⁶.

⁴ An annual fall of real GDP of less than 2% but of at least 0.75% could also be considered exceptional by the Ecofin council on the initiative of the Member State concerned and in the light of further supporting evidence.

⁵ Looking at the real growth figures for the eurozone countries in the period 1980-2004, we observe that growth has been below -2% in 1.45% of the cases and below -0.75% in 6.91% of the cases. The new threshold would have allowed for a more extensive application of the exceptional circumstances: in the period 1980-2004, growth has been below 0% in 9.82% of cases.

⁶ Initial proposals were inspired by the work of some economists (Calmfors and Corsetti).

- The deadline for the correction of an excessive deficit should in theory remain “the year after its identification”. In practice, the initial deadline could be set one year later in case of “special circumstances”, based on the “other relevant factors” mentioned above. Moreover, the initial deadline could be revised at a later stage if unexpected adverse economic events with major unfavorable budgetary effects occur.

The reform of the Pact strikes a balance between flexibility and sustainability⁷. The automatic stabilizers could work during the period of consolidation. The process of convergence would be smoothed over time; furthermore, a fixed speed of convergence is indicated, allowing those countries that are more distant from a balanced budget a longer time period. The sanctions of the SGP remain unaltered, but the changes in the corrective arm are likely to make their invocation more difficult in practice.

4 Methodological aspects

4.1 The empirical literature on fiscal policy

The investigation of the interaction between fiscal policy and macroeconomic developments requires, as a first step, identifying the contribution of fiscal policy to the economic cycle.

Structural regressions have been widely used to disentangle the components of fiscal policy. Van den Noord (2002) groups the structural methods into three categories. A first approach runs regressions of fiscal variables on different sets of explanatory variables. For instance, Galf and Perotti (2003) estimate fiscal rules for the discretionary budget deficit, using data on EMU countries on a sample period very similar to the one of this paper. This approach gives reliable results only if the set of explanatory variables is sufficiently wide, but may suffer from misspecification if the correct lags are not included. A second approach uses macroeconometric models, whose equations are calibrated. Macro models have the advantage of allowing the identification of different kinds of shocks, but suffer from the same problems just described, because the equations need first to be estimated in order to calibrate the elasticities in the model. The third approach is used by OECD, and consists of a mix of different methodologies. The elasticities of the cyclical components of taxes and expenditure are computed relative to a measure of the output gap independently estimated.

A different approach tries to overcome the difficulties of correctly specifying a model by using structural vector autoregression models (SVAR), which

2003, and EEAG, 2003) and favoured a solution linking the deficit threshold to the level of the debt/GDP ratio. The final solution is a weakening of the original proposals: the deficit threshold in the corrective part of the pact remains at 3%, while the Medium Term Objective in the preventive arm of the pact is country-specific and related to the debt ratio and the level of structural growth.

⁷Beetsma and Debrun (2005) provide an interesting theoretical model in which the trade-off between enforcement of the new rules and flexibility is taken into account. Their model also considers the effect of different degrees of transparency in the national budgets.

require only minimal identifying assumptions. SVAR models are widely used in empirical studies of monetary policy, but their use in the analysis of fiscal policy is fairly recent.

The lack of high frequency fiscal data or of long annual data series is partially responsible for this lack of interest. However, a number of important contributions have shown that the approach can give useful results. Blanchard and Perotti (1999) use a SVAR with taxes, government spending and GDP, all expressed in real terms, to investigate the dynamic effects of shocks in government spending and taxes in the US. A similar approach, with different specification of the model, can be found in Fatas and Mihov (1999). De Arcangelis and Lamartina (2001) use different identifying restrictions to explore the existence of different fiscal policy regimes. Perotti (2002) studies the effects of fiscal policy on GDP, prices and interest rates in 5 OECD countries. Favero (2003) and others have shown that fiscal and monetary policy cannot be estimated separately, because the interaction effects would bias the estimates.

Following Blanchard and Quah (1989), some authors use long run restrictions, which are relatively easy to reconcile with economic theory. This is the case of Bayoumi and Eichengreen (1992), who apply the long run restriction to divide between supply and demand shocks, and more recently of Dalsgaard and De Serres (2000), who estimate a SVAR for the 11 EMU countries⁸. Garcia and Verdelhan (2001) use a specification scheme à la Clarida-Gali, including both short and long run restrictions. They apply it to synthetic Euro Area data, including yearly GDP, inflation, real short term interest rate and budget balance, and manage to identify four types of shocks: supply, demand, monetary and fiscal. They also estimate cyclically adjusted budget balances and a synthetic indicator of policy mix.

A SVAR has some properties that make it particularly suitable for the present study. First, it can incorporate a measure of the cycle that is completely consistent with the model itself, without requiring additional information as input. It also avoids the need to identify specific and possibly restrictive fiscal and monetary policy rules. The presence of a sufficient number of lags can also include forward-looking behavior of policymakers, to the extent that VAR models can be interpreted as reduced forms of forward-looking models (see e.g. Favero 2003).

A specific advantage of SVAR models is that at least some identifying restrictions can be specified in the form of behavioral rules. This is for instance the case of the Blanchard and Quah long run restrictions that separate temporary from permanent shocks on the basis of their very own definitions. Behavioral restrictions can normally be reconciled with a large variety of economic models, and are therefore easier to accept. Our restrictions are of this nature.

Building on the SVAR approach, we estimate a simultaneous equation model, identifying fiscal shocks on the basis of long-run restrictions.⁹

⁸Their restrictions are that only supply shocks have a permanent effect on output, and that nominal shocks have a permanent impact on prices only.

⁹For a careful description of the properties of simultaneous equation models see Lütkepohl (1993), Ch. 10. For a model with variables similar to ours see Canova and Pappa (2003).

5 The model

The structure of the reduced-form model used for estimation is the following one:

$$Y = \sum_{L=1}^p C(L)Y + \sum_{L=1}^q D(L)X + e \quad (1)$$

where $C(L)$ and $D(L)$ are polynomials in the lag operator and the matrices are defined as follows:

$$Y = \begin{pmatrix} \gamma \\ d \\ \pi \end{pmatrix}; X = \begin{pmatrix} r \\ oil \\ b \end{pmatrix}; e = \begin{pmatrix} e_\gamma \\ e_d \\ e_\pi \end{pmatrix}$$

The model expresses the deficit/GDP ratio d_t , the growth rate γ_t and the inflation rate π_t as a linear function of their own lagged values and of the debt/GDP ratio b_t , the interest rate on debt r_t (or, in a robustness check, the long run interest rate) and the oil price index oil_t . The reduced form residuals e are assumed to be identically and independently distributed with mean zero and variance-covariance matrix $\Sigma = E(ee')$.

Our structural model contains three structural shocks: an aggregate supply shock ε_t^S , an aggregate demand (non fiscal) shock ε_t^D , and a fiscal shock ε_t^F . In order to identify these shocks we can rewrite model (1) in moving average (MA) form. Omitting the exogenous component we have

$$Y = \sum_{L=0}^{\infty} A(L)c \quad (2)$$

where $A(L) = [I - C_1 - \dots - C_p]^{-1}$ and $A(0) = I$ are known.

Structural form residuals ε_t are assumed to have a normalized covariance matrix: $E(\varepsilon\varepsilon') = I$. They are linked to the reduced form residuals e by the linear transformation S :

$$\varepsilon_t = \begin{bmatrix} \varepsilon_t^S \\ \varepsilon_t^F \\ \varepsilon_t^D \end{bmatrix} = S^{-1}e_t \quad \forall t \quad (3)$$

Taking into account that $SS^{-1} = I$, equation (2) may be rewritten as

$$Y = \sum_{L=0}^{\infty} A(L)SS^{-1}e = \sum_{L=0}^{\infty} B(L)\varepsilon \quad (4)$$

where

$$\begin{aligned} B(L) &= A(L)S \quad \forall L \\ B(1) &\equiv \sum_{L=1}^{\infty} B(L) = \sum_{L=0}^{\infty} A(L)S \equiv A(1)S \end{aligned}$$

Three identifying restrictions are required to just-identify the structural innovations from the reduced form VAR. Following a solidly established tradition, we identify the supply shocks ε_t^S as the only shocks to have a permanent long-run effect on growth. This is equivalent to restricting to zero the (1, 2) and (1, 3) elements of matrix $B(1)$. Moreover, the aggregate (temporary) demand shock ε_t^D is assumed to have no long-run impact on the deficit/GDP ratio. This is equivalent to restricting to zero the (2, 3) element of matrix $B(1)$. The fiscal shock ε_t^F is left free. After imposing these restrictions, the long-run matrix $B(1)$ looks like:

$$B(1) = \begin{bmatrix} b_{11} & 0 & 0 \\ b_{21} & b_{22} & 0 \\ b_{31} & b_{32} & b_{33} \end{bmatrix} \quad (5)$$

After imposing these restrictions, the signs of some of the elements of the S matrix need to be normalized.¹⁰ We choose a normalization such that the structural disturbances correspond to what are normally considered positive shocks.

5.1 The variables

Our dataset contains 26 annual observations of six variables for each of the EMU countries, with the exception of Luxembourg, over the years 1980 – 2005. The beginning of the sample in 1980 is chosen in order to concentrate on monetary regimes that stabilize inflation around a target value and to avoid modelling the impact of the two oil shocks.

The endogenous variables are: the rate of inflation (GDP-deflator based) π_t , the real GDP growth rate γ_t , the deficit/GDP ratio d_t . A negative value of d_t indicates a deficit, a positive value a surplus. The exogenous variables include the interest rate on debt (the implicit interest rate, calculated as general government interest as percent of gross public debt of preceding year) r_t , the oil price index expressed in national currency oil_t , the debt/GDP ratio b_t . The use of annual data when working with a dataset containing fiscal variables is in line with the literature and due to the absence of non-interpolated data at higher frequencies. The interest rate on debt is introduced to take into account the relationship between financial and monetary developments and the interaction between fiscal variables, inflation and real GDP. A robustness check uses long term bond yields, leading to similar results. Oil prices are used to capture the world economic cycle and exchange rate movements. The lagged value of government debt is introduced on the basis of the arguments contained in Favero and Monacelli (2003) and OECD (2003), according to which sustainability problems associated with indebtedness seem to be an important determinant of whether fiscal stance is pro-cyclical.

¹⁰See Christiano, Eichenbaum, and Evans (1999) for a discussion of this issue.

5.2 The EMU effect

A problem arising in this simulation exercise is that the beginning of EMU towards the end of sample may lead to a structural break in the conduct of economic policies. More specifically, it has been argued that the EMU may provoke a structural break in governments' behavior. The adoption of a common currency eliminates exchange rate risk and the associated interest rate premia among the participating countries. Furthermore, additional deficit can be financed more easily because the cost of the additional borrowing in terms of higher interest rates is partly spread across the entire currency area. Both factors may in principle lead to an increase in the deficit bias of fiscal policies. Fiscal developments since 1999 seem to suggest that indeed after the beginning of EMU fiscal consolidation has stopped and even reversed in some countries. This hypothesis is tested by adding a dummy starting in 1999 until the end of available data¹¹, and testing for its relevance. The results, reported in Table <DUM>, show that this dummy is often not significant; when it is, the sign is not always the one expected.

¹¹The choice of 1999 as first year coincides with the beginning of the third phase of the EMU. From the purely economic point of view, it presents a margin of arbitrariness, as argued in Canova and Pappa (2004), according to whom previous years (1997 and 1998) may already belong to the new regime. However, Canova and Pappa also find that the qualitative conclusions do not change by omitting these two years. An earlier break date would probably be opportune in a monetary policy rule, but we do not model monetary policy as an endogenous variable.

		Betas		T-stats	
		D 94-98	D 99-04	D 94-98	D 99-04
Belgium	Y=	-0.05	-0.01	-0.53	-0.29
	S=	0.05	0.02	1.15	0.36
	P=	-0.02	0.01	-0.27	-0.19
Germany	Y=	-0.06	-0.01	-0.26	-0.67
	S=	0.16	0.04	2.71	1.97
	P=	0.06	0.01	1.14	1.96
Greece	Y=	-0.08	-0.01	-0.63	-0.04
	S=	0.25	0.02	2.81	0.66
	P=	0.02	-0.01	0.10	-0.05
Spain	Y=	0.11	0.02	1.33	1.60
	S=	0.12	0.05	1.88	3.07
	P=	-0.04	0.00	-0.36	0.14
France	Y=	0.10	0.01	1.76	0.22
	S=	0.03	-0.01	1.01	-0.15
	P=	0.04	0.01	0.64	0.27
Ireland	Y=	0.19	0.00	1.76	0.10
	S=	-0.06	-0.04	-0.63	-1.97
	P=	-0.08	-0.03	-0.81	-0.84
Italy	Y=	0.21	0.01	3.24	1.35
	S=	-0.01	0.01	-0.16	0.15
	P=	0.20	0.02	2.10	1.22
Neth.	Y=	0.05	0.02	1.37	0.62
	S=	0.13	0.04	2.63	1.30
	P=	0.00	-0.02	-0.13	-0.57
Austria	Y=	-0.01	-0.01	-0.32	-0.66
	S=	0.00	0.02	-0.23	1.73
	P=	0.03	0.01	0.76	0.83
Portugal	Y=	-0.02	0.00	-0.20	-0.81
	S=	-0.12	-0.01	-1.31	-1.10
	P=	-0.07	-0.01	-0.29	-0.61
Finland	Y=	0.17	0.05	0.93	1.06
	S=	0.05	0.04	0.32	1.16
	P=	-0.10	-0.02	-0.56	-0.26

Table1: convergence and EMU dummies in the model

The few available data after 1998 do not allow for a test for structural breaks. However, we have compared the out-of-sample forecasts of the models estimated until 1998 with the observed variables until 2005. The forecasting ability of the model estimated until 1998 turns out to be quite good. One can thus conclude that the structural break is not statistically relevant and that pre-EMU estimated VARs are a good approximation of the economic structure in the whole sample. Following this conclusion, the model is re-estimated using the whole 1981-2005 sample.

Finally, a structural change certainly induced by the EMU is that the monetary authority, now targeting union-wide aggregates, will appear as little or not at all reactive to the national policymakers. While this phenomenon does not affect much our estimations, since we do not aim at estimating an interest rate rule, the out-of-sample simulation will be run using a constant interest rate equal to the one observed in the country in 2005. This is a compromise solution in the absence of information about the future developments of the interest rate.

6 The historical effect of European fiscal policy

This section assesses whether, in the past, discretionary fiscal policy has been effective in smoothing the economic cycle, or whether a procyclical component has prevailed, thus increasing the amplitude of the cycle. With the term “discretionary fiscal policy” we mean here those changes in fiscal variables that do not respond automatically to changes in economic conditions, as opposed to the so-called “automatic stabilizers”. Indeed, several recent works (e.g. Fatas and Mihov, 2003) questioned the conventional wisdom that fiscal policy is necessarily counter-cyclical by showing that in many countries discretionary fiscal policy has been pro-cyclical. Other authors (e.g. Méhitz, 2000) claimed that in Europe the conduct of discretionary fiscal policy also reduced the effectiveness of the automatic stabilizers. A study of the OECD (2003) finds evidence of procyclical easing in upturns and suggests that a high level of automatic stabilization associated with large public sectors may easily lead to more pro-cyclical discretionary fiscal policy. Gali and Perotti (2003) conclude that discretionary fiscal policy has become more counter-cyclical over time in EMU countries, but find the same trend in other industrialized countries.

The evaluation of the past effect of fiscal policies is conducted by comparing the variance of synthetic economic cycles, each constructed under different assumptions about fiscal policy. How a cycle can be constructed in the context of the estimated model is quite straightforward: only one of the identified shocks has a permanent effect on growth, the two other shocks (demand and fiscal) measure the temporary component, that is the cycle. The cycle is derived simply by shutting down the permanent shock in the estimated structural model.

Different assumptions on the fiscal shocks produce counterfactual economic cycles, whose variance can easily be compared¹². By assumptions about fiscal policy we simply mean a sequence of fiscal shocks, which can be for example the sequence of residuals estimated from the deficit equation (we refer to this case as observed fiscal policy) or some other completely different sequence. Therefore each simulated fiscal policy corresponds to a different sequence of fiscal shocks, while the demand shock and the parameters of the model are left unaltered. It has to be noted that every different sequence of shocks defines a different *discretionary* fiscal policy; the systematic component of fiscal policy, the so called automatic stabilizers, is always operating, as it is embedded in the structural parameters of the model.

The “observed cycle” in Table 2, corresponding to observed fiscal policy, is our baseline scenario and is compared with counterfactual cycles derived from different fiscal shocks. Its variability (measured by the variance of growth) is normalized to 100 in column 1 for comparability purposes.

¹²The averages of growth and inflation are intentionally omitted from the tables. The reason is that fiscal policy cannot sustain growth beyond the short run and has to be repaid at some point in time. In our model the effect is zero in the long run, following the identifying restrictions, therefore the differences would never be significant.

Variability of growth: 1980-2004			
	Cycle	Without fiscal shocks	Best fiscal policy
		All	All
Belgium	100	69.5	72.4
Germany	100	93.6	85.2
Greece	100	95.0	86.0
Spain	100	95.4	85.7
France	100	89.5	81.0
Ireland	100	100.8	94.3
Italy	100	92.0	83.1
The Netherlands	100	99.2	91.3
Austria	100	100.3	99.1
Portugal	100	90.3	82.8
Finland	100	70.8	67.8

Numbers below 90 are in bold

Table 2: effect of fiscal policy on the amplitude of the cycle

The second column shows what happens when the discretionary component of fiscal policy is shut down, letting the automatic stabilizers and every systematic component operate freely. The cycle in the "without fiscal shocks" column is derived by shutting down (putting to zero) both the permanent and the fiscal shocks, thus constructing a cycle purely driven by the third (demand) shock: it is useful to recall that this simulation does not refer to a world without fiscal policy, as the automatic stabilizers are embedded in the impulse responses of the deficit and the parameters of the model are never altered in the simulations, but simply to one in which rules predominate over discretion¹³. This simulation has the interesting feature that it eliminates the component of fiscal policy which can be misused by politicians. The results suggest that discretionary fiscal shocks explain only a moderate part of the variance in the cycle, with the possible exceptions of Italy and Belgium, in which discretionary fiscal policy appears to have been a major source of economic fluctuations¹⁴.

The other counterfactual simulation aims at deriving some measure of the *potential* for fiscal policy to stabilize the economy. Our simulation proceeds in two steps: in the first, we simulate the effect of quasi-random sequences of

¹³The reason for which we do not simply build a fiscally induced cycle and measure its variance is that there are interactions between the effects of demand, fiscal and monetary shocks, and we want to capture them in the simulation.

¹⁴The variance of the cycle without fiscal shocks is even bigger than 100 for Ireland and Austria. This apparently puzzling result (the variance does not always go down after removing a shock) is due to the fact that the structural fiscal shock is, in the original VAR, a linear combination of the reduced form shocks. Shutting down one structural shock only, leaving the others unaltered, does not guarantee a priori a reduction in the variabilities (although this remains very likely).

fiscal shocks, where the definition of quasi-random refers to the fact that the sequences of fiscal shocks are bootstrapped from the observed ones in order to have the same a priori distribution. The estimated parameters of the model are left unchanged. Repeating the simulation a sufficient number of times, each with a new draw of the fiscal shocks, we obtain a reasonable representation of all possible fiscal policies. Each of them is associated to a simulated business cycle, whose variability is computed. In the second step, among the simulations we then choose as “best fiscal policies” those that best succeeded in minimizing the variance of the cycle. However, the implementation of such best fiscal policies would require an amount of resources and information which is equivalent to perfect foresight and is way beyond the possibilities of any government. We take this objection into account and at the same time we increase the robustness of the analysis by considering, among the possible fiscal policies, the 5th to the 10th percentile of best fiscal policies, and by averaging the corresponding variability of the cycle.

The last column of Table 2 shows that fiscal policies could have been better used for countercyclical purposes in many countries. However, the only really big effects are to be found in Belgium and Finland, where the variability of growth is reduced by more than 25%. Germany, Greece, Spain, France, Italy and Portugal present potential reductions above 10%.

The comparison between the “without fiscal shocks” and the “best fiscal policy” scenarios is of particular interest, as the resulting output variances go in the same direction and are sometimes (again, Belgium and Finland) close to each other. In practice it appears that the “best policy” can be to some extent approximated by not using discretionary fiscal policy and simply letting the automatic stabilizers work freely. This latter solution also requires a comparatively minimal amount of information.

7 Reforming the Stability Pact

7.1 The simulated scenarios

In this section we try to assess whether some of the reforms of the Pact that are currently being implemented are likely to have an effect on the variability of the cycle. Since many of the proposals are difficult to quantify, we focus on stylized scenarios.

For the Preventive arm of the Pact:

- We calculate for each single country a “safety margin with respect to the 3 % of GDP government deficit ratio” and a second “safety margin ensuring rapid progress towards sustainability”. These two conditions motivate the introduction of the new country-specific Medium Term Objectives (MTOs) of the new Stability Pact, which would be, in cyclically adjusted terms and net of one-off and temporary measures, between -1% of GDP and “in balance or surplus”.

For the corrective arm of the Pact the effect of a different set of rules is simulated:

- In the "SGP scenario" the simulation is conducted in accordance with a stylized version of the old rules. In practice, as the operation of the corrective arm in the previous formulation of the SGP required that an excessive deficit must be corrected in the year following its identification, up to two years above 3% are allowed in the simulation before the deficit is forced again below the reference value. The imposed correction, when it happens, is instantaneous. This rule is not applied in the presence of "exceptional circumstances", defined in the simulation as a negative growth of -0.75% of GDP.
- A "no Pact scenario" is the second benchmark. In this case, the simulation is simply run on the estimated model without any constraint on fiscal variables.
- The three following simulations assess the effect of different changes in the Pact, each taken in isolation. The current SGP is modified in scenario 3 to allow for a longer time period (three years) above the reference value, scenario 4 modifies the threshold that defines the "exceptional circumstances" to 0% and scenario 5 allows a country in excessive deficit to revert below the 3% threshold progressively and taking into account the cycle, that is by imposing a 0.5% structural consolidation per year.
- The interactions between two modifications in the Pact are taken into account in simulation 6, which implements the changes in the time allowed to correct the deficit and the new 0% threshold for the exceptional circumstances.

7.2 Results: the medium term objective

This section finds numerical values for a "safety margin with respect to the 3 % of GDP government deficit ratio" and a "safety margin ensuring rapid progress towards sustainability", and compares them with the MTOs of the reformed SGP and with the results of Artis and Buti (2000).

In order to perform statistical analysis, we resort to dynamic stochastic simulation (DSS). As a statistical methodology, DSS is based on two assumptions. First, that the estimated model provides an adequate description of the economic phenomenon under consideration over the simulation period. Second, that the original distribution of estimated residuals is an adequate empirical measure of economic shocks, embracing a sufficiently ample spectrum of possibilities to form an adequate basis for the bootstrapping exercise¹⁵. For any period in the simulation, the DSS requires taking the following steps:

¹⁵In this context, the DSS assumes that the cyclical behaviour of the economies has not changed with the advent of EMU. This hypothesis is unlikely to hold in the long run. Artis and Buti point out that "as the cyclical behavior of the euro-area economy adapts to the new EMU environment, the medium-term targets will need to be re-addressed"

1. A shock is randomly chosen among the residuals of the estimated model (bootstrapping).
2. A new (simulated) data point is obtained by applying this shock to the estimated model.
3. This new data point is added to the data
4. For every period over the simulation horizon, points 1 to 3 are repeated. At every step, statistics of interest are collected.

Replicating the simulation described in steps 1 – 4 a congruous number of times (10000 in our case for each country), each time with a new set of shocks randomly chosen from the original distribution, it is possible to construct an ample set of alternative paths the economy might follow on the basis of the structure of the model and of the original distribution of residuals. These replications are the basis for our subsequent analysis.

The “safety margin” is defined as the target for the cyclically adjusted deficit which prevents the nominal deficit from breaching the 3% limit under normal economic fluctuations. In order to identify the safety margin, two informations are necessary: the knowledge of the probability of breaching the 3% reference value given an initial deficit value, and a (forcely subjective) assessment of what can be considered a sufficiently prudent probability \bar{p} .

The first of the two elements, the probability of exceeding the 3% threshold conditional on different levels of deficits, can be calculated on the basis of our simulations. The probability curves are reported in appendix: the continuous curves report the probability of going above 3% one year ahead for every initial level of deficit, the dotted curves the same probability two years ahead. As expected, a higher initial deficit implies higher probabilities of excessive deficits given normal economic fluctuations.

As for the prudent probability \bar{p} , since the main scope of the safety margin is to prevent the occurrence of deficits above 3%, it should be fixed to a fairly low level, to make sure that the probability of future excessive deficits is not too high. Given the arbitrariness of choosing a “prudent probability”, we pick up probabilities which are consistent with the rest of the rules contained in the Pact: the safety margin will then be such that the probability of trespassing the 3% limit under normal economic fluctuations is *grasso modo* the same as the probability of applying the exceptional circumstances clause, under which a deficit higher than three per cent is allowed. Looking at the real growth figures for the eurozone countries in the period 1980-2004, we observe that growth has been below -2% in 1.45% of the cases, below -0.75% in 6.91% of the cases and below 0% in 9.82% of the cases. The first two probabilities correspond to “prudent probabilities” of the old SGP, the third is derived from the new set of rules. In the figure in appendix these probabilities are represented as horizontal dotted lines.

The one-year-ahead safety margin for a country is then defined as the level of the deficit/GDP ratio which keeps the probability of that country's deficit being

larger than 3% one year ahead below the prudent probability \bar{p} . Analogously, the two-years-ahead safety margin is defined as the level of the deficit/GDP ratio associated with a \bar{p} probability of being larger than 3% two years ahead. In the figure in the appendix, one looks at the intersection of the curves with the horizontal probability lines.

The values corresponding to the different safety margins are reported in the following Table:

Safety margin with respect to the 3 % threshold						
	Probability: 1.45%		Probability: 6.91%		Probability: 9.82%	
	1yr ahead	2yr ahead	1yr ahead	2yr ahead	1yr ahead	2yr ahead
Belgium	-0.4%	-0.4%	-1.2%	-1.2%	-1.4%	-1.5%
Germany	-1.6%	-1.1%	-2.1%	-1.7%	-2.2%	-1.9%
Greece	1.4%	3.1%	0.1%	0.9%	-0.3%	0.4%
Spain	-0.9%	-0.2%	-1.7%	-1.1%	-1.9%	-1.3%
France	-1.1%	-0.3%	-1.6%	-1.4%	-2.0%	-1.6%
Ireland	-0.8%	-0.5%	-1.3%	-1.1%	-1.4%	-1.3%
Italy	-0.9%	-0.2%	-1.6%	-1.1%	-1.8%	-1.4%
The Netherlands	-0.2%	1.0%	-1.2%	-0.7%	-1.4%	-1.0%
Austria	-0.9%	0.0%	-1.4%	-0.9%	-1.6%	-1.2%
Portugal	0.7%	1.0%	-0.6%	-0.5%	-1.0%	-0.8%
Finland	1.6%	4.0%	0.1%	2.1%	-0.2%	1.3%

Safety margin with respect to the 3 % threshold. Negative numbers are deficits.

The resulting safety margins one year ahead calculated for the 0% threshold of the 'new Pact' (that is for a prudent probability of 9.82%) are as high as 2.2% deficit for Germany, where the shocks are relatively small, and as small as 0.3% for Greece, a country whose estimated model tends to produce systematic high deficits, and 0.2% for Finland, whose bootstrapped shocks include the fall of Soviet Union in the beginning of the 1990s. The average safety margin is around 1.4%. Looking at the safety margins two years ahead, they are slightly more restrictive, as one might expect, with an average of around 0.9% and a maximum at 1.9% (again Germany). This results are very similar to those obtained by Dalsgaard and DeSerres (1999) with a similar SVAR methodology.

A similar exercise has already been undertaken by Artis and Buti (2000), who use output gap and elasticities of the budget balance to the cycle. The methodology used in this section is different, in that it does not use any outside information on output gap or elasticities. This difference in methodology is partially reflected in the results; in their paper, Germany, Greece, France, Italy and Austria could aim for a deficit slightly above 1% of GDP, while the other countries should remain below.

As a second requirement, the medium term objectives would be defined in such a way that the debt would be "sufficiently diminishing and approaching the 60% reference value at satisfactory pace".

Debt sustainability is listed among the relevant factors that the Commission has to take into account when preparing a report under article 104(3) of the treaty. It has been agreed that the debt condition shall be evaluated in qualitative terms, but it cannot be ruled out that the reaffirmed commitment to debt reduction may actually lead to the definition of a more specific framework of assessment. In the present paper the definition of debt ratio sufficiently diminishing and approaching the 60% reference value at satisfactory pace is quantified by the following general form:

$$b_t - b_{t-1} = -\lambda(b_{t-1} - b^*) \quad (6)$$

in which the required rate of debt reduction $b_t - b_{t-1}$ declines linearly with the deviation from debt target $b_{t-1} - b^*$ at a constant adjustment speed λ . Budget dynamics in terms of GDP ratios are expressed by

$$b_t = def_t + \frac{b_{t-1}}{(1 + y_t)(1 + \pi_t)} \quad (7)$$

where def_t is deficit (including interest payments), y_t is real GDP growth and π_t is inflation. Putting together the required consolidation (6) and the equation of debt dynamics (7) we obtain the following expression:

$$def_t = \lambda b^* + \left(1 - \lambda - \frac{1}{(1 + y_t)(1 + \pi_t)}\right) b_{t-1} \quad (8)$$

which shows that for every nominal growth rate $(1 + y_t)(1 + \pi_t)$ the required deficit level def_t is a positive function of the debt target b^* and, for realistic values of the parameters¹⁶, a negative function of the previous level of debt b_{t-1} . Taking long run values for π and y , equation (8) identifies for each debt level a safety margin ensuring rapid progress towards sustainability.

In order to implement the simulation, numerical values are needed for the parameters. In equation (6) we choose $\lambda = 0.05$ and experiment with both $b^* = 0.4$ and $b^* = 0.6$. The first value of b^* implies that a country with a high debt ratio around 100% of GDP will be initially required to reduce this ratio by 3% yearly, while the required debt reduction will be of 1% for a debt ratio just above 60% of GDP; as a consequence, the 60% debt criterion would be satisfied in a finite number of years. The second value of b^* would drive the debt ratio to 60% only asymptotically. The long run value for inflation in equation (7) is set to $\pi = 0.02$, a value compatible with the objective of price stability of the ECB. Two values of structural growth are tried in order to provide with robust evidence, the structural growth provided from the estimated model and the average real growth observed in the 2001-2005 period. The results are summarized in the following Table.

¹⁶ For small values of λ, y and π the condition to have a negative coefficient is $\lambda > y + \pi$.

Debt in 2005		Thresholds based on Average real growth 2001-2005		Thresholds based on structural growth from model	
<i>Lambda</i>		0.05	0.05	0.05	0.05
<i>Bstar</i>		60%	40%	60%	40%
Belgium	93%	-1.7%	-0.7%	-2.4%	-1.4%
Germany	68%	-1.6%	-0.6%	-1.8%	-0.8%
Greece	108%	-4.1%	-3.1%	-4.0%	-3.0%
Spain	43%	-3.0%	-2.0%	-2.8%	-1.8%
France	67%	-2.0%	-1.0%	-2.3%	-1.3%
Ireland	28%	-3.5%	-2.5%	-3.8%	-2.8%
Italy	106%	-0.6%	0.4%	-1.4%	-0.4%
The Netherlands	53%	-2.1%	-1.1%	-2.3%	-1.3%
Austria	63%	-2.1%	-1.1%	-2.1%	-1.1%
Portugal	64%	-1.5%	-0.5%	-1.6%	-0.6%
Finland	41%	-2.9%	-1.9%	-3.1%	-2.1%

Table 4: medium term objectives such that the debt would be "sufficiently diminishing and approaching the 60% reference value at satisfactory pace".
Negative numbers are deficits.

The resulting medium term objectives vary extensively from country to country. With the adoption of the more restrictive debt target at 40% of GDP and the average 2000-2005 growth, both of which imply a higher consolidation effort, Belgium, Germany, France and Portugal should aim at structural deficits between 0 and 1% of GDP. Greece, Spain, Ireland, The Netherlands, Austria and Finland would achieve the necessary debt reduction also in presence of higher structural deficits, while Italy should target a surplus of about 0.4% of GDP. The less demanding 60% target would allow for structural deficits 1% higher, while the adoption of the growth estimated from the models generally implies slightly less demanding targets (the exceptions are Spain and Greece).

In order to derive numbers comparable with the medium-term budgetary objective of the new SGP, which must both provide a safety margin with respect to the 3 % of GDP government deficit ratio and ensure rapid progress towards sustainability, the lowest numbers from both exercises must be considered. In a somewhat arbitrary choice, the one year ahead safety margins and the second column of the previous Table are considered in Table 5. The resulting picture is overall supportive of the new MTOs from 1% deficit to close to balance or in surplus; Ireland and Spain could be allowed less demanding targets, also taking into account that their main reason for the MTO is not linked to the sustainability of debt, whilst Italy should target a structural surplus in order to reduce the debt ratio.

Country	Threshold deficit	Reason for the threshold
Belgium	-0.7%	Sustainability of debt
Germany	-0.6%	Sustainability of debt
Greece	-0.3%	Safety margin from 3%
Spain	-1.9%	Safety margin from 3%
France	-1.0%	Sustainability of debt
Ireland	-1.4%	Safety margin from 3%
Italy	0.4%	Sustainability of debt
The Netherlands	-1.1%	Sustainability of debt
Austria	-1.1%	Sustainability of debt
Portugal	-0.5%	Sustainability of debt
Finland	-0.2%	Safety margin from 3%

Table 5: estimated Medium Term Objectives

It should however be noted that the data used in the simulation are overall deficits, while the MTOs are defined on deficits excluding temporary measures and implicit liabilities. The results are therefore to be considered as indicative.

7.3 Results: the corrective arm

The corrective arm of the Pact has been subject to extensive revisions. Such revisions or “improvements” in the corrective arm followed the repeated breaching of the old rules by large countries such as France and Germany. They were justified on the basis of the need to increase the economic rationale of the Pact and diminish the character of “straightjacket” of rules which were leading to pro-cyclical policies and increased variability of the economic fluctuations.

This section aims at evaluating the systematic effect of different fiscal rules on the amplitude of the economic cycle and on the level of deficits which are obtained under normal economic fluctuations. The six scenarios described at the beginning of the section are simulated and the resulting variability of growth is compared.

In practice, the variabilities are calculated by repeating the Dynamic Stochastic Simulation as explained in the previous section. According to the chosen scenario, suitable shocks are fed to the simulation. The working of fiscal rules which act ex post is imposed on the simulated data: if a simulated point violates the rules imposed by the scenario (e.g. a simulated deficit/GDP ratio higher than 3% in scenario 2), a correction is applied. Following the DSS, it is possible to determine the distributions and probabilities of the real growth rate and of the deficit/GDP ratio, and calculate means and variances.

The results on the variability of growth are summarized in Table 6. The variability of output corresponding to the benchmark scenario (the application of the pre-reform SGP fiscal constraints) has been normalized to 100 for comparability purposes.

	sgp	free	3yrs	zero	progr	all
Belgium	100.00	100.43	93.90	95.39	100.85	106.57
Germany	100.00	87.56	82.86	81.81	87.12	88.59
Greece	100.00	95.92	92.10	97.00	98.41	100.63
Spain	100.00	98.40	96.50	108.63	103.69	97.26
France	100.00	80.83	98.80	94.10	98.80	89.79
Ireland	100.00	93.80	100.58	97.91	98.64	102.90
Italy	100.00	105.16	101.84	108.69	99.85	103.15
The Netherlands	100.00	111.83	103.45	110.77	103.84	102.84
Austria	100.00	107.91	102.68	106.94	101.24	102.41
Portugal	100.00	111.05	108.06	106.52	116.87	110.89
Finland	100.00	99.35	94.17	87.02	88.56	95.08

Table 6: variability of output

The figures provide somewhat surprising results. First, the variability of growth increases under the effect of the SGP rules only for a few countries. Among those we find some of the countries that have been struggling to respect the rules, or that have failed to do so, such as Germany, Greece and France, but not Italy and Portugal, which on the contrary seem to have benefitted from the higher discipline that the Pact imposed on naturally pro-cyclical fiscal policies. Even for these countries, however, the effect is limited. A possible interpretation of this result could be that for many countries the Stability and Growth Pact has been little more than the officialization on paper of policies which were already in place.

This conclusion is supported by comparing the "sgp" column with the following columns in each graph. Column "zero", corresponding to the new 0% growth threshold for applying the exceptional circumstances clause, is at least 5% lower than the "SGP" column in Germany, France, and Finland, but at least 5% higher in Spain, Italy, the Netherlands, Austria and Portugal. A longer time span given to correct a situation of excessive deficit seems to moderately reduce the variability of the cycle in several countries, namely Belgium, Germany, Greece, Spain, France, and Finland. This change in the Pact seems as a matter of fact to improve economic stabilization by avoiding an immediate correction of the deficit below the 3%. On the other hand, the progressive correction of excessive deficit, highlighted in column "progr", does not seem to have relevant effects. This may be due to the fact that even in our free models the countries are never willing to go from one year to the other to such high deficits that an instantaneous correction is much different from a progressive one.

Finally, the interaction of the different modifications has some effect only in Germany, France and Finland, which are affected by at least one of the single provisions anyway. The hypothesis that the effects of different aspects of the reform may reinforce each other does not seem to be confirmed in general; it may, however, grant more leeway to the "big sinners" of the recent years.

Overall, the impact of different rules on the variability of growth is quite

reduced. From this result it follows that the modifications of the Pact are likely to give the governments only a limited extra leeway to reduce the variability of the cycle. This evidence is consistent with previous findings, e.g. by Gali and Perotti (2003) or OECD (2003), according to which the constraints of the Maastricht treaty and the SGP do not seem to have created a pro-cyclical bias in the conduct of fiscal policies.

The explanation of such a limited impact of different rules is easily found in Table 7, which report on the average deficit that the model simulates under each set of rules.

	Average deficits					
	sgp	free	3yrs	zero	progr	all
Belgium	100.00	103.60	101.10	102.74	97.97	96.88
Germany	100.00	99.95	100.00	99.97	100.05	99.93
Greece	100.00	102.36	101.40	99.99	102.15	101.64
Spain	100.00	99.08	99.67	98.61	100.19	97.90
France	100.00	99.60	100.17	100.23	99.85	99.83
Ireland	100.00	101.30	100.82	99.79	100.34	100.44
Italy	100.00	112.35	100.15	99.98	112.39	100.17
The Netherlands	100.00	100.46	100.02	100.49	100.10	100.18
Austria	100.00	100.43	100.01	100.40	100.62	99.88
Portugal	100.00	107.96	102.60	101.16	107.72	103.42
Finland	100.00	99.91	99.87	99.90	99.84	99.74

Table 7: deficit levels

Italy and Portugal (the two countries whose variability of output is reduced under the SGP) appear to be the countries whose deficit would naturally be higher without the SGP rules. For these countries, the change of the threshold that defines the "exceptional circumstances" to 0% does not make a difference from current rules, one more year to correct the excessive deficit increases slightly the average deficit, while a "progressive approach" from excessive deficit is definitely the major weakening of the current fiscal rules for all three countries. For most other countries the current set of rules, if used to the maximum extent, would have resulted in a very small change compared to the "old SGP" scenario and the "no pact" scenario.

Following these considerations, it can be expected that the implemented changes in the rules of the Pact are likely to have very little impact on fiscal policies, as the current rules already guaranteed ample margins of discretion.

The previous analysis was conducted over more than one economic cycle, and it therefore took into consideration the variability of growth. However, in the current stagnating economic environment many of the proposals for reforms of the Pact are aiming at short run increases in the economic growth. An evaluation of the different scenarios in relative terms in the short run has been

implemented via simulations covering a period of 5 years after the end of the sample (2006-2010). The evaluation of the short run effects of the different rules is in this case based on mean variables. The analysis confirms the long run conclusions: the extra leeway in the conduct of fiscal policies is extremely limited, and the effect on growth negligible (less than 0.1% extra growth per year for all the countries).

8 Conclusions

The present paper provides an assessment of the effect of the reform of the Stability and Growth Pact on the European economy.

A set of structural VARs, one for each eurozone country, is estimated. The estimated models are used for assessing the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact in its old and reformed version.

The investigation highlights a number of facts.

- Fiscal policy has not been effectively used as a counter cyclical macro-economic tool, nor it has had strong pro-cyclical characteristics; simply, the discretionary component of fiscal policy seems to have been mainly assigned to objectives other than stabilization. The overall evidence suggests that fiscal policy has had a limited (if any) smoothing effect on the cycle.
- The restricted impulse response functions confirm that fiscal policy has generally a limited and ambiguous effect on output.
- The results of a "best stabilizing fiscal policy" are difficult to obtain even for a benevolent government, due to informational constraints. However, the "best policy" can be approximated by not using discretionary fiscal policy and simply letting the automatic stabilizers work freely. This latter solution requires a comparatively minimal amount of information and is less prone to abuse by politicians.

The dynamic stochastic simulation is used to assess the effect of the fiscal rules of the old and the reformed SGP.

- The analysis is overall supportive of the new country-specific Medium Term Objectives from 1% deficit to close to balance or in surplus; possibly Ireland and Spain could be given less demanding targets, while Italy should target a structural surplus in order to reduce the debt ratio.
- Overall, the cost in terms of stabilization of the old rules in the corrective arm of the Pact was limited. A possible interpretation of this result could be that for many countries the Stability and Growth Pact has officialized on paper policies which were already in place. Furthermore, while the variability of the cycle increased under the SGP rules for some countries,

others seem to have benefitted from the higher discipline that the Pact imposed on naturally procyclical fiscal policies.

- The simulations of the modifications of the corrective arm of the Pact suggest that they are likely to give the national governments only a limited additional fiscal freedom. The more lenient threshold for applying the exceptional circumstances and the progressive rules for correcting excessive deficits are of little quantitative importance, while a longer time span given to correct a situation of excessive deficit only moderately affects fiscal policy and reduces the variability of the cycle in few countries. The findings also suggest that the scenarios with the assumed interpretation of the new Pact would raise deficits only in some of the high debt countries. This evidence is consistent with previous findings in the literature.

The results of this study should be interpreted with caution. First, the estimation of the model assumes that government behavior estimated over the 1980-2005 period can be conveniently represented by a unique model with some dummies. Second, it is assumed that governments do not change behavioural preferences in the EMU and that they strictly comply with the assumed interpretation of the fiscal rules under any given scenario. In reality a more lenient Pact may bend governments towards a more relaxed attitude on deficits. Third, trend growth may in the future be lower than in the past 26 years so that instances with negative or even significantly negative growth may become more frequent than expected according to the estimated models.

9 Appendix

9.1 Unit root test of the variables

ADF unit root tests on variables						
Probability of unit root	GDP real growth		Deficit ratio		GDP deflator	
	Intercept	No intercept	Intercept	No intercept	Intercept	No intercept
Belgium	0.00	0.02	0.84	0.20	0.41	0.22
Germany	0.10	0.10	0.23	0.47	0.30	0.08
Greece	0.53	0.64	0.34	0.46	0.84	0.17
Spain	0.00	0.34	0.75	0.37	0.35	0.02
France	0.05	0.19	0.13	0.58	0.09	0.00
Ireland	0.20	0.30	0.58	0.04	0.19	0.03
Italy	0.03	0.06	0.89	0.40	0.01	0.00
The Netherlands	0.02	0.19	0.50	0.29	0.03	0.05
Austria	0.01	0.36	0.29	0.31	0.42	0.09
Portugal	0.00	0.08	0.24	0.20	0.71	0.08
Finland	0.15	0.06	0.15	0.02	0.27	0.03

H0: Unit root exists. Probability of unit root reported. Lag length in the test: Schwarz info criterion.

9.2 The identification of the model

The three long run restrictions on $B(1)$ imply that

$$\begin{aligned}
A(1)SS^{-1}e &= B(1)\varepsilon = B(1)S^{-1}e \\
A(1) &= B(1)S^{-1} \\
A(1)S &= B(1)
\end{aligned}$$

where $A(1)$ is totally known and the zeros of the $B(1)$ are the long run restrictions. The restrictions apply to the transition matrix S .

Finally, the normalization of restricted residuals ε implies that

$$E(\varepsilon\varepsilon') = I$$

since $\varepsilon = S^{-1}e$ or $S\varepsilon = e$, then

$$E(ee') = E(S\varepsilon\varepsilon'S') = SS' = \Sigma.$$

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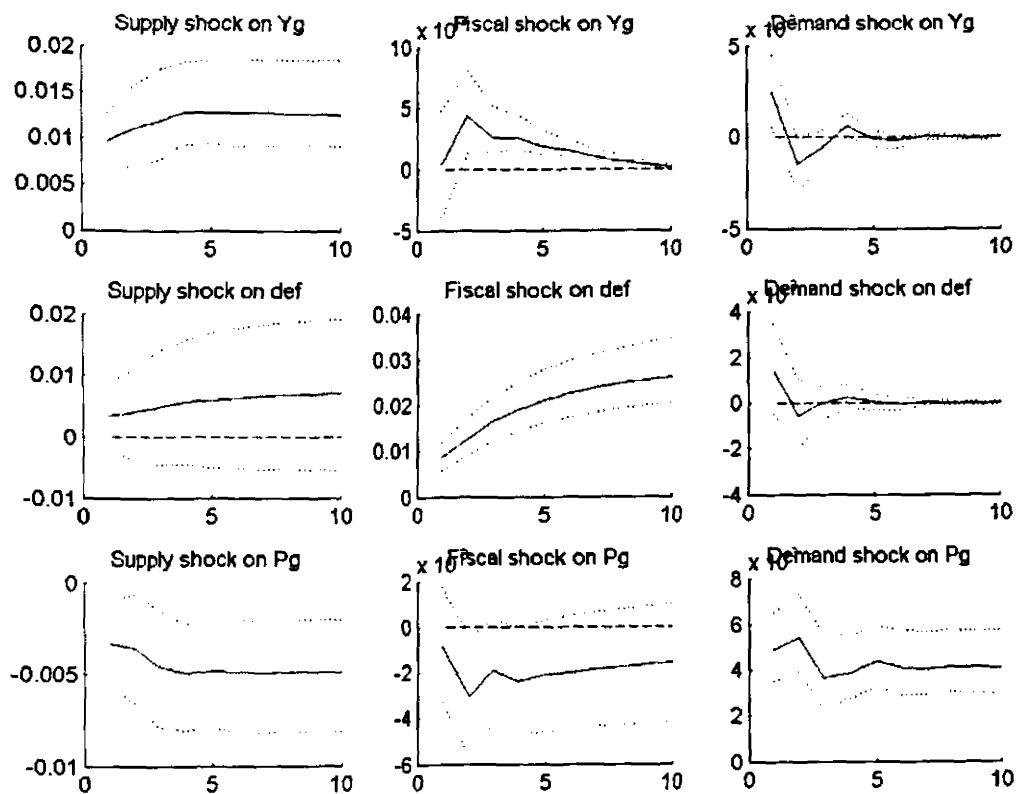
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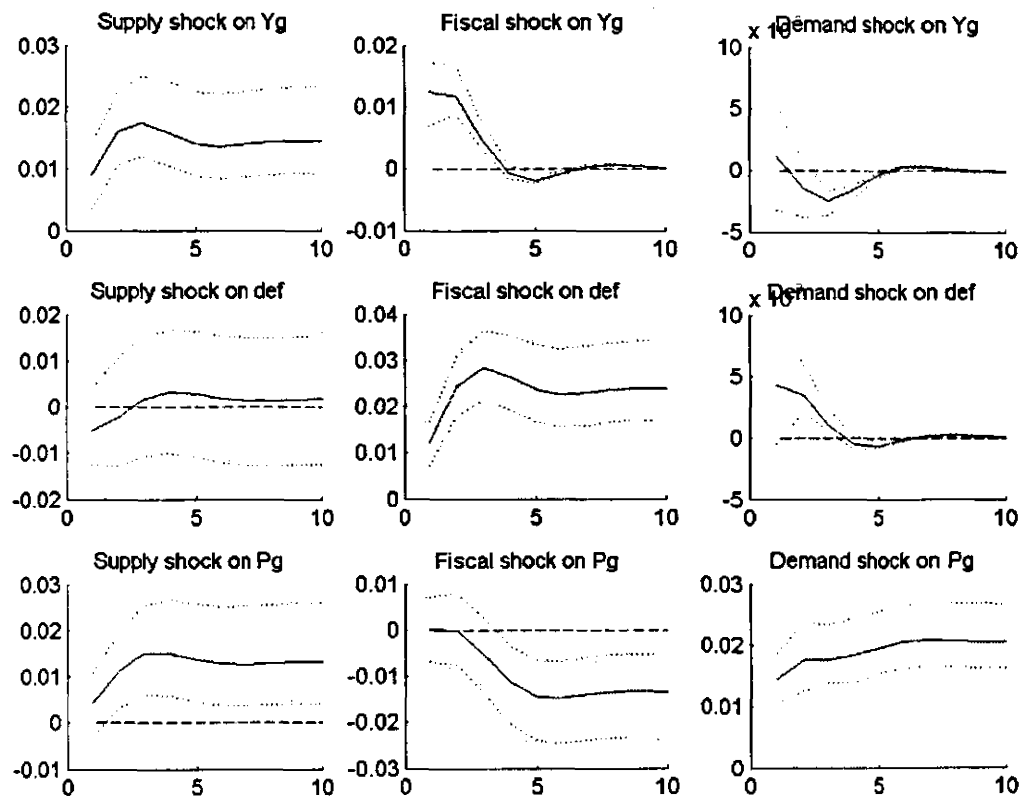
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structural model – impulse responses

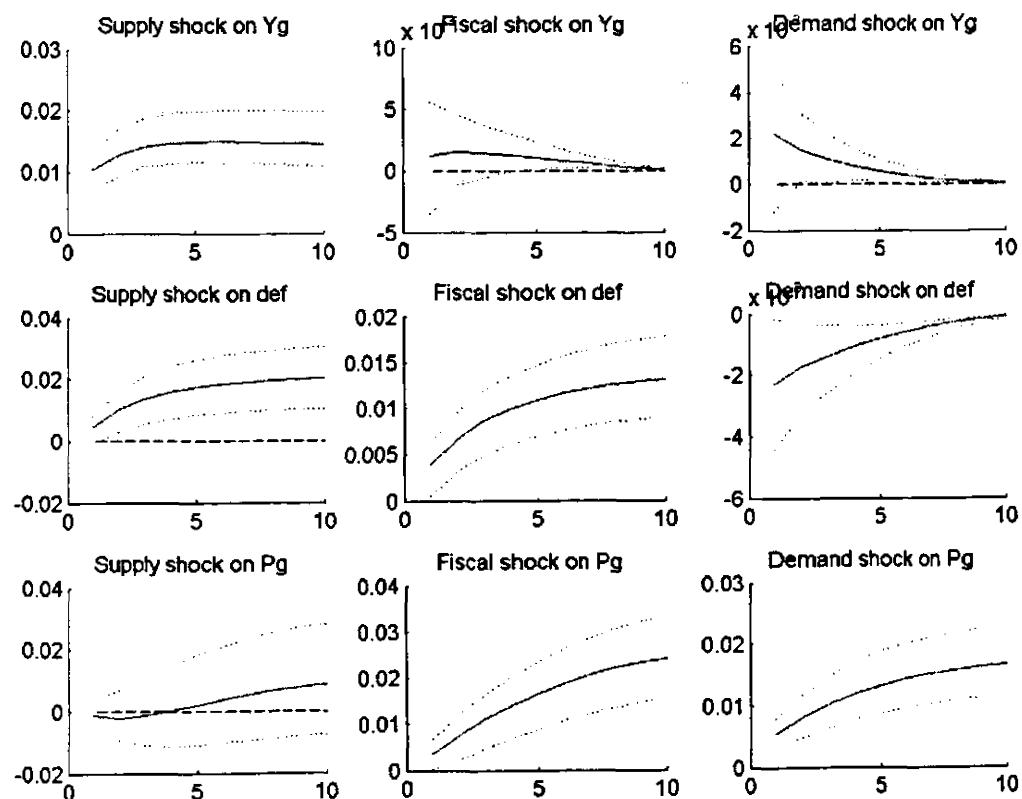
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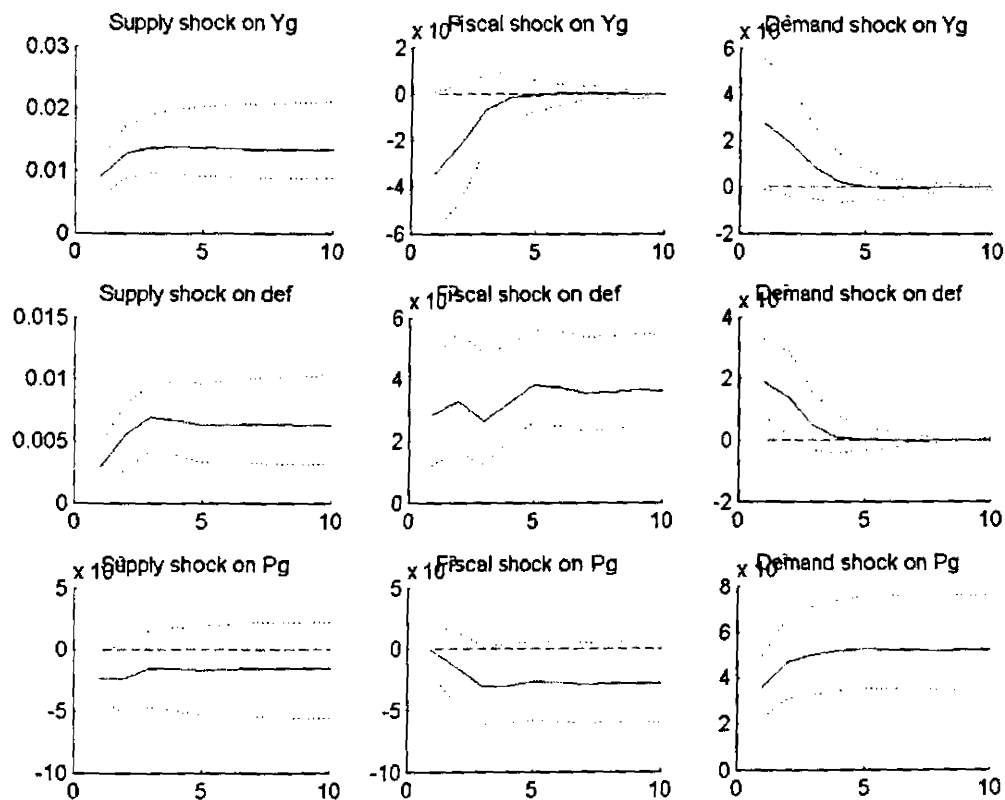
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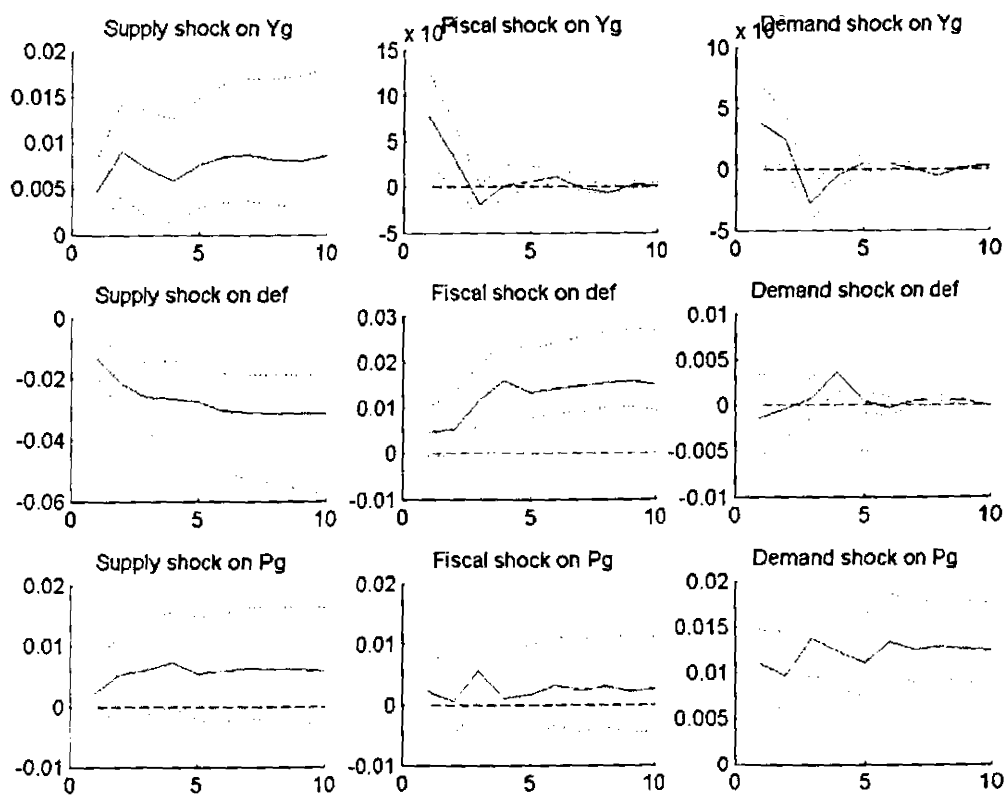
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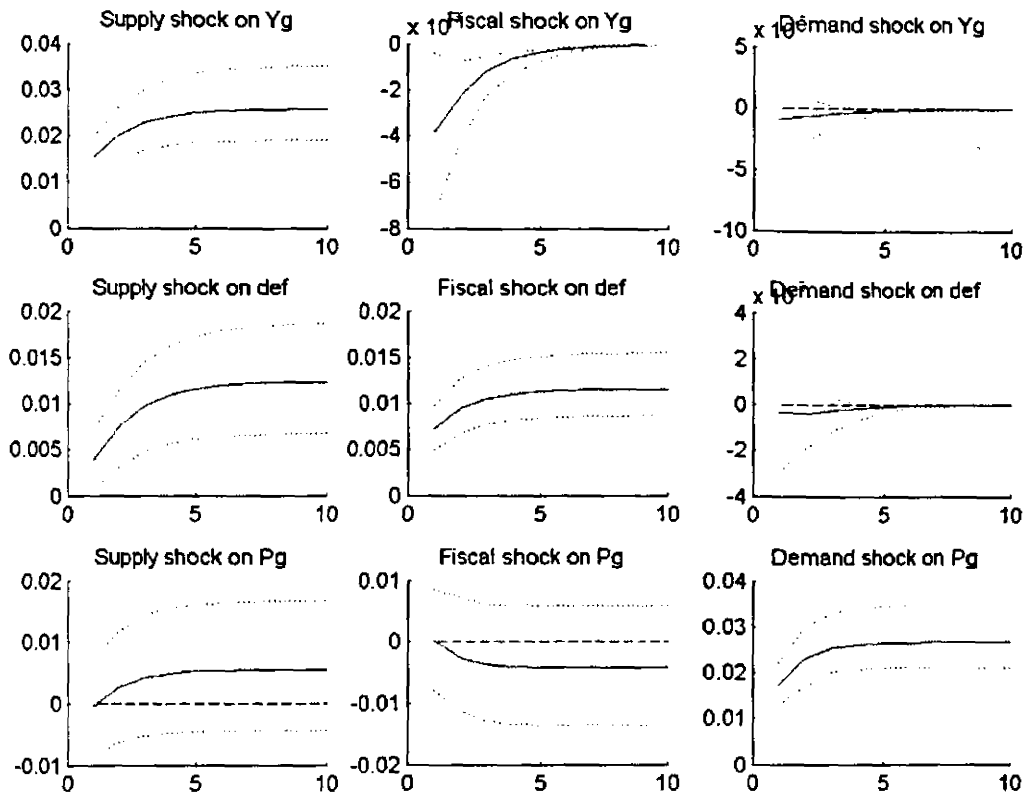
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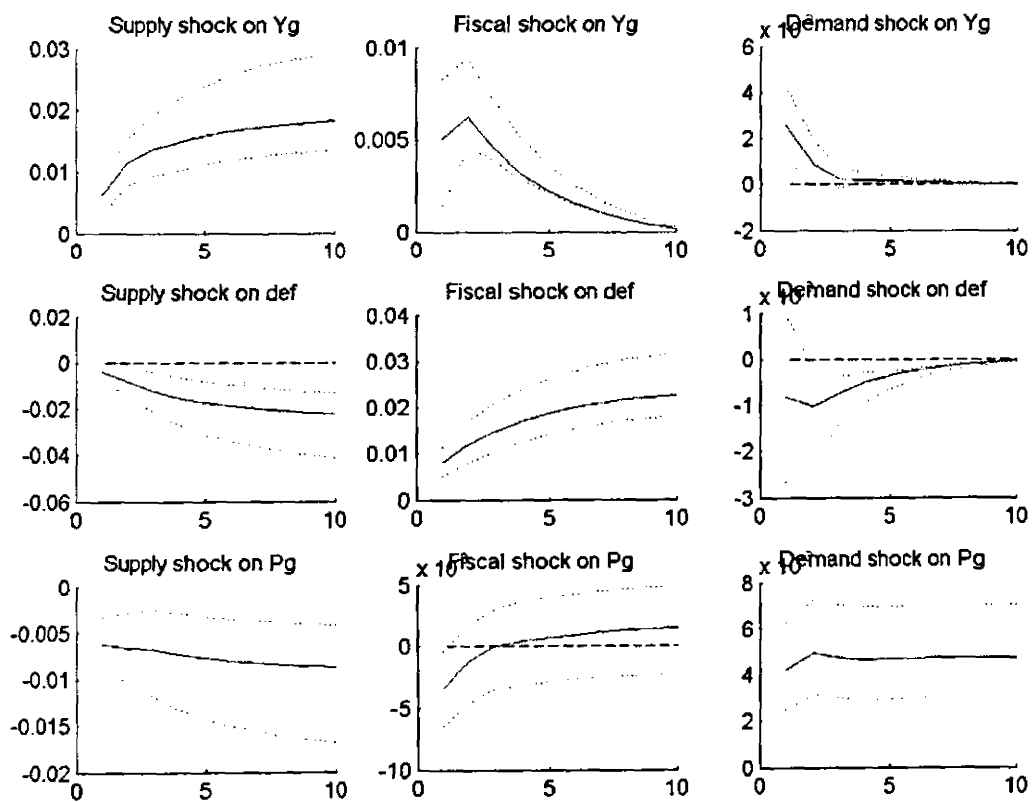
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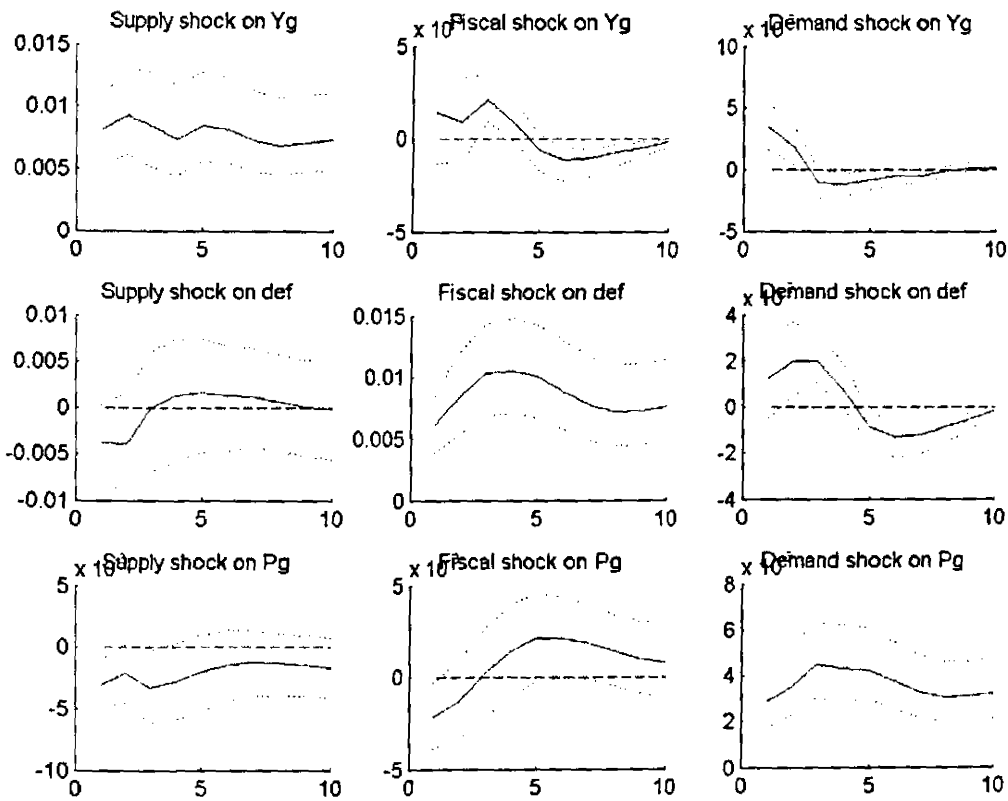
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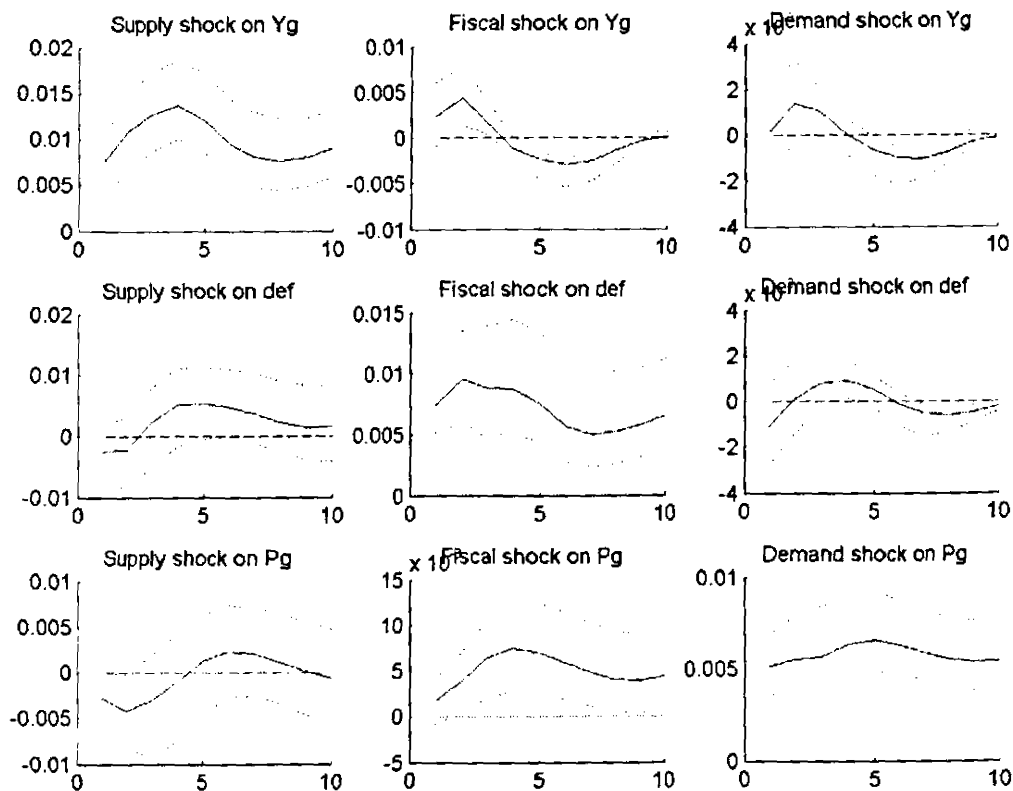
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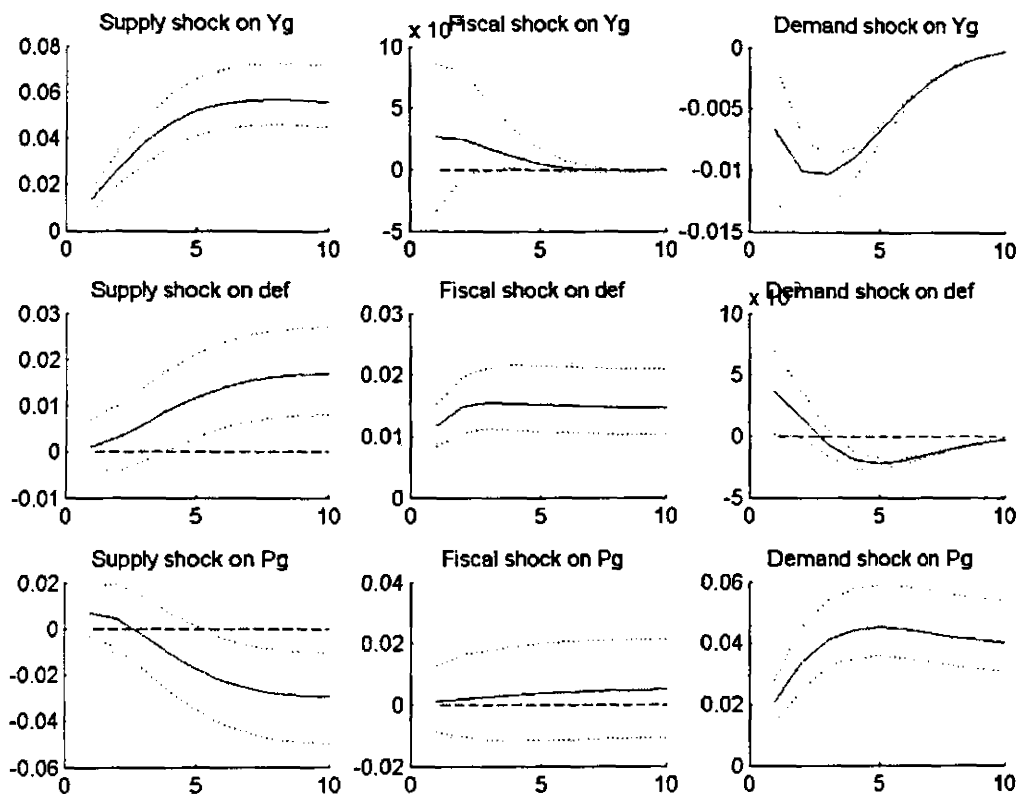
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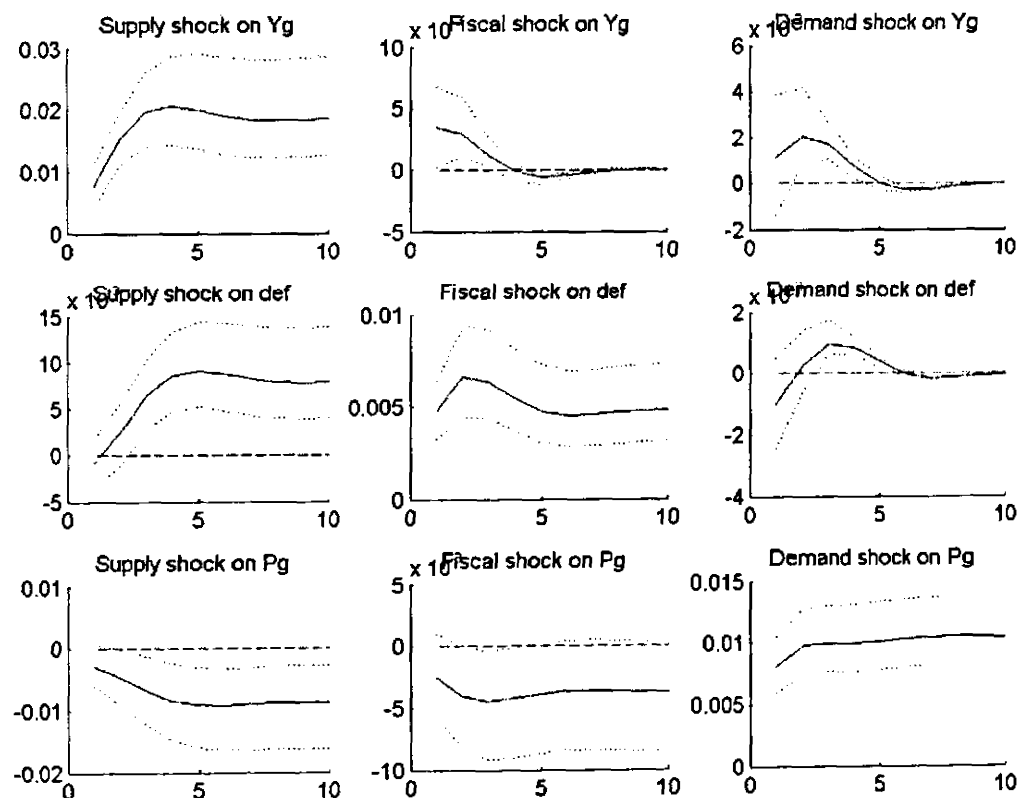
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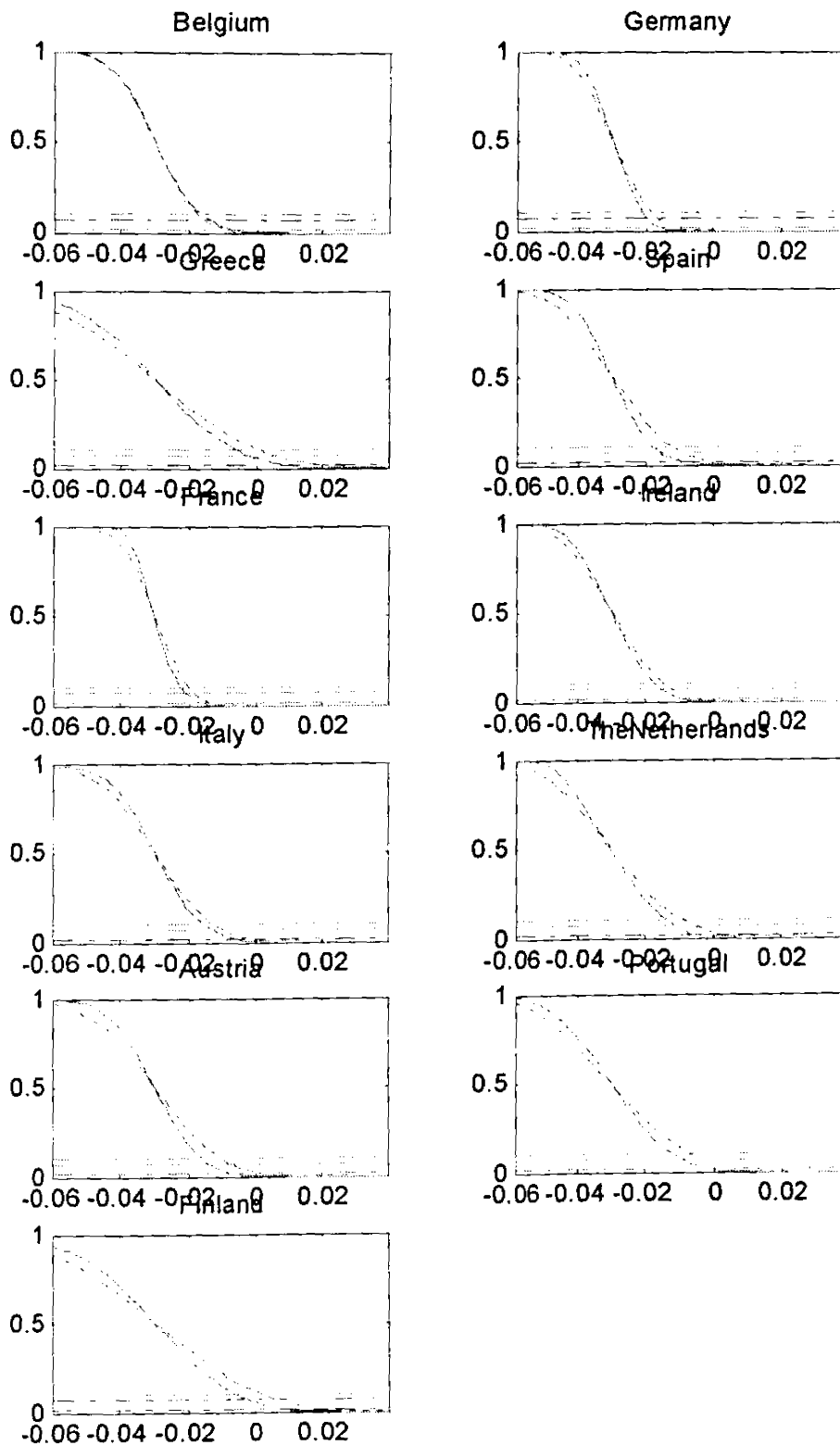
Portugal



Spain



Medium term objectives: safety margin from 3% deficit threshold



Restricted model - coefficients

The table includes:

- Y,S,P Long-run matrix B(1) (cumulative impulse responses, in percentage points)
- Y(0),S(0),P(0) Matrix inv(S) in equation (3) and (4), transforming the reduced form into restricted form
- Y(1),S(1),P(1) Restricted model, coefficients at lag 1, $A(L=1) * S$ in equation (3)
- Y(2),S(2),P(2) Restricted model, coefficients at lag 2, $A(L=2) * S$ in equation (3)

	Y	S	P	Y(-0)	S(-0)	P(-0)	Y(-1)	S(-1)	P(-1)	Y(-2)	S(-2)	P(-2)
Belgium	Y= 1.90%	0.00%	0.00%	97.07	-78.50	-12.49	3.26	-11.25	-28.41	36.38	-65.12	15.55
	S= 0.19%	1.81%	0.00%	38.80	85.84	-39.85	-10.79	45.19	-72.48	53.96	-18.32	33.00
	P= -0.75%	-0.13%	0.49%	21.92	21.72	166.18	3.93	-35.45	19.92	-57.20	42.55	-55.60
Germany	Y= 1.38%	0.00%	0.00%	75.49	61.12	-69.72	14.59	70.53	-74.16	-10.84	-10.45	4.16
	S= 0.50%	0.30%	0.00%	-66.90	253.09	-82.31	26.14	37.56	-45.99	21.57	-106.31	-34.59
	P= 0.08%	-0.18%	0.49%	27.77	36.52	242.97	36.13	-32.08	26.67	44.04	-47.56	15.25
Greece	Y= 0.76%	0.00%	0.00%	68.01	-16.42	-45.68	-3.02	3.64	-26.94	-80.31	-18.07	-25.05
	S= -0.52%	2.10%	0.00%	27.41	84.37	16.64	-35.71	30.05	17.83	35.95	7.08	4.11
	P= -0.57%	0.23%	1.02%	46.43	-43.54	65.95	-1.97	-57.69	-26.07	-33.25	24.81	-18.30
Spain	Y= 1.90%	0.00%	0.00%	110.50	-90.12	-28.93	58.53	-91.22	-29.19	-	-	-
	S= 1.07%	0.91%	0.00%	15.00	156.39	10.11	77.99	47.33	10.67	-	-	-
	P= -1.37%	-1.28%	1.05%	55.92	66.23	119.17	64.77	-69.60	24.11	-	-	-
France	Y= 1.02%	0.00%	0.00%	111.41	-42.99	-36.42	13.61	-43.51	-38.70	-	-	-
	S= 0.69%	0.99%	0.00%	-20.77	149.12	128.70	47.58	49.33	135.44	-	-	-
	P= -1.30%	3.49%	2.81%	56.22	-159.19	56.63	-74.40	-33.30	22.15	-	-	-
Ireland	Y= 2.75%	0.00%	0.00%	60.25	24.42	10.25	23.91	24.47	10.26	-	-	-
	S= 1.53%	1.33%	0.00%	-21.61	113.55	-0.43	20.27	38.28	-0.41	-	-	-
	P= 0.60%	-0.27%	2.23%	-7.24	-8.26	58.52	7.59	-17.40	13.58	-	-	-

Restricted model - coefficients

The table includes:

Y,S,P Long-run matrix B(1) (cumulative impulse responses, in percentage points)
Y(0),S(0),P(0) Matrix inv(S) in equation (3) and (4), transforming the reduced form into restricted form
Y(1),S(1),P(1) Restricted model, coefficients at lag 1, A(L=1) * S in equation (3)
Y(2),S(2),P(2) Restricted model, coefficients at lag 2, A(L=2) * S in equation (3)

Italy	Y=	1.64%	0.00%	0.00%	57.62	-31.86	-68.15	-3.17	-32.07	-68.28	-	-	-
	S=	-1.47%	2.51%	0.00%	25.27	105.31	10.20	-10.37	65.94	10.51	-	-	-
	P=	-0.74%	-0.07%	0.49%	150.95	-35.73	116.19	54.34	-41.49	-87.27	-	-	-
Neth.	Y=	1.03%	0.00%	0.00%	103.00	-35.43	-46.93	42.29	-17.29	-22.49	-53.09	-24.36	-37.86
	S=	0.29%	0.84%	0.00%	15.32	109.36	-24.25	23.42	14.71	-32.85	30.93	-34.24	-0.34
	P=	-0.56%	-0.19%	0.89%	114.21	11.22	142.32	52.53	22.24	87.16	16.55	-49.72	-69.24
Austria	Y=	0.66%	0.00%	0.00%	79.24	-41.46	-75.85	-31.14	-29.76	-26.25	-45.80	-13.36	-58.31
	S=	0.39%	0.36%	0.00%	20.10	264.48	-124.19	56.19	19.98	-22.22	144.66	-23.17	-114.08
	P=	-0.08%	-0.12%	0.53%	81.32	95.03	148.10	54.93	-1.24	18.48	45.58	41.66	-59.25
Portugal	Y=	7.21%	0.00%	0.00%	49.84	-15.65	34.44	34.56	-15.04	35.08	-	-	-
	S=	1.72%	1.22%	0.00%	14.07	89.52	-14.56	34.06	7.58	-13.10	-	-	-
	P=	1.65%	-0.30%	0.06%	-43.84	21.24	22.21	-40.46	18.32	8.46	-	-	-
Finland	Y=	1.74%	0.00%	0.00%	63.11	-64.40	14.78	3.49	-64.78	15.27	-	-	-
	S=	0.83%	2.22%	0.00%	25.65	52.74	-10.01	47.92	6.27	-9.96	-	-	-
	P=	0.98%	-1.14%	2.07%	-18.92	14.46	64.51	20.17	-11.31	16.43	-	-	-

Conclusion

Conclusions

This thesis investigates some of the mechanisms of propagation of asymmetric shocks in a monetary union and the effect that they may have on the conduction of policies and ultimately on macroeconomic variables. In the context of the European Monetary Union (EMU), and without any pretension to be exhaustive, the question is addressed of whether the current framework of policy coordination, based on a common monetary policy oriented to price stability, national autonomy of fiscal policies within common budgetary rules and the complete freedom of national wage policies, is appropriate in ensuring macroeconomic stabilization.

The first two papers tackle the issue of policy coordination in presence of shocks from the theoretical point of view. These papers develop models of policy interactions in a monetary union, focusing on wage dynamics, fiscal and monetary policy and their consequences on the variability of inflation and output.

Some general conclusions concern the interaction of policies after an asymmetric shock:

- The effectiveness of the common monetary policy is strongly affected in a MU by the national fiscal and wage policies. The capacity of the central bank to keep inflation stable is always smaller in a monetary union than in the one country case, and even the most conservative central bank can reduce but not eliminate this problem. Furthermore, the model shows that the unique monetary policy can lead to very different price dynamics in different countries of the union.
- As of fiscal policy, fiscal activism is always increased by entry in the monetary union. This conclusion does not depend on any switch in the preferences of the governments, and should be considered as an inevitable fact for any country joining a monetary union. The models also highlight the presence of a "domino effect" of fiscal policies: once a country increases its deficit, the others tend to do the same.
- The effects of the common monetary policy are also influenced by the structure of the national wage setting process. The models show that some convergence in the structure of labor markets could be useful.

Mechanisms to internalize the costs of salary changes on output and employment in the wage setting process could also be beneficial.

The papers provide some justification for the existence of the European fiscal rules as a coordination device. The first kind of coordination examined is the so called positive coordination of fiscal policies, according to which the fiscal policies can be agreed together at each point in time.

- Positive fiscal coordination among national governments is shown to create policy activism even if it is limited to an informal exchange of information. The awareness of the interplay of fiscal policies and monetary policies by the players starts quite complex interactions, leads to the multiplication of the initial disturbances and propagates them to the whole union through monetary externalities, thus leading to policy induced instability.
- A deeper positive coordination going as far as taking common decisions on fiscal policies would internalize the monetary externalities and avoid the international propagations of asymmetric shocks, while giving back to the fiscal authorities one degree of freedom in fiscal policy to counteract common disturbances. On the other hand, it would imply a high level of fiscal and monetary activism and greatly reduce the independence of the central bank: fiscal coordination produces in the model exactly the same result as policy coordination comprising both fiscal and monetary authorities.

Negative coordination is somewhat simpler: some rules are decided once and for all. In Europe, the Maastricht deficit criteria impose low levels of public deficit before entry in the EMU and sanction excessive deficits thereafter. The models argue in favor of negative coordination, based on rules. In particular, the following conclusions emerge:

- For candidate countries, a rule imposing the reduction of deficits prior to entry in a monetary union may be preferable both for the country and the stability of the existing monetary union.

- Fiscal constraints are also shown to be necessary and useful after the establishment of a monetary union, and they are effective in preserving the independence of the central bank.
- A fixed threshold on nominal deficits limit, such as the common 3% deficit limit of Maastricht, cannot be considered optimal: an alternative rule is proposed that allows for more flexibility in such a way to obtain at the same time more stabilization and more independence of the Central Bank. This rule is similar to the country-specific thresholds defined in cyclically adjusted term in the revised SGP.

Finally, positive and negative coordination interact. In particular, the simulations underline the danger that an excessive positive coordination could make a fiscal rule ineffective; as one can observe, the SGP is effective in reducing the involvement of the ECB, unless the fiscal decisions are formally coordinated.

The final paper is an empirical assessment of the effect of fiscal policy on the European economy. The estimated models are also used for assessing the possible effect of alternative sets of fiscal rules, with particular attention to the Stability and Growth Pact in its old and reformed version.

The investigation highlights some general features of fiscal policy in Europe:

- Fiscal policy has not been effectively used as a counter cyclical macroeconomic tool, nor has it had strong pro-cyclical characteristics. The overall evidence suggests that fiscal policy has had a limited (if any) smoothing effect on the cycle.
- The restricted impulse response functions confirm that fiscal policy has generally a limited and ambiguous effect on output.
- A "first best stabilizing fiscal policy" is difficult to implement even for a benevolent government, due to informational constraints. However, the "best policy" can be approximated by not using discretionary fiscal policy and simply letting the automatic stabilizers work freely. This latter solution requires a comparatively minimal amount of information and is less prone to abuse by politicians.

Dynamic stochastic simulation is used to assess the effect of the fiscal rules of the old and the reformed SGP.

- The analysis is overall supportive of the new country-specific Medium Term Objectives, whose personalized cycle-adjusted targets correspond quite closely to the “alternative SGP” proposal I formulated in the first paper. These targets perform better than fixed nominal thresholds in terms of stabilization while preserving the independence of the central bank.
- The cost in terms of stabilization of the old rules in the corrective arm of the Pact appears to be limited. A possible interpretation of this result could be that for many countries the Stability and Growth Pact has set on paper policies which were already in place. Furthermore, while the variability of the cycle increased under the SGP rules for some countries, others seem to have benefited from the higher discipline that the Pact imposed on systematically expansive and procyclical fiscal policies. A systematic bias towards high deficits is not accounted for in the theoretical models, and the empirical investigation suggests that this could be an interesting extension.
- Following the previous considerations, the simulated modifications of the corrective arm of the Pact are likely to give the national governments only a limited additional fiscal freedom. The more lenient threshold for applying the exceptional circumstances and the new rule which allows a gradual correction of excessive deficits are of little quantitative importance, while a longer time span given to correct a situation of excessive deficit only moderately affects fiscal policy and reduces the variability of the cycle in few countries. The findings also suggest that the new Pact would raise deficits only in some of the high debt countries, those characterized by a stronger deficit bias.

The goal of the thesis was not to take into account all possible factors, but to describe some relevant mechanisms of interaction among players which are typical of a monetary union. The conclusions cannot be considered as absolute statements, as they may not be valid in the context of a different modelization. There are several ways in which the thesis could be developed. First, the analytical framework is extremely simplified and could be enriched by adding systematic biases for the

national governments and the unions, in order to obtain results that are valid for the steady state and not only for the cyclical fluctuations. Such an extension would also bring the model closer to the empirical observation. In addition, the asymmetry in the preferences of the governments in responding to a positive or a negative shock could be explicitly modeled. Other relevant phenomena, such as international spillovers, the exchange rate of the common currency, differences in tastes between the countries, may affect the results in various ways. These are interesting topics for future research.

Overall, this thesis provides for some economic rationale for the existence of fiscal rules in a monetary union, and in the choice between different types of rules argues in favor of country specific rules defined in cyclically adjusted terms, such as those of the "reformed" stability and growth pact. The empirical study, however, suggests that the importance of such rules has been overemphasized in the political debate. This evidence is consistent with other empirical studies.

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