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# Fiscal Interdependence, Fiscal and Monetary Policy Interaction and The Optimal Design of EMU

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February 1999

Submitted in fulfilment for the degree of Doctor of Philosophy

## Declaration of Rights

# Abstract

The research looks at the design of fiscal and monetary policy in EMU. The characteristics of the "economic constitution" established in the Maastricht treaty are analysed to test their robustness to different hypothesis about fiscal sustainability and fiscal and monetary policy interaction.

Chapter two illustrates how the possibility of default of public debt in one large member country creates interdependence among fiscal positions of all member countries. Chapter three and four show that a similar kind of interdependence between national fiscal position could be determined by the effect that un-funded fiscal expansions have on the level of prices. The theoretical argument, borrowed from the so called Fiscal Theory of Price Determination, is developed both in a closed economy, to illustrate the basic mechanism and its interpretation, and in a two country monetary union model.

Chapter five analyses, in a game theoretical framework, how the interdependence between policy instruments should be recognised in full, in order for any policy to be effective. In a situation in which a possible conflict of objectives or preferences between policy makers is present, any institutional arrangements which does not deal with it positively is intrinsically inefficient and can result in the policies cancelling each other out.

The last chapter develops an example on how the conflict between policy institutions can be endogenous to an institutional structure chosen to reduce the influence of policy uncertainty on the economy. It is therefore a note of caution about the common belief that is possible with simple institutional solutions to overcome differences in preferences or objectives that are characteristic of the European environment.

The analysis suggests that both greater fiscal policies cooperation and decentralisation of policy institutions from national to regional are developments necessary to achieve the policy goals of the Monetary Union.

# Acknowledgements

This Ph.D thesis is the result of three years of research at the University of Strathclyde. I am indebted to many people who have contributed in different ways to this work and I would like to thank them all.

Special gratitude I owe to Andrew Hughes Hallett for guiding me in these three years. His constant encouragement, his example and his extraordinary support have been an important formative experience for which I feel privileged. I am also specially grateful to Maria Demertzis who has been an invaluable source of comments, advice and friendship. Many of the ideas in this thesis have been tested and developed for the first time at the blackboard in her office, and her tolerance and contribution have been equally invaluable.

I am grateful to Jim Love and all the staff of the Department of Economics for helping me and for providing me with a very friendly and stimulating environment. I gratefully acknowledge the support of the University of Pisa and the ESRC which provided financial support at different stages of my studies.

My gratitude goes also to many fellow Ph.D. student and colleagues for their friendship and kind help throughout. A particular thank goes to Dionysios Chionis and Laura Piscitelli who have shared this time with me from the beginning. I would like to mention also Amr, Ahmed, Ian, Felix, Norbert, Liz, Khaled, Andrew, Stuart and many other friends who have made these years a wonderful personal experience.

There are no words to thank enough my family for the confidence and the generous and unconditional support that I have always encountered. I particularly thank my Father for being my greatest source of inspiration and I owe him more than he knows.

Finally, a particular thanks goes to Rosaria, my compagna, for being there all these years, providing sustain, critics and affection in the good and in the bad times. This thesis is dedicated to you.

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# CHAPTER 1.

# GENERAL INTRODUCTION

## *1.1 - Motivation*

During the past decade, the European economic-political environment has been radically changed by the project of monetary unification launched in Maastricht in December 1991. Any government, any monetary institution, any public and private sector in any country of the European Community has felt the pressure to reshape policies, habits, institutions to achieve the common standard as defined in the Treaty. In particular, the need to fulfil the convergence criteria agreed in Maastricht has largely changed the priorities of economic policy. The nature of this change is evident looking at the level of convergence in inflation rates and fiscal deficit among the 15 European countries member of the European Union.

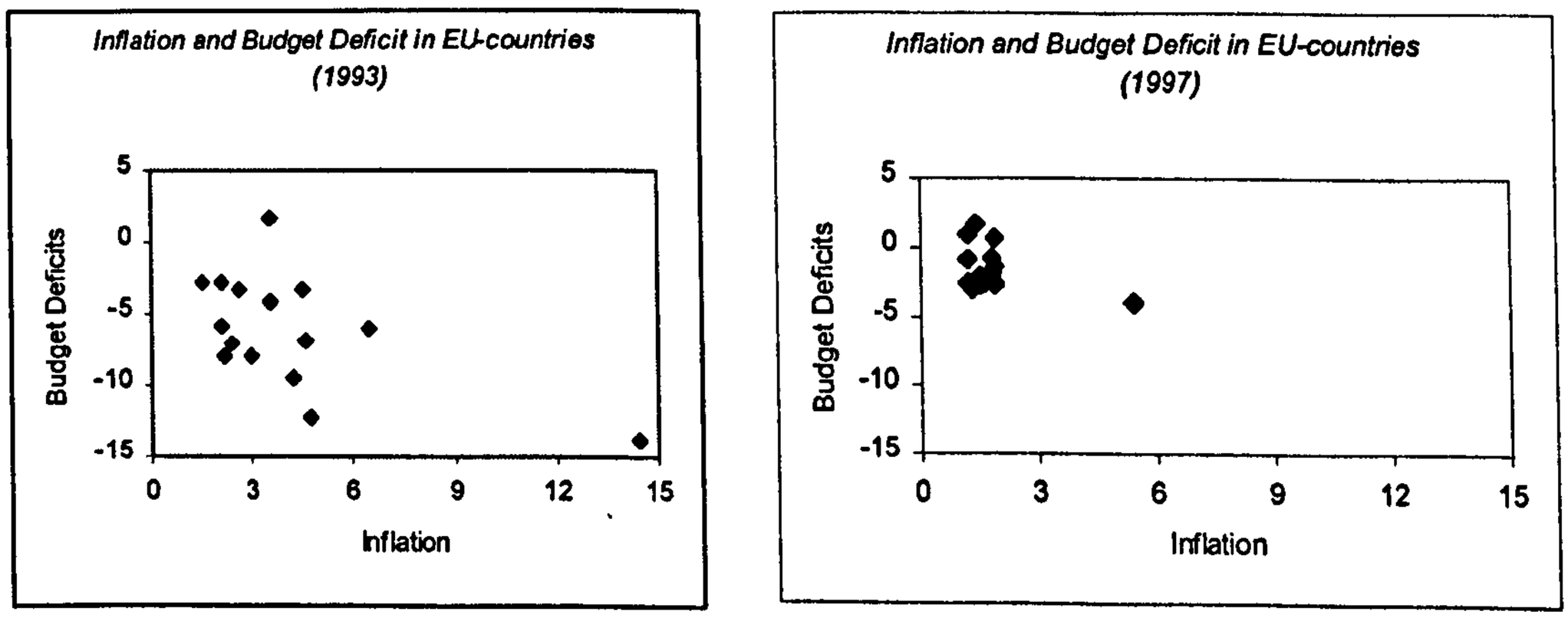


**Figure 1: Convergence in Inflation and Budget Deficits** - source: Eurostat

Figure 1 above is the simple dramatic evidence of this convergence in policies. The fact that this convergence in policies has happened against a background of weak economic

performances in all the EU area (partly determined by the policies themselves, see De Grauwe, 1998), that could have undermined the process of transition towards EMU, shows the importance which the majority of the European countries have accorded to this project.

But the Maastricht Treaty has not only the objective of designing a feasible transition strategy[1]. Its main objective is to build up an institutional setting for the new monetary union able to provide monetary and fiscal stability, advocated as the condition necessary (and sufficient) "to promote throughout a harmonious and balanced development of economic activities" (Maastricht Treaty Art. 2). In doing so it creates an unprecedented economic environment based upon the pillars of an independent European Central Bank with the constitutional duty of pursue price stability; and a series of disconnected national fiscal authorities which are constrained by a set of "behavioural" rules that simply extend the convergence criteria of the transition phase (the so called "Stability Pact").

Given its peculiar characteristics, the consequences of this institutional environment on the conduct of economic policy is at the centre of much economic research and this thesis is one contribution to this debate.

Two main themes are at the focus of the thesis. The first one regards the extent to which the Maastricht rules are able to insulate national fiscal policies, reducing their aggregate impact, and in doing so reducing the risk of instability coming from undisciplined fiscal behaviour. The second one regards the way in which fiscal and monetary policy interdependence affects the stability of the new institution. In particular we want to

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[1] - Although as transition strategy the Maastricht treaty has been successful in providing a system of penalties and incentives for the countries willing to join EMU (Winkler, 1995), many doubt the economic relevance of the Maastricht criteria. Buiter, Corsetti and Roubini (1989 and 1993) analyses the economic sense of the process of transition designed by the Delors commission and implemented in the Maastricht treaty, and they did not find much. Many have questioned the necessity of such a long and difficult process of adjustment and its proper design (Begg and al, 1991, Hughes Hallett and Mcadam , 1996, and von Hagen and Lutz, 1996, for analyses of the cost of fiscal adjustment and De Grauwe ,1998, for an ex post overview of the process of transition). Giovannini and Spaventa (1991) are almost the only one to argue strongly in favour of strict no-entry clause to discipline the future member countries. De Grauwe (1995) has also argued that the main objective of the Maastricht criteria was to minimise the number of participants to the Monetary Union: if this is true, than they were not so successful after all.

analyse where that interdependence could come from, what are the possible consequences of interdependence for the other instruments of economic policy, and whether the Maastricht institutions are able to cope with it.

The answers to these questions depend critically to the way in which fiscal policy is modelled. This poses a difficult choice of the "best possible" specification of reality, especially as the debate about the role of fiscal policy in macroeconomics is far from being settled. On the other hand the main objective of our analysis is to test the robustness of the present form EMU, and this test can only be done looking at extreme hypothesis. For this reason, the thesis will appear "schizophrenic" in its variety of themes. We look at the question of the sustainability of a No-Bail out Clause, and at the interdependence between fiscal policies with and without probability of default. We will also analyse interdependence between fiscal and monetary policy in the context of "unorthodox" fiscal policy modelling, and in the context of a traditional Dornbush model. At the same time we look at the causes of fiscal-monetary interdependence, and the conflicts which come from the macroeconomic structure and from the underlying political process. This multidimensional analysis shows some interesting interaction which are usually neglected in the analysis of each single aspect. Those interaction are important because they can easily change the interpretation and the outcomes derived from the use of conventional models.

Before illustrating the structure of the thesis, it is probably necessary to look at the basic characteristics of the Maastricht project, at least our interpretation of them, that will serve as point of reference for the following analysis.

## *1.2 - Economic Policies and Institutions in EMU*

The idea that the process of economic and political integration in Europe should be reinforced by monetary unification goes back almost thirty years. The importance that exchange rate stability was given among the policy objectives of the community has always been so high that monetary union could not be nothing but the natural extension

of these policies[2]. Moreover the project of monetary unification has always been part of a wider project of political integration among European countries.

This approach is evident in the Delors report in which the monetary unification in Europe is seen as the instrument to eliminate a barrier towards economic integration of different European economies. In particular it recognised that the European Union is and will be formed by a group of structurally different national entities: "Even after attaining economic and monetary union, the Community would continue to consist of individual nations with different economic, social cultural and political characteristics" (par. 17). This seemingly obvious statement introduces the recognition that such a differentiated union need to go further in the process of integration, introducing rules harmonising national policies, increasing the level of co-ordination, introducing "common policies" aimed at developing a more balanced economic and monetary union[3].

In this respect, the Delors Report is a much more complex document that usually argued, in which together with advocating fiscal and monetary stability, it recognises the complexity of the task ahead and the need to think new institutions to keep such a differentiated monetary union together. " The existence and *preservation* (italics added) of this plurality would require a degree of autonomy in economic decision-making to remain with individual member countries and a balance to be struck between national and

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[2] - We are not going to analyse in dept this process, started officially with the Werner report in 1970, that has been extensively reviewed and studied. In particular see the monograph by Kenen (1995), and Giavazzi and Giovannini (1989).on the importance of exchange rate stability for the European countries

[3] - The logic of the argument strictly relies on the acceptance that increasing economic and political integration is an achievable and worthwhile objective. Therefore, while the differences between countries should be recognised in the determination of the steps to follow towards integration, they cannot be the base to halt the process itself. On the other hand, much economic research has been devoted to the discussion if the integration among European countries is achievable and worthwhile, given the difference in economic structure (De Grauwe and Vanhaverbeke, 1993, Bayoumi and Eichengreen, 1994, Demertzis, Hughes Hallett and Rummell, 1998a, 1998b, Frenkel and Rose, 1998, Hughes Hallett, Piscitelli and Warmedinger , 1998). Most of this literature borrows the criteria for a successful currency area from the Optimal Currency Area literature (Mundell, 1961, McKinnon ,1968, Kenen 1969, and Ishiyama, 1975, and Tavlas, 1993, for surveys). Thus, Europe is an optimal currency area if the participating countries are subject to similar shocks and responses to shock; or if, giving the presence of asymmetric shocks, factor of production are mobile enough; or if wages are flexible enough to adjust asymmetries. No one of these criteria seems to be applicable to the European Union, although there seems to be a core of countries already integrated enough to represent an optimal currency area.

Community competencies. For this reason it would not be possible simply to follow the example of existing federal States; it would be necessary to develop an innovative and unique approach" (par. 17), and, about fiscal policies, "..the fact that the centrally managed Community budget .... will not be available for cyclical adjustment will mean that the task of setting a Community-wide fiscal policy stance will have to be performed through the co-ordination of national budgetary policies. Without such co-ordination it would be impossible for the community as a whole to establish a fiscal/monetary policy mix appropriate...*Monetary policy alone cannot be expected to perform these functions*" (it. ad., par. 30).

The report recognises the need of a "second layer" of institutions providing the necessary balancing act in this Union of Diverse. But the document does not go beyond the simple indication of the problems. A typical example is the policy indications about budgetary rules presented at the end of par. 30. After having indicated the necessity of upper limits to deficit of individual member countries and the need of a no-bail out clause, the paragraph end with: "Moreover the arrangements in the budgetary field should enable the Community to conduct a coherent mix of fiscal and monetary policies"

The following implementation of the project of Monetary Unification partly reflects this vagueness of the Delors Report. In fact the implementation of the EMU has followed a narrow interpretation of the scope of Monetary Union, in which the excessively vague recommendations of the Delors report have been overlooked to concentrate the attention on the set of rules that would minimise the influence of national authorities on the functioning of the single market[4]. In the words of the Deutsche Bundesbank " the introduction of a single currency eliminates exchange risk between participating states, enhances planning security (especially for corporations) and lowers transaction costs. The expected increase in competition is likely to improve the deployment of the factors of production and heighten the efficiency of the financial markets, with the result that, over

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[4] - Kenen (1995) describes in some details the passage from the Delors Report to the Maastricht Treaty. It is generally argued that "the actual design of the EMU would have to satisfy German

the longer term, the scope for growth, the potential for innovation and the employment opportunities in European economies can be exploited to a greater extent" (Deutsche Budesbank, 1998, p.2). Any other objective indicated in the Delors' Report, like promoting growth, employment, economic cohesion, or regional convergence, is relegated of being a long run effect of a free economic area of price stability at best. Thus the transition process should be designed to select those members that prove to be "prepared for coping with the specific circumstances of monetary union and therefore would not be a burden to a lasting community of stability" (Deutsche Budesbank, 1998, p.6)[5].

As argued by Duisenberg (1997, p.1) "a Monetary Union with ill-converged Member States would be incapable of absorbing economic shocks. Ultimately the tension attending a malfunctioning EMU would jeopardise the achievement of the Single Market. ...potential derogation countries should not even *wish* to take part in an EMU which allows insufficiently converged Member States to join in".

But the meaning of convergence as implemented in the Maastricht Treaty has nothing to do with the convergence in structure advocated by the Optimal Currency Area literature (Mundell 1961). The Maastricht Treaty provides a definition of converged economies only in term of the economic policies followed by each government. Thus, only those government that have demonstrated their "stability" credentials through a certain period of stable and converging prices and interest rates and through restraint in the use of fiscal policy, can be part of EMU.

Therefore, the fact that all the countries willing to participate in EMU (except Greece) have accomplished the objectives laid down in the Treaty "confirms the advent of a genuine culture of stability in Europe that is essential to the establishment of a stable,

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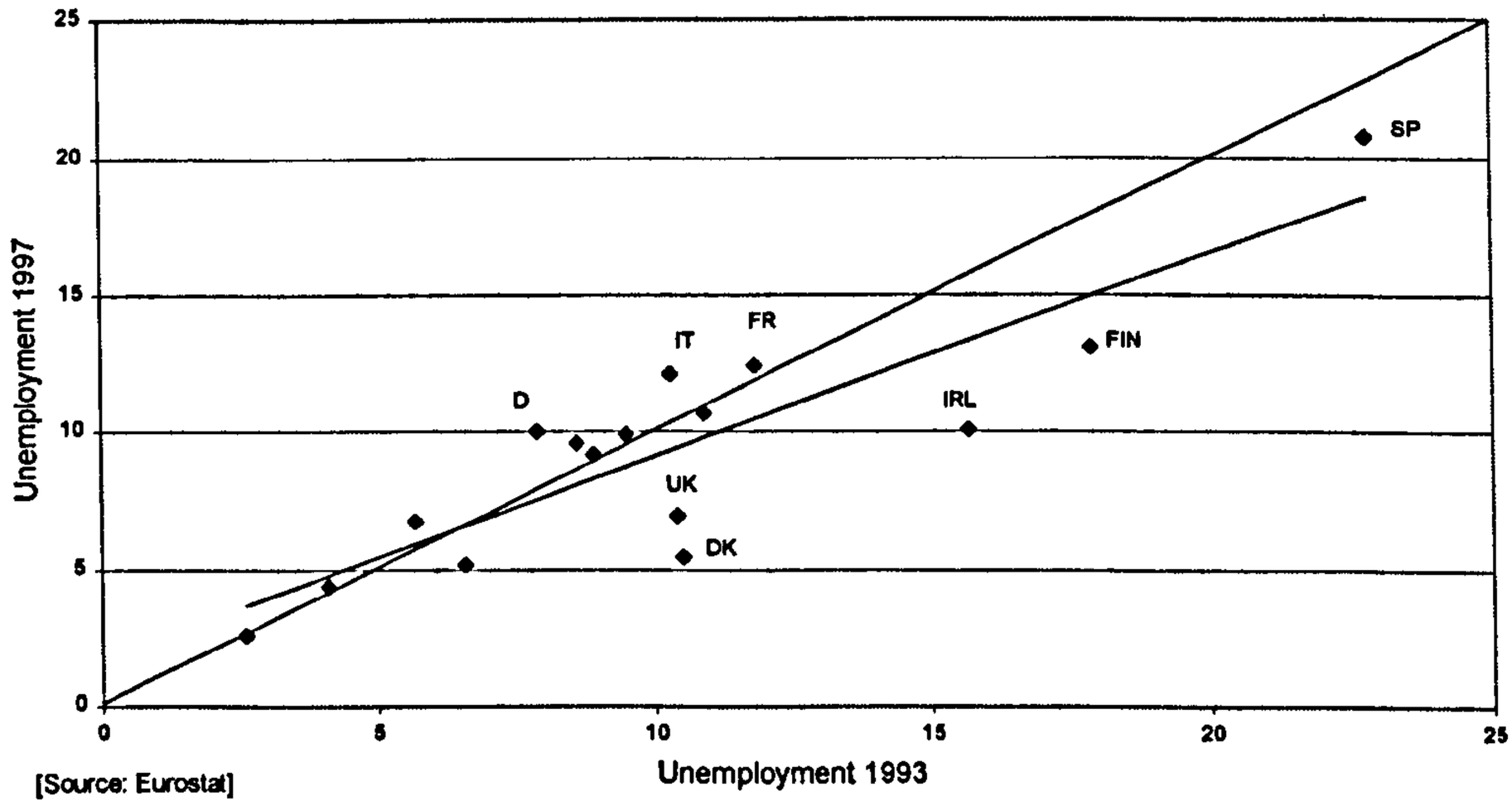
concerns. The ECB would have to resemble the Bundesbank; it would have to be protected from political interference and dedicated to pursuing price stability"(Kenen, cit. , p.19).

[5] - As noted above, De Grauwe (1993) argues that the Maastricht criteria had the objective to limit the number of participants to the EMU. While this was probably true (although for a different interpretation see Jaquet, 1993), the point we are making here is that irrespective of the numbers, the objective of the Maastricht rules is to have an Union among Equal, or already converged, countries.

sound and efficiently managed economic framework", and that " Convergence is now an established fact in Europe"(European Commission, 1998, p.10).

However, this is a superficial view. The convergence achieved in the transition process, as illustrated by figure 1, has not produced any substantial convergence in many other important economic indicators. If we consider for example, the level of unemployment in the European countries in the same interval 1993 - 1997, not only very few countries have experienced an absolute improvement, given also the policies followed in the period, but more importantly there has not been any convergence toward an average level of unemployment (figure 2)

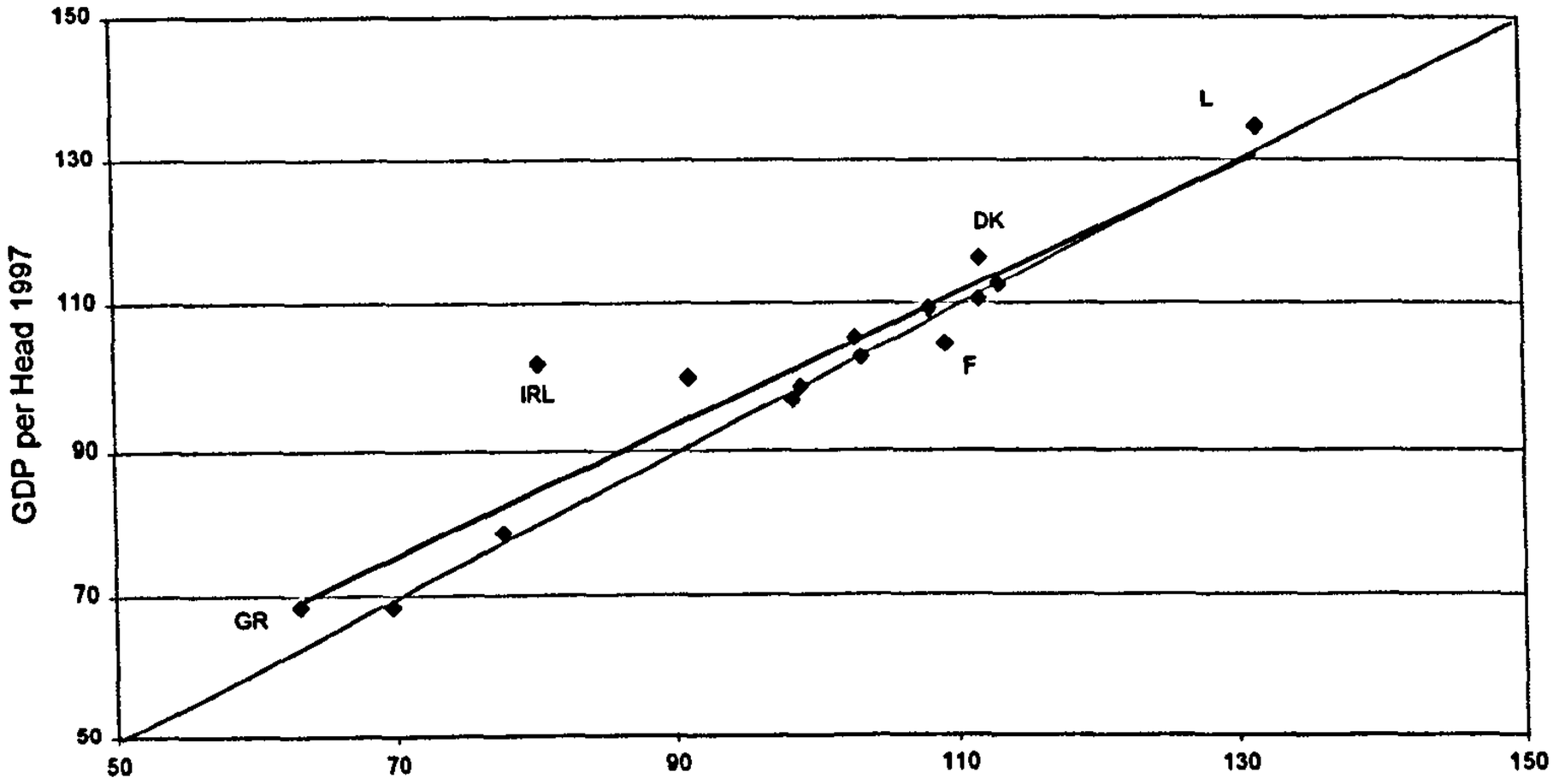
***Figure 2 : Unemployment in Europe 1993-1997***




[Source: Eurostat]

The same and more can be said looking to the level of GDP per head in the same interval (figure 3), in which four years have not produced any convergence at all if it was not for the substantial and spectacular level of growth achieve by Ireland, that went from having around 80% of the European average GDP per head to having a level higher that the European average.

*Figure 3: GDP per Head 1993 - 1997*




[Source: Eurostat]

This simple evidence shows that the starting of the EMU will pose different problems to different countries, and therefore different national governments will have to follow different priorities, and different economic policies, according with the different economic conditions. Moreover this idea of divergence (or differentiation) is reinforced once we look at great structural differences that is possible to find in the weight of the public sector in different national economies, either in term of level of total public expenditure or in term of level and composition of total government receipts (Figure 4). The convergence towards EMU has not yet produced any significant change in the structure and in the role of the public sector in the national economies, if not the one already implemented before the "convergence" took place[6].

[6] - The difference in economic structure between European Economies has been largely studied in relation to the so called Optimal Currency Area literature. The point that the convergence among European economies noted in some empirical literature was more the product of similar economic policies and than of converging structural changes has been noted by Demertzis and Hughes Hallett and Rummel (1996). On this point see also Hughes Hallett, Piscitelli and Warmedinger (1998).

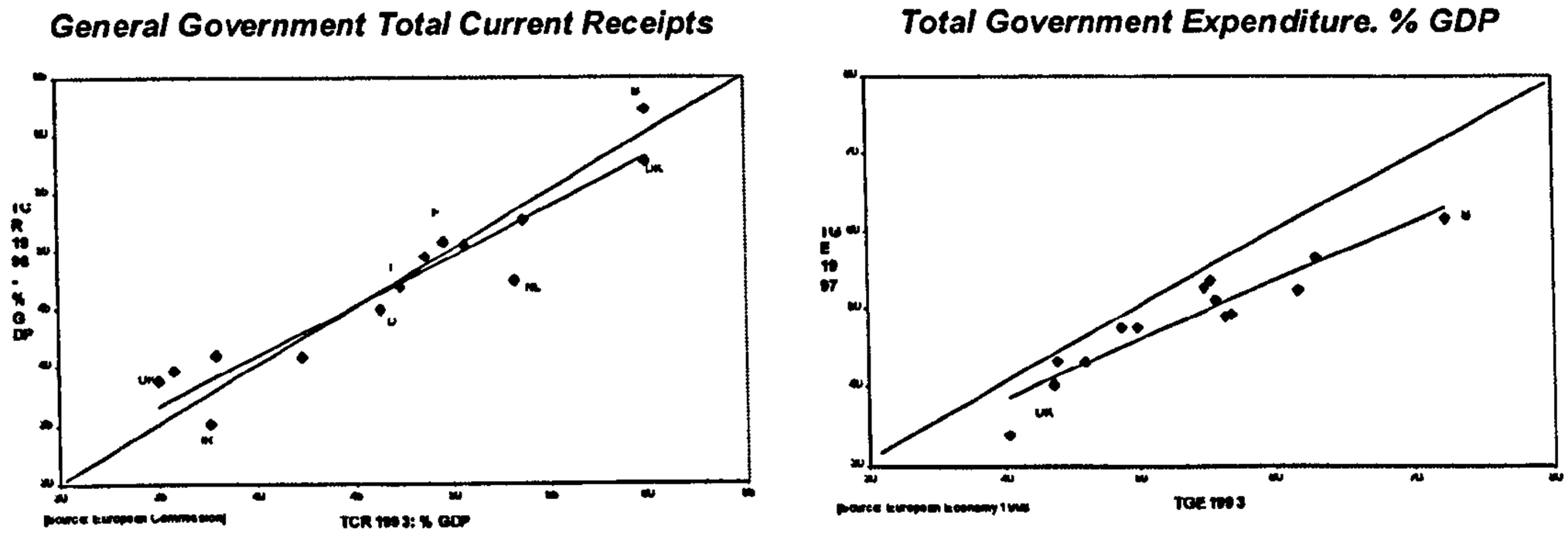



**Figure 4: Convergence in Public Expenditure and Revenues**

Given the heterogeneity remaining, the question arises of whether the set of instruments established in the Maastricht treaty are strong enough to guarantee the monetary coexistence of such differentiated economies. As noted before, EMU is based on two building blocks: on one hand the common monetary policy is delegated to an independent European Central Bank with the constitutional objective of maintaining price stability, and on the other hand fiscal policy remains at the national level but its use is permanently constrained by the rules set out in the Stability and Growth pact agreed at the Dublin Summit (1997), which essentially prescribes the adoption of a balance budget rule for each member countries (Duisemberg, 1997)[7].

But by itself this institutional structure does not necessarily produce the convergence in economic structure required for the long term stability on the EMU. For example, while the possibility for this institutional structure to work (in the sense of reducing the effect of economic fluctuation either on prices or on output) lies critically on the degree of flexibility that each country will be able to introduce in their labour market (Commission of the European Communities, 1990), nothing can guarantee neither that this process will take place speedily nor that it will happen at all, if not supported by the political will of the

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[7] - De Grauwe (1998) shows how the Stability Pact de-facto has transformed the limit for debt accumulation from 60% to zero, therefore "countries will not be able to relax fiscal policies when they come in the neighbourhood of the 60% debt norm. They will have to continue their budgetary effort. The light in the tunnel will be a receding one"(p. 19). Given this scenario there is also the possibility that the Stability Pact would be loosely interpreted, a prospective that is starting to materialise.

member countries to sustain such a regime. It is somehow ironic that institutions built up to reduce the discretionary of economic policy, will depend their success on the discretionary political will of the member countries to sustain such a system.

## *1.3 - Economic Thought and EMU*

Although the project of EMU and its implementation is essentially a political project and has been driven by political motives and compromises, current economic thinking has played an important part in shaping EMU. As in the famous passage of Keynes General Theory (Keynes 1936, p.) about the relation between economic theory and policy, the monetary union process has been justified or based upon basic economic theory. In this respect we cannot overlook the fact that the basic approach of the Maastricht Treaty and the Stability Pact is consistent with some of the most widely known contributions to economic theory and to the theory of economic policy.

Firstly and foremost, the idea that the functioning and the freedom of the markets should be safeguarded via "constitutional" constraints on the behaviour of the economic policy authorities, is central to the EMU construction. This is an idea that has been at the centre of the academic debate from the seminal Kydland and Prescott (1977) contribution on the inefficiency of discretionary economic policies in a world of forward looking agents[8]. Without reviewing a debate that is widely known and part of which will be analysed in the following chapters, it is important to note how far the Maastricht treaty has gone to minimise any source of political influence on the conduct of economic policy.

Central Bank Independence as a precondition for monetary stability, a familiar statement at least from Rogoff's (1985) contribution, is enhanced in EMU because of the absence of any other institution at the same level, making the European Central Bank much more independent than the Bundesbank itself (at least on paper).

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[8] - For a complete review of this debate from a theoretical and empirical point of view, see Eijffinger and de Haan (1995) and Persson and Tabellini (1990).

The use of fiscal policy is also highly constrained, reflecting of an academic debate that sees any active use of fiscal policy as potentially producing financial instability without corresponding beneficial effects on the economy (Barro, 1974, Sargent and Wallace 1981). Therefore if fiscal policy is damaging or at best useless, any active use of fiscal policy can only be a reflection of political myopia or of self-interested governments which would be harmful for neighbouring countries.

On the contrary, contractionary fiscal policies could have beneficial effects if well planned, because once again they reduce the uncertainty about future financial, investment and inflation conditions introduced by excessively expansionary fiscal policies in the past (Giavazzi and Pagano, 1990) . In this respect the main issue of economic policy becomes how to reduce the political (exogenous) uncertainty. Moreover, even if fiscal policy were useful for any necessary short term adjustment in response to regional differences or asymmetric shocks, the same result could be achieved more effectively through increasing the flexibility of the labour and capital markets. Economic policy therefore should become microeconomic policy, to increase flexibility and efficiency of the market.[9]

This is the economic policy agenda of the Maastricht Treaty and arguably is the economic policy agenda that many economists would follow.

Because of the strict connection between these theoretical contributions and the project of monetary union, no analysis of EMU can avoid examining their consequences for the EMU project. In particular it is important to examine if the Maastricht institutions are robust to different hypothesis about the underlying economic structure. Because it is a structure with very few adjustment mechanisms, we have to ask what will happen if economies are not totally flexible, or if the different countries have very different political objectives, or if the effect of fiscal policy on the economy is more direct than usually assumed. And to the extent the outcomes may not represent an unqualified improvement,

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[9] - The influence of a particular economic theory is often only the result of the utility of the theory to justify or present better a policy choice. The fact that the Giavazzi and Pagano contribution on expansionary fiscal contractions pops up now and then in official debate and document (Ministro del Tesoro 1998) is probably more due to the necessity to justify a given policy choice rising the possibility a relatively free lunch than the real conviction that this free lunch really exists.

we have to ask in which direction the common institutions should evolve in order to increase robustness without loosing efficiency. These are the questions which motivate this thesis.

## *1.4 - Outline of the Thesis*

Given the foregoing background, this thesis has been developed around the idea of testing the robustness of the Maastricht institutions to different hypothesis about the underlying economic structures. The thesis is composed of five essays.

### Optimal Response to Fiscal Imbalances in a Monetary Union

In chapter two a two-country model will be presented in order to analyse the effects of fiscal imbalances in a highly integrated economy such as the Monetary Union. Although very simple in its basic structure, the model captures ways by which fiscal uncertainty in one member state affects the behaviour of their fiscal partner. Because it shows that bailing out is always the optimum response to a fiscal crisis, any ex-ante contrary commitment is by definition not credible. That implies that sustainability of the fiscal position of any one country will be evaluated by the private sector on the basis of the overall fiscal position of the members of the Monetary Union as a whole (i.e., the ability of the other partners to bail out). This creates a clear strategic problem because of the possibility of one member free riding on the fiscal discipline of other partners. This scenario seems to be the main motivation for the tightness of the Maastricht fiscal criteria. On the other hand it also indicates that one way to reduce this risk is to lower the external cost of default. This can be achieved by reducing the relative size of the fiscal authority (from national to regional, for example). In this case, even though the cost of a bail out is reduced, the credibility threshold is lowered as well and a political commitment against fiscal bail out is more credible. Finally the possibility of monetary bail out is analysed and compared with the previous two scenarios: monetary bail out constitutes the most

expensive way to resolving fiscal imbalances of a member country because of its universal nature.

## The Intertemporal Approach to Fiscal and Monetary Policy Interdependence

The third chapter is dedicated to the analysis of the interaction between monetary and fiscal policy in the light of new theoretical contribution that gives a much greater role to fiscal policy in the determination of the level of prices ( Sims,1994, Woodford, 1995). At least from the contribution of Sargent and Wallace (1981) the interrelation between monetary and fiscal policy has been analysed in term of a seignorage game, in which the fiscal authority would try to exploit its institutional position to obtain higher seignorage revenues at the expenses of monetary stability. The solution of this strategic problem is the theoretical motivation of the institutional design decided in Maastricht. But if fiscal policies have a much more direct effect on price levels, as argued by recent theoretical contributions critically reviewed in the chapter, than the Maastricht rules could be not only insufficient, they might not even be desirable.

## Fiscal and Monetary Policy Interdependence in EMU Reconsidered

In the fourth chapter the previous analysis of fiscal and monetary policy interdependence will be extended to the particular economic environment represented by EMU. A two country monetary union model is developed in which fiscal policies have an expansionary effect in line with the theory developed Woodford and Sims. The effect of applying the "Fiscal Theory of Price Determination" to EMU is to extend the applicability of the main results of chapter two. In such an environment, the intertemporal budget constraint of the governments member of the union are always interdependent and therefore there is always the possibility of a strategic use of fiscal policy to create a wealth transfer between countries. The difference now is that this transfer is obtained trough the wealth effects of price level changes produced by fiscal indiscipline. This creates a potential three way conflict among fiscal authorities and the common central bank, which cannot, without

incurring in considerable costs, control the price level without the support of the fiscal authorities. Once again the driving force of these effects is private sector expectations about the future behaviour of the governments. And although Maastricht like fiscal rules provide in principle the solution for this conflict, a more structural solution is once again the regionalisation of the fiscal activities.

## ACCOUNTABILITY AND INDEPENDENCE OF THE EUROPEAN CENTRAL BANK: DOES FISCAL POLICY MATTER?

The next part is dedicated to the analysis of the policy game between independent fiscal and monetary authorities in a monetary union in which each actor seeks to achieve divergent stabilisation objectives. Most of the literature on the independence of the Central Bank assumes only one policy instrument is available: monetary policy. If we introduce fiscal policy as well, when preferences may differ among policy-makers, the situation can be radically different. Fiscal policy could have the power to weaken substantially the impact of Central Bank actions. One of the possible solutions to constraint the use of the fiscal policy, in a way envisaged in the Stability Pact, but this greatly weakens the ability of the monetary policy to deal with exogenous shocks. In this chapter we analyse whether there is any incentive to retain monetary independence; or whether accountability can and should be used to ensure fiscal and monetary policies support each other, rather than destroy each other.

## A NOTE ON CENTRAL BANK INDEPENDENCE, POLITICAL UNCERTAINTY AND THE CORRECT ASSIGNMENT OF INSTRUMENTS TO TARGETS

This chapter is dedicated to the analysis of the effect of introducing fiscal policy in the traditional models of monetary policy delegation. In particular we show that the results of Alesina and Summers (1995), about the absence of correlation between central bank independence and output variability, are not incompatible with the analysis of Rogoff (1985), once fiscal policy is introduced in the picture. In fact, increasing central bank independence, not only produces a more extensive use of fiscal policy by any fiscal authority, but also it induces the median voter to prefer a fiscal authority more willing to

use the instruments at its disposal. Therefore, contrary to the analysis of Alesina and Gatti (1995), Central Bank Independence changes, but do not cancel, the nature of the political choice faced by the public. The analysis reinforces the conclusion of the previous chapter about the possible conflict between fiscal and monetary policy, and shows another possible source of this conflict.

# CHAPTER 2.

# THE RISKS OF INTERDEPENDENCE: IS THE NO BAIL OUT CLAUSE THE OPTIMAL RESPONSE TO FISCAL IMBALANCES IN A MONETARY UNION?

## *2.1 – Introduction*

The academic and political debate on the fiscal side of Monetary Union has been dominated for a long period by the possibility that the creation of the EMU would produce an «over-expansionary bias» in the use of fiscal instrument by the National Authorities. At the academic level the argument is largely based on two main considerations:

- In a monetary union there will be a greater necessity to use fiscal instruments for stabilisation purposes, given the lack of monetary instruments at the national level, especially if the new monetary union is subjected to large asymmetric shocks (Hughes Hallett and Vines, 1993).
- In a monetary union, with a common nominal and real interest rate, the cost of using the fiscal instrument, from a national point of view, will be lower (Currie, 1992, von Hagen, 1993).

The preoccupation that fiscal indiscipline of one member state could jeopardise the common institutions is the main justification of the tight fiscal requirement advocated by the Delors report and incorporated in the Maastricht Treaty. Academic literature has been largely influenced by this preoccupation and many papers have been devoted to finding

the root of this possible over-expansionary bias. (Levine and Brociner, 1994, Beetsma and Bovenberg, 1997, Van Aarle, Bovenberg and Raith, 1997). Although all these studies conclude that in particular circumstances disciplinary devices can be useful to ensure overall stability, the evidence is not overwhelmingly in favour of tight fiscal limits. On the contrary, welfare evaluations actually tend to point out that tight fiscal limits could be as dangerous as no limits at all, especially in absence of federal fiscal institutions (Sala i Martin and Sachs, 1992, Bayoumi and Eichengreen 1995).

The main problem with this first wave of theoretical and empirical analysis was its lack of a clear definition of what an over-expansionary bias would actually mean.[1]. Two distinct meanings of excessive use of fiscal policy can be isolated throughout the literature. The majority of the research is concentrated on the possibility that EMU would produce an use of the fiscal instrument excessive with respect to a certain defined target of economic policy. On this view, a "Over-expansionary Bias" is simply the result of a non-cooperative game in which independent fiscal authorities do not internalise the international negative spillovers of national fiscal policies, producing a result that is not optimal in terms of national or European welfare. In this field, most of the contributions extend to the European Monetary Union the theoretical tools developed in the international co-operation and credibility literature[2].

On the contrary, the preoccupation of those who drafted the Maastricht treaty was the possibility that EMU would produce an environment in which the fiscal policy was used more than possible, threatening the stability of Union as a whole. In theoretical terms it means that Governments could find inside the union an incentive to violate the inter-

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[1] - In fact, at least at the beginning of the debate, some emphasis was placed on the opposite argument, directly derived from the international co-operation debate: the increasing integration among the European Countries increases the positive spillover effects of the national fiscal policies. Then, without fiscal co-ordination, a monetary union could produced an «overcontractionary bias» (see for example van der Ploeg, 1991).

[2] - Canzoneri and Henderson (1991) provide a extended analysis of this literature, started with the contributions of Hamada (1974, 1976). See also some of the papers in Buiter and Marston (1985) and part III of Currie and Levine (1993).

temporal budget constraint, conducting a Ponzi game at the expense of their partners. As argued by Giovannini and Spaventa (1990) "..the relevant fiscal problems for EMU are not those of aggregate demand externalities, but those arising from the existence of structural fiscal imbalances in some countries".

Therefore in the Maastricht Treaty the only provisions regarding fiscal policy are designed to impose limits to its use and, in article 104b of the treaty, to forbid any bail out operation among members countries and between Central Bank and fiscal authorities. But it is evident that Art. 104b defines a commitment that is credible only if it reduces the probability of default.

In this respect, very few have tried to analyse the effect of Monetary Union on the probability of default of a national government (Wyplosz, 1991, Valli, 1998). It is often assumed that if Monetary Union increases the willingness to use the fiscal instrument than, given the level of growth and the level of real interest rate, it also increases the risk of fiscal default, especially if the Central Bank is committed to the No Bail-out rule.

Traditionally the need for institutional provisions to provide fiscal discipline has been contrasted with the ability of the Market to provide stability by itself (Buiter, Corsetti and Rubini, 1993). Confronted with an indisciplined Government, such *market-based fiscal discipline* would initially take the form of a rising risk premium on the debt of the country running excessive deficits; if these deficits persisted, the default premium would increase at an increasing rate until the offending country will be denied additional credit. The increase of cost of borrowing, along with the possibility of credit rationing, would then provide the incentive to correct irresponsible fiscal behaviour, Studying the American experience, Bayoumi, Goldstein and Woglon (1996) argue that there is significant evidence that this non-linear relationship between risk premia and level of deficit is in play in restraining irresponsible borrowing by national authorities. However, as pointed out by

Goldstein and Woglom (1992), a market-based fiscal discipline can work only if certain conditions are satisfied, namely:

- Capital must be able to move freely,
- Full information on sovereign borrower must be available,
- The market must be convinced both that there are no implicit or explicit outside guarantees on sovereign debt and that the borrower's debt will not be monetized and
- The financial system must be strong enough to withstand the failure of the 'large' borrower.

These conditions are only partially satisfied within EMU. The capital mobility is already virtually free and the information problem can be theoretically solved increasing the mutual control between member countries and financial institutions. On the other hand the conditions (iii) and (iv) are difficult to meet in EMU in the foreseeable future.

Estimates of default risks presented in the literature (Giovannini and Piga, 1994, Favero, Giavazzi and Pagano, 1996) do not give a clear picture of the ability of the market to assess default risk. For example Favero and his co-authors estimate a risk premium on Italian debt of around 2% respect to different "riskless" assets in 1995. The problem arises not only in the estimation itself, as noted by the authors, but also by the interpretation of this estimation: in fact it could correspond either to a probability of total default of around 1.5%, or an higher probability of smaller dimension default[3], or a combination of objective

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[3] - Partial default can be defined as any unilateral action of the government that change the condition of the contract implicitly subscribed by public debt holders, like for example change in maturity. Therefore, accordingly to the arbitrage condition

$$R = \frac{R^*}{1 - p\theta^e}$$

where $R$ is the national gross interest rate on public bonds, $R^*$ is the riskless rate of return, p is the probability of default and $\theta^e$ is the expected amount of default, as defined above. Rearranging

$$p = \left(1 - \frac{R^*}{R}\right)\frac{1}{\theta^e}$$

assessment of risk, preferences and overall uncertainty (Wyplotz 1991, Hughes Hallett and McAdam).

While the ability of the market to value correctly public debt risk is traditionally difficult to assess, it is definitely true that increasing market integration will increase the external effects of fiscal crisis . But it will also increase the benefit of bailing out the debt, irrespective of the ability of the market to form correct expectations. If this is foreseen by the market, it would mean a looser government budget constraint and a risk premium imposed on the whole European debt and not on each single national debt.

Although the Maastricht Treaty states that neither Community nor Member States shall be liable for commitments of national or local authorities or public undertakings, by eliminating currency risk, a monetary union encourages EMU residents to invest in debt instruments issued by governments of other member countries. The increased exposure of their residents would increase the pressure on EMU governments to bail out a member in financial distress. More generally, the increased political and economic integration associated with a move toward EMU would strengthen the financial interdependence among member countries.

But if it is not possible to exclude, credibly, the possibility of bail-out of the countries in solvency crises, then the fiscal policy can automatically produce an (ex-ante) transfer of consumer wealth from the lower to the higher debt countries. In a world of forward looking agents the possibility of bail out will be immediately discounted by the private sector at the European level. An excessive fiscal impulse, a confidence crisis or a worsening of the credit position of one government will then spill over into the expected fiscal position of the other member countries. As such, the government debt of countries in such a position

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therefore an estimated default risk of 2% could mean a small probability of total default or a large probability of very small default. For example, in the specific case of Italy it could represent a very high probability of partial consolidation of the short term debt, or other forms of compulsory change in the conditions of the Debt.

affects the future tax liabilities of consumers in other member countries, and the process leads to a net transfer of wealth and consumption[4].

The objective of this chapter is to analyse how increasing fiscal uncertainty changes the characteristics of the interdependence between countries forming a monetary union. We will use a well known macroeconomic model, as the Weil (1989) overlapping generation model, which will allow us to discuss some macroeconomic effects of increasing economic integration and fiscal uncertainty. The choice made here differs from previous studies on the issue of debt default (Calvo 1988, Alesina, Prati and Tabellini 1990). Our specification permits a closer evaluation of the nature of the economic spill-over of expansionary fiscal policies and the roots of a possible «Over-Expansionary Bias» in the EMU, though it sacrifices a careful study of strategic interaction among agents.

## *2.2 – The Model*

In order to analyse the issue we consider a monetary union composed of two symmetric countries called Italy and Germany. In this monetary union two fiscal authorities (the German and Italian Government) provide services and levy income taxes over two different national groups. The supply side of the economy is represented by an exogenous stream of income.

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[4] - As previously noted, traditionally the tendency toward excessive deficits is analysed via the effect that a common interest rate has on the government budget of the member countries. In EMU, an increasing deficit of one member state would rise interest rate union-wide and attract savings from all parts of the union to finance it. As interest rate increases, borrowing costs for every government in the Union will increase, raising their cost of refinancing outstanding debt and discouraging debt financing expenditure. That is, the rising deficit in one country crowds out private investment and consumption and public expenditure in other member countries. However, for citizens of an EMU member country, the purchase of another member newly issued government debt increases net private wealth. The fact that the public deficits in the borrowing country crowd-out domestic investment is irrelevant since, at the margin, the expected future revenue stream from the investment project that would have been taken otherwise, must be equal to the expected future revenue stream from the borrowing country's bonds.

## 2.2.1 - The Private Sector

The private sector in the two countries is modelled following the Overlapping Generation framework developed by Weil (1987, 1989), and based on the perpetual youth model of Blanchard (1984) and Yaari (1967)[5]. Contrary to the Blanchard model, in which the individual was facing a constant probability of death, in the Weil model it is assumed that the single individual is infinitely lived, but the population is growing at a rate n.

Taking the interest rate as exogenous[6], the individual of generation *v* at time t maximises the following logarithmic utility function,

$$U_t^v = E_t\left\{\sum_{s=t}^{\infty}\beta^{s-t}\log c_s^v\right\} \tag{1}$$

subject to the budget constraint at time t,

$$E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}c_s^v\right\} = (1+r)b_t^v + E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s)y_s^v\right]\right\} \tag{2}$$

where $b_t^v$ is the beginning of the period stock of assets of vintage *v*, and $\tau_s$ is the income tax rate imposed by the Government. Maximisation of equation (1) subject to (2) gives the individual consumption function for Italy,

$$c_s^v = (1-\beta)\left\{(1+r)b_t^v + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s)y_s^v\right]\right\} \tag{3}$$[7]

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[5] - The list of application and extension of this class of models is almost endless. Applications to open economics can be found in Frankel and Razin (1992), Giovannini (1988) Buiter (1990).See also Obstfield and Rogoff (1997) ,chapters 3 and 4.

[6] - Taking the interest rate as an exogenous quantity is generally justified with the "small country" argument. I will not even try to use such an excuse for an assumption that substantially simplifies the analysis. On the other hand, because the dynamic and steady state properties of this class of models are well known, it is easy to control for the effect on the results of introducing endogenous interest rate determination and then to verify the generality of the results themselves.

The model at the individual level is a straightforward infinitely lived agent model. On the other hand at the aggregate level the population in the two countries ($N_t$ and $N_t^*$) grows at a rate *n* assumed to be strictly lower than the real interest rate, i.e. *n<r*, in order to avoid any dynamic inefficiency[8]. Therefore $N_t = (1+n)N_{t-1}$ and at time t=0 the population $N_0$ is normalised to one in both countries. This assumption together with the assumption that a new born generation has no assets $\left(b_v^v = 0\right)$, allows us an easy derivation of the aggregate variables[9].

$$C_t = (1-\beta)\left\{(1+r)B_t + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s)Y_s\right]\right\} \tag{4}$$

Similarly, the equation governing private assets accumulation

$$b_{t+1}^v = (1+r)b_t^v + y_t^v - \tau_t y_t^v - c_t^v \tag{5}$$

can be aggregated into an equation of aggregate private assets accumulation, using the assumption the new born generation have not inherited any financial asset, giving

$$B_{t+1} = (1+r)B_t + Y_t - \tau_t Y_t - C_t \tag{6}$$

and, after substituting (4) in (6),

$$B_{t+1} = \beta(1+r)B_t + (1-\tau_t)Y_t - (1-\beta)\left[E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s)Y_s\right]\right] \tag{7}$$

The same relations govern the behaviour of the German private sector where each individual maximises a function like (1) subject to a budget constraint like (2). The results is an aggregate consumption relation equal to:

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[7] - This result comes from the substitution of the Euler equation for adjacent periods, $c_{t+1}^v = \beta(1+r)c_t^v$ in the budget constraint, and using the property of an infinite sum of an integer strictly lower than one.

[8] - Dynamic efficiency is particularly important in our analysis because without it there would not be a debt problem in the first place (see the following Government Budget Constraints 9 and 9') . See Blanchard and Fisher (1988) for a discussion.

$$C_t^g = (1-\beta)\left\{(1+r)B_t^g + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_s^g)Y_s^g\right]\right\} \qquad (4')$$

and an assets stock which accumulates according to:

$$B_{t+1}^g = \beta(1+r)B_t^g + (1-\tau_t^g)Y_t^g - (1-\beta)\left[E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(1-\tau_t^g)Y_s^g\right]\right] \qquad (7')$$

In order to capture financial integration in stylised fashion, we assume that at time (t) a portfolio of public debt issued by the two Governments represents the total financial assets of the private sector in the two countries. Suppose only a fraction $\alpha$ ($0<\alpha<1$) of Italian public debt is held by the Italian public, $1-\alpha$ being the part of Italian debt held by the German public. Similarly German debt is distributed between the two private sectors, with $\phi$ being the proportion held domestically, giving the following definition of non-human capital in period (t) in the two countries as:

$$B_t = \alpha D_t + (1-\phi)D_t^g \qquad (8)$$

$$B_t^g = (1-\alpha)D_t + \phi D_t^g \qquad (8')$$

Although they will play an important part in the following analysis, condition (8) and (8') are only a crude simplification of a much more complex process of financial integration. Nevertheless there is growing evidence that cross border holding of public debt is becoming an important source of interdependence between economies (IMF World Economic Outlook , 1995).

Moreover the main determinant of cross border capital flows, and with it the cross border transactions of public debt, is the level of financial market integration, constrained until now by institutional differences, imperfect information and exchange rate risk. Therefore the process of monetary unification in Europe, built up in order to reduce these

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[9] - The aggregate variables are defined as: $X_t = x_t^o + nx_t^1 + n(1+n)x_t^2 + \ldots + n(1+n)^{t-1}x_t^t$

impediments to full market integration, will accelerate the process described by equation (8) and (8').

### 2.2.2 - The Governments

In each country the Government at time t has inherited a stock of debt from the previous period and, given the expectation of future income, it should determine the tax rate that satisfies the inter-temporal budget constraint. Because the population is growing, the relevant budget constraint is defined as (see Appendix 1 for the derivation):

$$(1+r)D_t = E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(\tau_s Y_s) - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s)\right\} \qquad (9)$$

and for the German counterpart

$$(1+r)D_t^g = E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(\tau_s^g Y_s^g) - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s^g)\right\} \qquad (9')$$

The problem faced by the governments is to decide the tax-rate that satisfy the budget constraints (9) and (9') ex-ante, given the level of exogenous expenditure G and given the exogenous expected level of income.

A tax smoothing argument will therefore justify fixing the tax rate with respect to the *permanent* expected level of income Y and the *permanent* level of expenditure G (Barro, 1981, Lucas and Stockey 1985). For a constant interest rate *r* and a constant population growth rate, a permanent level of *Y* on a date t is defined by

$$\sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(\tilde{Y}_t) = \sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(Y_s) \qquad (10)$$

or, otherwise,

$$\frac{1+r}{r-n}\tilde{Y}_t = \sum_{s=t}^{\infty}\left(\frac{1+n}{1+r}\right)^{s-t}(Y_s) \qquad (11)$$

Similarly the permanent level of expenditure is defined as

$$\frac{1+r}{r}\tilde{G}_t = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(G_s) \tag{12}$$

The tax rate will then be decided on the basis of the following version of the budget constraint, expressed in terms of permanent values of the variables.

$$(1+r)D_t = \frac{1+r}{r-n}\tau\tilde{Y}_t - \frac{1+r}{r}\tilde{G}_t \tag{13}$$

giving the following result for the optimal tax rate:

$$\tau_t = (r-n)\frac{D_t}{\tilde{Y}_t} - \frac{r-n}{r}\frac{\tilde{G}_t}{\tilde{Y}_t} \tag{14}$$

Equation (14) shows level of taxes that, given the expected income, public expenditure and the inherited stock of debt, guarantees the sustainability of the fiscal plans. Substituting equation (9) and (14) in equation (4), and using the definition of permanent values of variable defined before, the aggregate consumption function for Italy at the time $t$ is redefined as:

$$C_t = (1-\beta)\left\{\begin{array}{l}(1+r)\left[(1-\phi)D_t^g + \left(\alpha - 1 + \frac{n}{r}\right)D_t\right] \\ + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s - \frac{r-n}{r}G_s\right]\end{array}\right\} \tag{15}$$

Equation (15) defines an aggregate consumption function in a integrated world with growing population. Note that the effect of cross border transaction of public bonds is to reduce the positive effect of national debt policies on national consumption. Indeed, although part of the present debt and future public expenditure will be paid by larger future generations, this positive wealth effect does not materialise in an increase in private consumption if the fiscal expenditure is financed with foreigner savings.

The same relation holds for Germany:

$$C_t^g = (1-\beta)\left\{\begin{array}{l}(1+r)\left[(1-\alpha)D_t + \left(\phi - 1 + \frac{n}{r}\right)D_t^g\right] \\ + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s^g - \frac{r-n}{r}G_s^g\right]\end{array}\right\} \qquad (15')$$

Relations (15) and (15') show an effect of increasing market integration that certainly does not support the hypothesis of over-expansionary bias in EMU. In fact, the simple presence of cross border holding of public debt reduces the impact of national fiscal policies through the reduction of the net wealth effect from debt creation[10]. At the limit of pure Ricardian equivalence {n = 0}, the net wealth effect of budgetary policies is negative.

Equations (15) and (15') indicates that in a very integrated monetary union fiscal discipline could be induced by the ineffectiveness of debt policies in controlling aggregate demand. This can be seen with the help of an index of fiscal stance, directly derived from the one used by Blanchard (1985). In a closed economy, fiscal policy affects aggregate demand directly and via its effects on human and non-human wealth of the private sector. Let g be this index of fiscal stance. Collecting all the terms in the aggregate demand affected by fiscal policy we get that in a closed economy:

$$g_t = G_t + (1-\beta)\left\{(1+r)\left(\frac{n}{r}\right)D_t - E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[\frac{r-n}{r}G_s\right]\right\} \qquad (16)$$

On the other hand, the same index for the open economy described above would look like:

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[10] - The effect of cross border holding of public debt on the effectiveness of fiscal policies is not often pointed out. In a closed economy, like in Barro (1979) or Blanchard (1985), the effect of fiscal policies depends exclusively on the degree of which present debt corresponds to future taxes. In the case we are analysing, the holder of the public debt is not necessarily the same person who will have to pay the taxes in the future. Therefore, national debt policies have not only an aggregate effect but also a distribution effect among countries. In the following part we will see that this result can be reverse when the possibility of fiscal default is taken in consideration. Buiter (1990, chapter 5) briefly analyses the effect of debt default in a steady state of a two country overlapping generation model.

$$g_t = G_t + (1-\beta)\left\{(1+r)\left(\alpha - 1 + \frac{n}{r}\right)D_t - E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[\frac{r-n}{r}G_s\right]\right\} \qquad (16')$$

The first term in the curly bracket measures the degree to which debt is net private wealth. In equation (16), as expected, if population growth is zero {n=0}, debt is not considered private wealth, being totally offset by anticipated future surpluses; and fiscal expenditure has an effect on aggregate demand only if the discount rate of the private sector β is higher than the real interest rate. In equation (16') instead the effect on domestic aggregate demand of an expansionary fiscal policy can be negative, even if debt is net wealth {n>0}, because the increase of public debt is not matched by an equal increase in national private assets holding. Therefore the increase in expected taxes is higher than the positive effect of increase in private wealth (if $\alpha$-1+n/r<0).

In conclusion, applying standard modelling strategies, it is not possible to argue that in a monetary union there is necessary more scope to use fiscal policy to manage aggregate demand, even in a non Ricardian world, because its effect is dispersed abroad[11].

But this result is strictly dependent on the assumption, that the long run solvency of the public sector is guaranteed by the movement in taxes, assumption implicitly incorporated in the government budget constraint. Therefore, although this result seems to support a benign view on the use of fiscal policy in a monetary union, it does not address the main issue of the effect of "unsustainable" fiscal policies in EMU. Because the preoccupation is about the effect of unsustainable fiscal positions on the stability of the whole union, and the possibility that unsustainable fiscal positions would be used to force change in policy, either in the partner fiscal policy or in the European Monetary Policy, the model should be amended to incorporate the hypothesis of debt default.

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[11] - As already mentioned previously, some authors have pointed out the possibility of a "over-contractionary" bias in EMU (van Der Ploeg, 1991, Persson and Tabellini, 1992). Generally the argument is centred around the positive external demand effect of national fiscal policies, or tax competition that will be produced by integrated markets, both

In the next part the possibility of debt default is introduced via simple introduction of income (and therefore tax revenues) uncertainty and tax ceiling. The model so modified will be used in the following parts to analyse how the national and international response to a fiscal crisis is modified by the presence of a monetary union among the countries.

## *2.3 -Income Uncertainty and Default Risk*

Monetary Unification is a regime shift for the European Economies, of which the long run results are highly uncertain. Moreover this uncertainty has long run characteristics (it could be said "systemic") which could affect the trend growth of income. Although at the aggregate level it is often assumed that the effect of monetary unification will be positive (One Market, One Money, 1990), many commentators have also argued for the possibility of structural difficulties for some member countries: either because European Monetary Union is not an Optimal Currency Area (Bayoumy and Eichengreen, 1993, Sala-y-Martin and Sachs, 1992) and therefore, in absence of an international shock absorber, asymmetric shocks could impose excessive costs to some of the participants: or, as argued by Krugman (1993), because monetary union will implies an increase in economic specialisation, and therefore an increase in structural asymmetries among countries, rendering difficult to forecasts the relative benefits of monetary unification.

Given this uncertainty about long term effects of monetary union, coupled with the presence of high debt countries inside the union itself, it is important to analyse how this uncertainty plays a role in the cross border effects of fiscal policy.

In order to keep the analysis simple, we introduce uncertainty in the previous model simply assuming that Italian income follows the following distribution:

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reducing the optimal level of public expenditure in a non-cooperative game between European fiscal authorities.

$$\begin{cases} Y_s = Y_h \ \forall s = t..\infty \text{ with probability } p \\ Y_s = Y_b \ \forall s = t..\infty \text{ with probability } (1-p) \\ Y_b < Y_h \end{cases} \tag{17}$$

Assume furthermore that, if the good state $Y_h$ is realised, the Italian government is willing and able to fulfil the inter-temporal budget constraint (13). On the other hand if the bad state $Y_b$ is realised, then taxes that the government should impose to fulfil the budget are too high and it will have to default on part of its debt[12].

Therefore, although the Italian government is willing to respect the budget constraint (13) ex-ante, realised the income can impose default on the government and force the partner Government to react to the possibility of a crisis.

Given condition (17) and considering the fact that the tax rate will be contingent to the income realisation, we can rewrite the budget constraint (13) as[13]:

$$(1+r)D_t = \frac{1+r}{r-n}\left[p\left(\tau_h \tilde{Y}_h\right)+(1-p)\left(\tau_b \tilde{Y}_b\right)\right]-\frac{1+r}{r}\tilde{G}_t \tag{18}$$

Before the income realisation is revealed, the Italian government can satisfy the budget constraint with a tax rate equal to:

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[12] - This outcome could be justified or on the basis that the marginal cost of taxation is higher than the marginal cost of default, or because of a Laffer curve type of argument. Because, in this model, income taxes are not distortionary, we leave this motivation to one side. An extension of the model incorporating labour decision to introduce the distortionary effect of taxation would complicate the analysis without adding very much to the result, based only on the presence of an upper limit of tax rate that can be charged.

[13] - In the budget constraint above implicitly we assume that differential bond default risks are not reflected in differential bond prices. This assumption is made in order to semplify the analysis, avoiding the complex dynamics that a differentiated term structure of interest rate would introduce. At the same time it reflects the uncertainty about the exact meaning of risk premium. Moreover, as noted previously (p. 21, n.4), the price of a bond reflects the expected future revenue stream from the borrowing country's bonds. The market will price different bonds such that the expected future revenue streams from each of them should be equal. While the difference in price is important in analysing the dynamics of debt (see for example Hughes Hallett and McAdam, 1996), after the default the difference in prices is irrelevant because it does not exist a market for that bonds anymore. Because our analysis deals with the appropriate reaction to a fiscal default, assuming away the difference in prices is not a particular strong assumption to make. Moreover if the optimal reaction to a default is to bail out, than the expected future stream of profits is not affected by the probability of default, and the difference in prices would not appear anyway.

$$\tau_t = (r-n)\frac{D_t}{p(\tilde{Y}_h)+(1-p)(\tilde{Y}_b)} + \frac{r-n}{r}\frac{\tilde{G}_t}{p(\tilde{Y}_h)+(1-p)(\tilde{Y}_b)} \qquad (19)$$

What (19) tells us is that the satisfaction of the inter-temporal budget constraint ex-ante is not a sufficient condition for the stability of the fiscal position ex-post. In fact, the default risk persists because government plans are contingent to an uncertain income realisation. Ex post, when uncertainty is resolved we have two possible scenarios:

In the good state of nature, i.e. if $Y_s = Y_h$, we have that the budget constraint (19) is satisfied if:

$$\tau_h = (r-n)\frac{D_t}{\tilde{Y}_h} + \frac{\tilde{G}_t}{\tilde{Y}_h}\frac{r-n}{r} \qquad (20)$$

On the other hand in the bad state of nature, i.e. if $Y_s = Y_b$, the same level of debt and permanent expenditure will be satisfied at an higher level of tax rate:

$$\tau_b = (r-n)\frac{D_t}{\tilde{Y}_b} + \frac{\tilde{G}_t}{\tilde{Y}_b}\frac{r-n}{r} \qquad (21)$$

Equation (20) and (21) give the ex-post tax rates required to satisfy the budget constraint. Having fixed the tax rate at the beginning of period t, the Italian government faces two possible outcomes, when the uncertainty will be solved. If the outcome of this new regime is the good state $Y_h$, the Italian Government will fulfil its plans reducing the tax rate to $\tau_h$. If instead $Y_b$ occurs than two possibility arises.

1 - Tax rate $\tau_b$ is lower than the maximum possible tax rate T (above which no further revenues are generated) and then we have an economy at high tax rates to repay past expenditure but this is all.

2. Tax rate $\tau_b$ is higher than the maximum possible tax rate T, then we have debt default for the part of the debt that is not guaranteed by future income. Formally

$$if\ Y_s = Y_b \quad \forall s = t+1.....\infty$$

$$\tau_s = T$$

$$D_{t+1} = (1+r)D_t - \frac{1+r}{r-n}[\tau_b - T]Y_b, \tag{22}$$

where the second term of the right hand side is the amount of default necessary to satisfy the budget constraint. Because not all Italian debt is in the hands of the Italian private sector, the actual cost of default in terms of private wealth for the Italian private sector is lower that it would have been otherwise. On the other hand, cross-border holding of public debt transfers part of the cost of default on the foreigner private sector. Therefore the German government which has as objective the maximisation of German private wealth, is forced to take into consideration the possibility of Italian default, not only ex-post, after the default has happened, but also ex-ante[14].

The ex post cost of Italian default for the German private sector should be compared with the cost of alternative policies. In the next section we will consider fiscal bail out (or substitution of the Italian debt with German guaranteed debt). After that we will consider, the possibility of monetising the Italian debt, after introducing small modifications to the model.

### *2.4 - Default or Fiscal Bail-Out?*

In this section we evaluate the cost of Italian default from the point of view of the German government; also what is the optimal German response and how this result will modify their behaviour ex-ante. The effect of an Italian default on German private wealth is simply the capital losses sustained on the Italian Debt held in their portfolio. Therefore, considering the definition of non-human wealth given in (8), net losses will be (ceteris paribus)

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[14] - Imposing that any government should aim at the maximisation of the expected private wealth of its citizens is a natural extension of the assumption that the government is forward looking.

$$\Delta B^{g}_{t+1} = -(1-\alpha)\frac{1+r}{r-n}[\tau_b - T]\widetilde{Y}_b \tag{23}$$

The German government, on the other hand, faces the possibility of avoiding Italian default by bailing out Italian debt, either through direct transfers, or by buying back the Italian debt held by German citizens. In both cases, the measure implies an increase in German debt and therefore in future German taxes.

Consider first the operation of buying back the Italian debt held by German citizens. In this case the non-human wealth of the German citizens will not be affected, being the Italian debt replaced with German one. On the other hand human wealth will be affected because of the increase in future taxes that the operation implies. Formally the new level of taxes will be derived from the following budget constraint:

$$\frac{1+r}{r-n}\tau\widetilde{Y}^{g}_{t} = (1+r)D^{g}_{t} + (1-\alpha)\frac{1+r}{r-n}[t_b - T]\widetilde{Y}_b + \frac{1+r}{r}\widetilde{G}_t \tag{24}$$

that gives the following sustainable tax rate:

$$\tau_g = (r-n)\frac{D^{g}_{t}}{\widetilde{Y}^{g}_{t}} + (1-\alpha)[t_b - T]\frac{\widetilde{Y}_b}{\widetilde{Y}^{g}_{t}} + \frac{r-n}{r}\frac{\widetilde{G}_t}{\widetilde{Y}^{g}_{t}} \tag{25}$$

The increase in taxes required will therefore affect the private sector's human wealth as:

$$\Delta H^{g}_{t} = -(1-\alpha)\frac{1+r}{r}[\tau_b - T]Y_b \tag{26}$$

Confronting equation (26) with equation (23) it is clear that an ex post buy out of German private sector is always the optimal solution from the point of view of the German government. The non-Ricardian nature of the model is such that it is always optimal to defer in the future any cost of adjustment.

The previous option does not avoid the Italian fiscal default but simply try to insulate the German private sector from the cost the default. A more radical option would be to operate a direct fiscal transfer to avoid the default in the first place.

In the case of a direct fiscal transfer, once again the operation is composed by two different elements. On one hand there is an increase in German debt equal to the part of Italian debt "rescued":

$$\Delta D_t^g = \frac{1+r}{r-n}[\tau_b - T]Y_b > 0 \tag{27}$$

If we assume that the increase in German debt is absorbed with the same proportion by the two private sectors, as shown in equation (8) and (8'), the manoeuvre will produce an increase in German private sector stock of bonds (and the non-human wealth) equal to:

$$\Delta B_t^g = \phi \frac{1+r}{r-n}[\tau_b - T]Y_b \tag{28}$$

On the other hand it will have to increase the stream of future taxes in order to satisfy the German Government budget constraint. The amount of taxes required to balance the inter- temporal budget as a result is equal to:

$$\frac{1+r}{r-n}\tau\tilde{Y}_t^g = (1+r)D_t^g + \frac{1+r}{r-n}[t_b - T]\tilde{Y}_b + \frac{1+r}{r}\tilde{G}_t \tag{29}$$

that implies a tax rate equal to:

$$\tau_g = (r-n)\frac{D_t^g}{\tilde{Y}_t^g} + [t_b - T]\frac{\tilde{Y}_b}{\tilde{Y}_t^g} + \frac{r-n}{r}\frac{\tilde{G}_t}{\tilde{Y}_t^g} \tag{30}$$

The increase in taxes required will therefore affect the private sector's human wealth as:

$$\Delta H_t^g = -\frac{1+r}{r}[\tau_b - T]Y_b \tag{31}$$

The operation will be carried out only if the total cost of bailing out in terms of private wealth[15], given by:

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[15] - Because the model departs from Ricardian Equivalence for positive population growth, the operation of bailing out can produce an increase in private wealth in period t. The operation of bailing out Italian debt becomes a cost in terms of German private wealth

$$\Delta W_t^g = \Delta B_t^g + \Delta H_t^g$$

is lower than the cost of leaving Italy to default. Therefore bailing out is the optimal response to Italian if:

$$\phi \frac{1+r}{r-n}[\tau_b - T]Y_b - \frac{1+r}{r}[\tau_b - T]Y_b > -(1-\alpha)\frac{1+r}{r-n}[\tau_b - T]Y_b \qquad (32)$$

or, rearranging and simplifying, if:

$$\frac{\phi}{r-n} - \frac{1}{r} > -\frac{(1-\alpha)}{r-n} \qquad (33)$$

In tables 1 to 3 the value of the two sides are presented for different parameter values.

**Table 1: Analysis of Condition** (33)
{r = 0.05, n = 0.003}

| $\alpha$; $\phi$ | *Cost of Bail Out* | *Cost of Default* |
|---|---|---|
| 0 | -20 | -21.28 |
| 0.2 | -15.74 | -17.02 |
| 0.4 | -11.49 | -12.77 |
| 0.6 | -7.23 | -8.51 |
| 0.8 | -2.98 | -4.26 |
| 1 | 1.28 | 0 |

**Table 2: Analysis of Condition** (33)
{r = 0.05, n = 0.02}

| $\alpha$; $\phi$ | *Cost of Bail Out* | *Cost of Default* |
|---|---|---|
| 0 | -20.00 | -33.33 |
| 0.2 | -13.33 | -26.67 |
| 0.4 | -6.67 | -20.00 |
| 0.6 | 0.00 | -13.33 |
| 0.8 | 6.67 | -6.67 |
| 1 | 13.33 | 0.00 |

only if the parameter $\phi$ is small, implying a high degree of integration between the two economies. On the other hand, as noted by Buiter (1990, pp.159-161), the steady state effect in terms of private wealth of a debt policy like the one described above is negative, because it increases the steady state level of taxation.

In table 1 a very low population growth is assumed {$n = 0.003$}, corresponding to the estimates of average population growth in Europe for the period 1995-2000 (Commission of the European Communities, 1994). Therefore the model has a very low degree of departure from Ricardian equivalence. Nevertheless it is evident that bailing out is always the optimal solution for Germany. If the value of $n$ is changed, forcing it towards a more generous interpretation as trend in income growth, assuming a value of {$n = 0.02$}, the results are even more dramatic, as shown in table 2.

Only in the case of perfect Ricardian equivalence {$n = 0$} is there no difference, for the same proportion of foreign debt holding, between the cost of bailing out and of default, as is clear from table 3;

**Table 3: Analysis of Condition** (33)
{r = 0.05, n = 0}

| $\alpha; \phi$ | *Cost of Bail Out* | *Cost of Default* |
|---|---|---|
| 0 | -20.00 | -20.00 |
| 0.2 | -16.00 | -16.00 |
| 0.4 | -12.00 | -12.00 |
| 0.6 | -8.00 | -8.00 |
| 0.8 | -4.00 | -4.00 |
| 1 | 0.00 | 0.00 |

Because an operation of Bail Out is a way to guarantee foreign debt with national income (in terms of future taxes) the last result is not surprising. A bit more surprising is the fact that Germany will bail out Italian debt for any $\alpha<1$. Moreover, given the overlapping generation structure of the model, for some values of the parameters the operation produce a welfare improvement for the German private sector[16].

[16] As noted above, the welfare analysis would be different if, instead than impact analysis, we would perform a steady state analysis of the different policies. In this class of model, with endogenous interest rate, higher debt induce lower capital and higher interest rate in the steady state, therefore reducing the possible "positive" impact of bailing out Italian debt. On the other hand impact analysis seems more appropriate when analysing the

Although it is not possible to infer direct empirical conclusions from the above numbers, it is interesting to look at the value of condition (30), substituting to $\phi$ and $\alpha$ their historical values in 1992, according to European Commission estimates (European Economy, 1995). Foreign investors held 25.9% of German government debt and only 6.1% of Italian government debt. Table 4 shows that, even if only 1% of the Italian debt was in German hands, bailing out is the optimal response to Italian fiscal imbalances.

**Table 4 – Analysis of Condition** (33)
{r = 0.05, n = 0.0125, $\phi$ = 0.749}

| $\alpha$ | *Cost of Bail Out* | *Cost of Default* |
|---|---|---|
| 0.94 | -0.027 | -1.6 |
| 0.95 | -0.027 | -1.3 |
| 0.96 | -0.027 | -1.1 |
| 0.97 | -0.027 | -0.8 |
| 0.98 | -0.027 | -0.5 |
| 0.99 | -0.027 | -0.3 |
| 1 | -0.027 | 0.0 |

The importance of the aforementioned conclusions is that the fiscal positions of the member countries are not independent, once a possibility of fiscal crisis arises. This is true both in the case of buy out of German private sector and in the case of direct transfer between the governments For the moment, consider only what condition (33) implies for the ex-ante form of the Government Budget constraint.

From the Italian point of view, the government budget constraint must incorporate the possibility of bail out. Therefore the specification (18) must be modified to consider the expected value of bail out intervention from an economic partner. Formally the present value of the stock of debt, in order to be sustainable, must be equal to:

$$(1+r)D_t = \frac{1+r}{r-n}\left[p\left(\tau_h \tilde{Y}_h\right)+(1-p)\left(T_b \tilde{Y}_b\right)+(1-p)(\tau_b - T)\tilde{Y}_b\right]-\frac{1+r}{r}\tilde{G}_t \qquad (34)$$

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effect of a crisis that has potentially a much higher cost that the one illustrated in the

where the last term in the square brackets is the expected value of a possible Bail-out. On the other hand, even before the bail out happens, the present German Debt does not represent the expected value of future liabilities of the public sector, and that does not represent the expected amount of future taxes. Given that it is optimal for the German government to consider bailing the Italians out, the probability of doing so must be considered in the government maximisation process.

The future stream of budget surpluses can be written as:

$$S = \frac{1+r}{r-n}(p)\left(t_h^g \tilde{Y}_h^g\right) + \frac{1+r}{r-n}(1-p)\left(t_b^g \tilde{Y}_t^g\right) - \frac{1+r}{r-n}\tilde{G}_t^g \qquad (35)$$

where the first term of the right hand side is the cost of paying back the present stock of debt $D_t$ and the second term is the cost of paying back the debt plus bailing out Italy. Assuming the German Government wants to maintain a flat tax rate (ex-ante), the present tax rate will therefore be:

$$\bar{\tau}_g = \tau_s + (1-p)[t_b - T]\frac{Y_b}{\tilde{Y}_t^g} \qquad (36)$$

and the inter-temporal budget constraint will have the form:

$$(1+r)D_t^g = \frac{1+r}{r-n}\bar{\tau}_s \tilde{Y}_t^g - (1-p)\frac{1+r}{r-n}[t_b - T]\tilde{Y}_b - \frac{1+r}{r}\tilde{G}_t \qquad (37)$$

Condition (37) renders the interrelation between fiscal positions in a highly integrated economic area explicit. The difference between equation (37) and equation (34), the two inter-temporal budget constraints, is given only by the different way in which uncertainty presents itself. While the uncertainty in equation (34) is in the future income realisation, the uncertainty in equation (37) is introduced by the uncertain future level of taxes, conditioned by the expected income realisation in Italy. Note also that Germany is forced to run an *intertemporal* budget surplus in order to cover the risk of Italian default.

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model.

## *2.5 -Default Risk and Monetary Bail Out.*

The possibility of default of a large borrower could also put pressure on the ECB to inflate away the risk. This possibility was recognised in the Maastricht treaty itself and many authors interpret the provisions of the treaty on fiscal policy as the way to protect the independence of the ECB (Artis and Winkler, 1997). Almost any paper on the issue dedicates a part of the analysis to the need to preserve monetary independence through fiscal control (see Kenen, 1995, for a survey of the argument, Giovannini and Spaventa, 1990, Buiter, Corsetti and Roubini,1993, Eichengreen and von Hagen, 1996).

Therefore, in order to complete the previous analysis, we have to look at the possibility of monetary bail out of Italian debt through a jump in the level of prices which reduces the real value of the outstanding debt. Because the previous analysis has been conducted in real terms, the model must be amended in order to have a comparable and meaningful solution. Following a recent stream of literature (Woodford, 1995,1996, Sims, 1994, Bergin, 1997), we simply express the inter-temporal budget constraint considering explicitly the nominal nature of the debt issued. Therefore now the inter-temporal budget constraint (18) will be transformed as follows:

$$(1+r)\frac{D_t}{P_t} = \frac{1+r}{r-n}\left[p(\tau_h \tilde{y}_h)+(1-p)(\tau_b \tilde{y}_b)\right]-\frac{1+r}{r}\tilde{g}_t \qquad (38)$$

where all the lowercase letter variables express real values of income and public expenditure, while $D_t$ represents the nominal value of the debt outstanding at time t. The budget constraint (38), although satisfied ex-ante, presents a risk of default in the case that the bad state is realised. As argued by Eichengreen and von Hagen (1996), the monetary bail out may take two forms: an ex-post bail out, involving monetization of government debt after the solvency crises is materialised; and an ex-ante bail out, requiring the ECB to follow a monetary policy that minimises the risk of default.

## 2.5.1 - Ex Post Monetary Bail-Out

Consider the case in which the Central Bank has private information about the future income. Knowing that the future income for Italy is not enough to provide the necessary stream of future tax revenues to stabilise the Italian fiscal position, it can decide to intervene producing an unexpected jump in prices such that the real value of Italian debt will be cut from:

$$(1+r)\frac{D_t}{P_t} = \frac{1+r}{r-n}[(\tau_b \tilde{y}_b)] - \frac{1+r}{r}\tilde{g}_t \qquad (39)$$

to the sustainable level

$$(1+r)\frac{D_t}{{}_1P_t} = \frac{1+r}{r-n}[(T\tilde{y}_b)] - \frac{1+r}{r}\tilde{g}_t \qquad (40)$$

Subtracting (40) from (39) and rearranging, we derive the percentage price jump necessary to achieve the bail-out:

$$\frac{{}_1P_t - P_t}{P_t} = \frac{1}{r-n}[(t_b - T)\tilde{y}_b]\left(\frac{D_t}{{}_1P_t}\right)^{-1} \qquad (41)$$

Equation (41) indicates that the jump in prices required to achieve the stabilisation is inversely related to the nominal value of the stock of debt. Therefore the use of monetary bail-out is less dramatic for high level of debt (Canzoneri and Diba, 1997)[17]. On the other hand, this does not represent a sufficient condition for the monetary bail out to be an efficient instrument for fiscal stabilisation.

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[17] - The observation is certainly counter intuitive and will be analysed once again in Chapter 4. Certainly, If we think at monetary bail out as extraction of seignorage to pay back the debt, than the previous observation cannot be correct because more seignorage is needed to pay an higher amount of debt. But if monetary bail out consists principally in the effect that an increase in prices have on the real value of debt, taxes and expenditure (as observed by Persson, Persson and Svensson,1996), than the same change in prices will have proportionally an higher effect for higher level of debt, as argued in the text.

In fact, for the private sectors in the two countries monetary-bail out is more expensive in terms of wealth than default itself. In fact a jump in the level of prices has two effects on the private sector wealth. Firstly, it reduces the real value of Italian debt for the amount necessary to avoid default. Therefore, for the two private sector the cost will be, respectively:

$$\Delta W_t = -\frac{\alpha}{r-n}[(t_b - T)\tilde{y}_b] \tag{42}$$

$$\Delta W_t^g = -\frac{1-\alpha}{r-n}[(t_b - T)\tilde{y}_b] \tag{43}$$

Equations (42) and (43) are nothing more than the cost of default itself. Given the absence, in this particular set-up, of any other explicit cost of default, monetary bail out is not different from default itself, in terms of its final effect on debt value. On the other hand, monetary bail out has also the effect of reducing the value of all the private wealth, independently of its composition or location. Therefore, for example, the value of the German government debt after the stabilisation will be reduced by the following amount:

$$\frac{D_t^g}{P_t} - \frac{D_t^g}{{}_1P_t} = \frac{D_t^g}{{}_1P_t}\frac{{}_1P_t - P_t}{P_t} = \frac{1}{r-n}[(1-p)(t_b - T)\tilde{y}_b]\frac{D_t^g}{D_t} \tag{44}$$

Considering (44) in the evaluation of the total cost of the operation gives the following wealth losses for the Italian private sector:

$$\Delta W_t = -\frac{1}{r-n}[(t_b - T)\tilde{y}_b]\left[\alpha + (1-\phi)\frac{D_t^g}{D_t}\right] \tag{45}$$

For the German private sector the total cost of the operation is partly mitigated by the fact that it reduces the expected future taxes, given the reduction in the real value of the German debt. Therefore the total cost is equal to:

$$\Delta W_t^g = -\frac{1}{r-n}[(t_b - T)\tilde{y}_b]\left[(1-\alpha) + \left(\phi - \frac{n}{r}\right)\frac{D_t^g}{D_t}\right] \tag{46}$$

Comparing equations (44) and (46) with the respective cost of default, i.e.,

$$\Delta W_{def.} = -(\alpha)\frac{1}{r-n}[\tau_b - T]Y_b \tag{47}$$

$$\Delta W^{g}_{def.} = -(1-\alpha)\frac{1}{r-n}[\tau_b - T]Y_b \tag{48}$$

it is evident that ex-post monetary bail out is never an option in a monetary union. In fact the use of price jump to stabilise the fiscal position of one single member state is highly inefficient because cannot be properly targeted. Although any generalisation of the previous result should be handled with care, it does suggest that monetary bail out can be credibly excluded because it is not in the interest of any of the participants of the monetary union.

## 2.5.2 - Ex Ante Monetary Bail-Out

The result of the previous section is reinforced by a similar analysis of ex-ante monetary intervention. Again consider that the ECB has the possibility to engineer a jump in prices such that the risk of default is eliminated. Formally it means that at the new level of prices the budget constraint (38) is satisfied for any possible state of nature.

$$(1+r)\frac{D_t}{{}_1P_t} = \frac{1+r}{r-n}[p(\tau_g\tilde{y}_g)+(1-p)(T\tilde{y}_b)]-\frac{1+r}{r}\tilde{g}_t \tag{49}$$

Proceeding as before, the total cost of the operation for the Italian private sector is equal to:

$$\Delta W_t = -\frac{1}{r-n}[(1-p)(t_b - T)\tilde{y}_b]\left[\alpha+(1-\phi)\frac{D^g_t}{D_t}\right] \tag{50}$$

and for the German one is equal to:

$$\Delta W^g_t = -\frac{1}{r-n}[(1-p)(t_b - T)\tilde{y}_b]\left[(1-\alpha)+\left(\phi-\frac{n}{r}\right)\frac{D^g_t}{D_t}\right] \tag{51}$$

Comparing the welfare losses (50) and (51) with the welfare losses of default, it is evident that if the probability of default is small enough, a monetary adjustment is convenient. But this is not true if we consider the ex-ante expected cost of not doing the operation of monetary bail out. In this case the results are completely parallel to those in the previous section. Although an intervention of the monetary authority can eliminate the risk of default at a lower cost than the default itself, the present cost of the operation is higher than the expected cost of default. Therefore, if the authorities are risk neutral, even an ex-ante monetary bail out is not an option.

In conclusion, a fiscal imbalance in a monetary union does not necessarily imply an increased pressure on the monetary authority to monetize the debt in excess, as argued in most of the literature on the issue[18]. On the contrary, a commitment of the monetary authority not to bail out any government debt is credible because it is compatible with the interest of any member country. On the other hand, this puts pressure on the fiscal side, in which instead the commitment must be sustained by a political will against the effective interest of the participant.

### *2.6 – Fiscal Policy Interdependence and Private Sector Behaviour*

The analysis in parts (4) and (5) suggests that while economic integration increases interdependence among the fiscal players, it does not necessarily increase the spill-over between fiscal and monetary policy. Nevertheless, the conclusion that fiscal bail out is the optimal response to a fiscal crisis, produces a series of ex-ante effects which we are going to analyse in this section.

The main implication of the analysis in part (4) is that it is not always appropriate to consider the government budget constraints separately when considering the private

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[18] - This is true only if the prices can be effectively controlled by the ECB in the event of a fiscal imbalances. If instead the prices react automatically to fiscal imbalances, as argued by the so called fiscal theory of price determination literature (Woodford, 1995,1996, Sims,

sector optimisation. Recalling from above, the two government budget constraints are equal to:

$$(1+r)D_t = \frac{1+r}{r-n}\left[p\left(\tau_h \tilde{Y}_h\right)+(1-p)\left(T_b \tilde{Y}_b\right)+(1-p)(\tau_b - T)\tilde{Y}_b\right]-\frac{1+r}{r}\tilde{G}_t \qquad (52)$$

for Italy, while for Germany, modified to incorporate the risk of Italian default, it looks like:

$$(1+r)D_t^g = \frac{1+r}{r-n}\bar{\tau}_s \tilde{Y}_t^g - (1-p)\frac{1+r}{r-n}[t_b - T]\tilde{Y}_b - \frac{1+r}{r}\tilde{G}_t \qquad (53)$$

It is clear that the two equations are not independent. Aggregating (52) and (53) we obtain the following aggregate inter-temporal budget constraint:

$$(1+r)\left(D_t + D_t^g\right) = \frac{1+r}{r-n}\left[p\left(\tau_h \tilde{Y}_h\right)+(1-p)\left(T_b \tilde{Y}_b\right)+\bar{\tau}_s \tilde{Y}_t^g\right]-\frac{1+r}{r}\left(\tilde{G}_t + \tilde{G}_t^g\right) \qquad (54)$$

Condition (54) simply synthesises the fact that Italian public debt can become a future tax liability for the German private sector every time there is a positive probability of default[19]. At the same time it redefines the trasversality condition for the Government and the private sector problems. What is important is that is that the only necessary condition to produce a result like (54) is that the private sector expect a positive probability of default in one member country big enough, or important enough, to threaten the stability of the union as a whole.

Does a condition like (54) produce an important risk of undisciplined strategic behaviour? After all, the discussion about the possibility of an over-expansionary bias in EMU is

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1994, Bergin, 1997),, then monetary bail-out is not a political choice but a market solution. The next chapter will be totally dedicated to this issues

[19] Condition (51) is similar to the case of fiscal bail out presented in Woodford (1996) and Bergin (1997). Their analysis shows that respecting an inter-temporal aggregate budget constraint like (51) is a sufficient condition to maintain price stability in monetary union. On the other hand, requiring a constant transfer of wealth from one member to the other, it is not an equilibrium condition, because every government would play the same expansionary policy. In our analysis, instead, condition (54) is independent from the actual behaviour of the fiscal authorities, but is only the result of their expected optimal behaviour in the presence of default. For an analysis of optimum behaviour in a setting similar to Bergin and Woodford, see Viegi (1996) and the next two chapters.

based upon the assumption that someone could exploit the interdependence that EMU would create to achieve national objectives. If we consider how the consumer maximisation problem is changed by a condition like (54), we can evaluate the conditions that renders a "beggar-thy-neighbour" policy feasible. It is easy to show that considering the aggregate budget constraint (54) modifies the consumption functions (15) and (15') as follows:

$$C_t = (1-\beta)\left\{\begin{array}{l}(1+r)\left[\left(\frac{n}{r}-\phi\right)D_t^g+\left(\alpha-1+\frac{n}{r}\right)D_t\right]+\\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s-\frac{r-n}{r}G_s\right]+E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s^g Y_s^g-\frac{r-n}{r}G_s\right]\end{array}\right\}$$

(55)

and

$$C_t^g = (1-\beta)\left\{\begin{array}{l}(1+r)\left[\left(\frac{n}{r}-\alpha\right)D_t+\left(\phi-1+\frac{n}{r}\right)D_t^g\right]+\\ +E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[Y_s^g-\frac{r-n}{r}G_s^g\right]+E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s Y_s-\frac{r-n}{r}G_s\right]\end{array}\right\}$$

(56)

An increase in Italian permanent expenditure not matched by an equal increase in expected revenues, will produce an increase in the portion of Italian debt guaranteed by German wealth. This will have a negative effect on German consumption, as long as the amount by which the Italian debt is absorbed by the German private sector is lower than the expected amount of fiscal bail-out. Therefore the strategic use of fiscal imbalances to transfer wealth from abroad is possible, but it is limited by the negative effect that an increase in integration has on the effect of fiscal policy on private demand.

This combination of effects can be better illustrated considering how the index of fiscal stance introduced in section 2 is modified by the analysis so far. Grouping all the elements of aggregate demand affected by fiscal policy, we have that:

$$g_t = G_t + (1-\beta)\begin{Bmatrix} (1+r)\left(\alpha - 1 + \frac{n}{r}\right)D_t - E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[\frac{\dot{r}-n}{r}G_s\right] + \\ \left(\frac{n}{r}-\phi\right)D_t^g + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s^g Y_s^g - \frac{r-n}{r}G_s^g\right] \end{Bmatrix} \quad (57)$$

which can otherwise be expressed as:

$$\begin{aligned} g_t &= G_t - (1-\beta)E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}[G_s] + \\ &+ (1-\beta)\left\{(1+r)\left(\alpha - 1 + \frac{n}{r}\right)D_t + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[\frac{n}{r}G_s\right]\right\} + \\ &+ \left\{\left(\frac{n}{r}-\phi\right)D_t^g + E_t\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[t_s^g Y_s^g - \frac{r-n}{r}G_s^g\right]\right\} \end{aligned} \quad (58)$$

The first line gives the standard effect of spending on aggregate demand if it is financed by contemporaneous taxes. In this case the effect of growing population is not significant and a constant level of fiscal expenditure has a positive effect on aggregate demand only if $\beta>(1/1+r)$. The second line gives the effect of financing public expenditure with debt. In the case of Ricardian equivalence {n = 0}, debt financing reduces the private wealth for the extent that the debt is part of foreign private wealth $(1-\alpha)$. For {*n>0*} not only part of the debt will be absorbed by taxes on future generations, but the same is true for expected future expenditure. As noted above, this is the direct effect of fiscal policy in EMU, and it shows a reduction in the effect that fiscal expenditure has in EMU compared to a closed economy setting.

The third line instead shows the effect of fiscal policy on the fiscal position of the neighbour country, and therefore the positive effect of an increase in the expected bail-out on national debt.

## *2.7 – A Europe of Nations Vs A Europe of Regions*

As mentioned at the beginning, the main objective of the Maastricht fiscal rules was to provide a framework for a stable and disciplined monetary union, in which every member is the sole responsible to the market of their actions. The analysis so far suggests that a no-bail out rule could not be the better way to achieve this objective. This is because it is not optimal ex-post, cannot be credible ex-ante, and therefore does not solve the risk of a strategic use of fiscal imbalances.

The previous analysis shows that in order to cope with this form of "over-expansionary bias" the European institutions should be designed to reduce the external economic cost of default, therefore reducing the incentive to bail-out that produces the strategic dilemma illustrated. On the contrary, the choice made in Maastricht has been to increase the "political" cost of bailing out a country with fiscal problems while at the same time reducing the probability of default via strict rules on the use of fiscal policy.

It is clear that by themselves these rules, they go in the right direction, offer no guarantee against "time inconsistent" behaviour of the governments. As recent experiences in the world financial markets demonstrates[20], without an institutional structure robust to all possible state of nature the possibility of bail out cannot (and should not) be ruled out.

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[20] - The financial and economic crisis in Asia of 1997-1998, the default of Russian debt in summer 1998 and the bail out of the Long Term Capital Management hedge fund by the Federal Reserve has spark new interest in the design optimal institutions for financial stability. As far as we are concerned the interest is given by the fact that not only it demonstrates the possibility of fiscal default in particular circumstances, but more importantly it shows the time inconsistency of any no-bail out commitment if not supported by institutions that can minimise the external costs of a crisis. As argued by the Chairman of the Federal Reserve Greenspan " had the failure of LTCM triggered the seizing up of markets, substantial damage could have been inflicted on many market participants, including some not directly involved with the firm, and could have potentially impaired the economies of many nations, including our own" (Greenspan 1998). Therefore although bailing out is not the optimal policy ex-ante, because it would promote free riding behaviour on the public good, i.e. stability, it is optimal ex-post given the overall costs of a crisis. For an impressive collection of information and comments on the crisis and its consequences for the international financial system see http://www.stern.nyu.edu/~nroubini/.

But the analysis so far suggests also a possible institutional solution to the described "time inconsistency" problem. What drives the results in not only the level of integration (represented by the parameters $\alpha$ and $\phi$), but also by the dimension of the member in fiscal distress respect to the union as a whole.

The point is made clear if we consider the case that the union is formed by (m) countries, perfectly identical in term of preferences and initial conditions. Thus, the total amount of government debt in this enlarged union is given by

$$D_t^{emu} = \sum_{i=1}^{m} D_t^i \tag{59}$$

As before, the private sector has a preference for national assets and is indifferent between the foreign ones. Therefore the national resident will hold a fraction $\alpha$ of national debt, while the rest of the community will absorb the rest. Each country will though hold *(1-$\alpha$)* of the average of the remaining total debt. Given the assumption of perfect symmetry among countries, the aggregate wealth in country (i) at time (t) will be thus composed by a portfolio of debt issued such as:

$$B_t^i = \alpha D_t^i + \frac{(1-\alpha)}{m-1}\sum_{j=1}^{m-1} D_t^j \qquad j \neq i \tag{60}$$

Consider the possibility of default in one country arises in the same way we have described in the two country setting. For example, a generic country *(i)* faces the possibility of default that would produces a cost for its own private sector equal to:

$$\Delta W_{def.}^i = -(\alpha)\frac{1}{r-n}[\tau_b - T]Y_b \tag{61}$$

Similarly, the default of country *(i)* debt will impose a cost on the private sector of the other member countries equal to:

$$\Delta W_{def.}^{j \neq i} = -\frac{(1-\alpha)}{(m-1)(r-n)}[\tau_b - T]Y_b \tag{62}$$

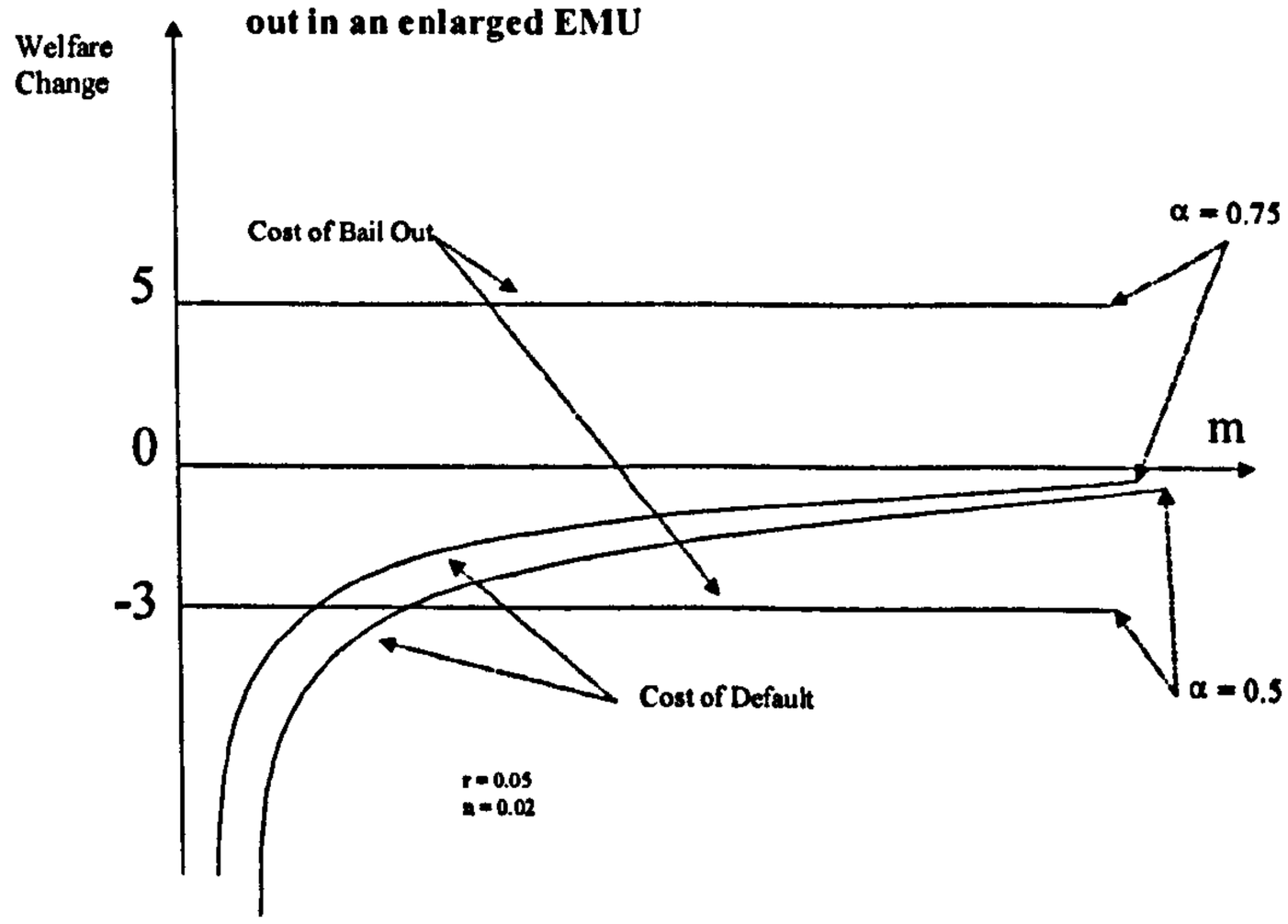
Equation (62) shows that the cost of default is an inverse function of the number of the members of the union (or the relative weight of any local authority issuing debt respect to the union). Moreover the enlargement (or fragmentation) of the Union only affects the external cost of default but not, as shown by (61) the cost for the country in crisis.

On the other hand the enlargement does not affect the cost of bail out, as it has been defined above, unless a co-ordinated action of the other member countries to rescue country (i) was possible[21]. In an enlarged union, the cost of bail-out would again be equal to:

$$\Delta W_{bo}^{j} = \frac{\alpha}{r-n}[\tau_b - T]Y_b - \frac{1}{r}[\tau_b - T]Y_b \qquad (63)$$

In figure (1) equations (62) and (63) are graphed for different values of $\alpha$ and *m* given a value of $r = 0.05$ and $n = 0.02$. The horizontal lines are the cost of bailing out (a positive value is an increase in country *(j)* private wealth following a bail-out operation of country *(i)*), independent of the number of country members of the Union.

**Fig. 1: Comparison of fiscal default and fiscal bail out in an enlarged EMU**




[21] - We abstract from analysing this case, not because it has no relevance, but because, given the fact that increasing the number of players decreases the cost of default, the incentive to co-operate in order to reduce the cost of bailing out decreases as well.

As argued before, the cost of bailing out one country increases the greater is the amount of national debt held abroad ($\alpha$ smaller) and the lower is the degree of departure from Ricardian equivalence. Bail out is the optimal response to a fiscal crisis only if the Union is composed by a relatively small number of countries and the degree of cross-border transaction of public bonds is small. On the other hand, as we saw in section 2.4, the increase in openness increases the cost of default but the increase in the number of union members softens the problem, reducing the possibility of the single member to determine the outcome for the whole union.

The analysis of this part seems to conclude that, while deepening integration, European countries have to widen integration at the same time, or otherwise reduce the size of the building blocks of the Union from the States to the local or regional level. The two processes reinforce each other because, reducing the external cost of default reduces the incentive to resort to default, or the threat of it, therefore inducing discipline not through external enforcement but through self interest. It is a sort of perfectly competitive monetary union.

## *2.8 - Conclusions*

This chapter had the aim of looking at the conventional wisdom about fiscal default and verify if in a monetary union there is, as often argued, an incentive to excessive use of the fiscal instrument. Our findings in this respects are partly validating the idea that a strategic use of default risk could be used to force a fiscal bail-out from the other member states, especially if the country using this "instrument" is big enough with respect to the whole union. On the other hand, as noted by Buiter, Corsetti and Roubini (1993), this is a theoretical possibility common to any integrated economic space, and in this respect the Monetary Union does not add anything further to the scenario.

What distinguish a Monetary Union is that a monetary bail-out becomes much more costly to all the parties involved, because it affects all the countries to the same extent.

Therefore fiscal bail-out becomes more likely and this affects the ability of the market to asses specific country risk. The more interesting results, in this respect, is that the optimality of a fiscal bail out produces interdependence of national fiscal positions. In some curious way it is the creation of a fiscal federalism by default.

Is then the no-bail out clause the institutional solution to this possible strategic use of fiscal default risk? We have argued that it is not because it required a political commitment to pay the cost of a possible fiscal default of the economic partner, that can be far superior to the cost of a fiscal bail-out. On the other hand the relative dimension of the players is the single determine factor of the strategic problem analysed. Therefore an enlargement of the Union, or a transfer of the power of issuing debt to a lower institutional level could reduce the cost of default to a level lower than the political will to sustain a no-bail out clause. Moreover this would also increase at infinitum the cost of monetary bail out.

***Appendix 1: Derivation of the Government Budget Constraint:***

The derivation of this inter-temporal budget constraint is quite standard. Consider period t government budget identity:

$$D_{t+1} = (1+r)D_t + G_t - t_t Y_t \qquad \text{(A1)}$$

or,

$$(1+r)D_t = D_{t+1} - G_t + t_t Y_t$$

where $D_t$ is the beginning of period stock of debt, G is the level of public expenditure, Y is the aggregate level of income and t is the tax rate on income. Forward this identity, dividing both side of the result by (1+r) and considering that Aggregate Income is growing at a rate equal to the population growth, the following is obtained:

$$D_{t+1} = \frac{1+n}{1+r} t_{t+1} Y_t - \frac{1}{1+r} G_t + \frac{1}{1+r} D_{t+2} \qquad \text{(A2)}$$

which we use to eliminate $D_{t+1}$ from A1:

$$(1+r)D_t = t_t Y_t - G_t + \frac{1+n}{1+r} t_{t+1} Y_t - \frac{1}{1+r} G_{t+1} + \frac{1}{1+r} D_{t+2} \qquad \text{(A3)}$$

Repeating this iterative substitution for periods (t+2), (t+3) and so on up to period T, we obtain:

$$(1+r)D_t = \sum_{s=t}^{T} \left(\frac{1+n}{1+r}\right)^{s-t} (\tau_s Y_t) - \sum_{s=t}^{T} \left(\frac{1}{1+r}\right)^{s-t} (G_s) + \left(\frac{1}{1+r}\right)^{T} D_{t+T+1} \qquad \text{(A4)}$$

The identity (A4) is transformed in the budget constraint (6) taking the limit of (A4) for T->∞ and imposing the following trasversality condition:

$$\lim_{T\to\infty} \left(\frac{1}{1+r}\right)^{T} D^{g}_{t+T+1} = 0 \qquad \text{(A5)}$$

# CHAPTER 3.

# THE INTERTEMPORAL APPROACH TO FISCAL AND MONETARY POLICY INTERDEPENDENCE

## *3.1. Introduction*

The main objective of the Maastricht Treaty has been to build up a stable monetary environment in which member country could fully exploit the benefit of a single market with single money for the whole Europe. The possibility to achieve this objective seems to be conditioned by the ability of the Maastricht institutions to built up and impose a "stability culture" in each member country. In particular, the debate about monetary union has been characterised by a particular emphasis on the control of national fiscal policy. The Delors Report (1989) argued that monetary union without fiscal constraint could be a source of monetary and economic instability. The Maastricht Treaty itself based its institutional framework upon two main building blocks: a totally independent central bank and a set of constraints set upon national fiscal authorities. So great was the preoccupation of some members of the latter, that the already stringent fiscal requirements (at least at the eyes of many economists[1]) of the Treaty have been tightened considerably in the so-called Stability Pact.

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[1] - The number of contributions arguing for a relaxation of the criteria of fiscal stability are practically endless. The first and certainly the most frequently quoted is Buiter, Corsetti and Roubini (1993), who criticise the fiscal criteria on the ground that they are not necessary, not well specified, and too costly. Von Hagen and Eichengreen (1996) argue that international experience suggests that restrictions on borrowing by subcentral governments are redundant when subcentral governments control a large share of the tax base. Hughes Hallett and McAdam (1996) argue that expressing the criteria in terms of GDP rends the convergence more difficult because policy aimed

The political debate about the effects which national fiscal behaviour could have on the common monetary policy has produced a renewed interest in the analysis of the channels of interrelation between fiscal and monetary policy. In fact, while a clear understanding of the way in which fiscal and monetary policy interact is critical in the evaluation of policy institutions, the economics analysis of the issue has been largely characterised by two different, and difficult to reconcile, approaches.

On one hand, many authors have stressed the, negative, spillover effects that uncoordinated economic policy could produce. These contributions reflect a Keynesian view, in which the main linkage between the policy is through the effect that debt financing of public expenditure has on aggregate demand. In this theoretical framework, as recently argued by Nordhaus (1994), non-coordinated fiscal and monetary policies would produce a Pareto inferior outcome, because the two policies do not internalise the negative spillover produced by the other policy maker.

On the other hand, modern macroeconomics emphasises the intertemporal nature of the economic decisions. Therefore, at least from the seminal paper of Barro (1974) on the irrelevance of fiscal expenditure financing method, the demand approach to fiscal and monetary policy interdependence has been largely abandoned, at least theoretically. In its place, a view that stresses the inter-temporal interdependence between the two policies through the dynamic government budget constraint has been dominant. Indeed the Ricardian Equivalence theorem, demonstrating the irrelevance of the method of financing of public spending, in fact ultimately argued for the irrelevance of fiscal expenditure as a mean of demand management. Thus, if Ricardian equivalence holds even approximately,

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to reduce the numerator (deficit and debt) would affect negatively the denominator as well (GDP). They point to growth and tax reform as preconditions for a successful monetary union. See also Bayoumi and Eichengreen (1995) for the cost of having stringent fiscal restraints in term of increasing output variability.

the relation between monetary policy and fiscal policy cannot passes trough aggregate demand[2].

The only source of interrelation between monetary and fiscal policy remained is the necessity to fulfil the intertemporal budget constraint and the pressure that is imposed on monetary policy to abandon the objective of price stability to provide enough seignorage to finance an overspending government. On the other hand, as often in the neo-classical theory, the inter-temporal approach do not provide the policy maker with clear normative propositions (except perhaps abstain yourself). This leaves a vacuum filled by policy pragmatism and institutional experiments largely based on theories where the fiscal policy plays no role at all[3].

This chapter is dedicated to a review of this debate and to the analysis of new theoretical developments, that could provide a bridge between the different approaches. In doing this we will also consider how this debate affects the institutional design of, among other things, the EMU.

The main point is that analysing the interrelation between fiscal and monetary policy only in term of intertemporal sustainability and seignorage could be reductive and could underestimate the importance of fiscal policy in determining the dynamics of the economy. In this respect the so called Fiscal Theory of Price Determination (Sims, 1993, Woodford, 1994) can be used to improve our understanding of the complex interrelation between policies among themselves and their effect on the real and monetary variable.

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[2] - From the article of Barro (1974), the debate about the relevance of Ricardian equivalence has been enormous. For a comprehensive and sympathetic review of this theoretical and empirical literature, see Seater (1993).

[3] - We refer to the literature on dynamic inconsistency. Only recently the importance of fiscal policy has been recognised by some authors and incorporated in the study of optimal monetary institutions (Castren, 1998, Brociner and Levine, 1995, Alesina and Tabellini, 1987). On the other hand the critics of the Central Bank independence paradigm have often argued that the delegation of one policy instrument would not provide an efficient fiscal-monetary policy mix (Meade, 1991, Rankin, 1997, Blake and Weale, 1998, Demertzis, Hughes Hallett and Viegi, 1998)

### *3.2. From the "Unpleasant Monetarist Arithmetic" to the Central Bank Independence Paradigm*

The obvious starting point for analysing the inter-temporal approach to fiscal and monetary policy interdependence is the seminal paper of Sargent and Wallace (1981) "Unpleasant Monetarist Arithmetic". The main objective of the paper was to show that, even in a pure monetarist framework, unbounded fiscal policy produces negative spillover effects on monetary policy, and ultimately it can undermine the ability of monetary policy to control inflation.

This conclusion largely based on the "assumption" that permanent budget deficits must be eventually monetized. Not surprisingly, with an exogenous stream of budget deficits, there is only one integral of money creation that is consistent with long run equilibrium (in term of satisfaction of agents trasversality conditions). The only choice in the hand of the monetary authority is the time profile of money creation.

The basic argument is very simple. Consider an economy in which, given the level of income, the prices are determined according to a pure quantity theory of money equation. Given an exogenous level of income (normalised to 1), it means:

$$P_t = \frac{1}{k} M_t \qquad (1)$$

The monetary authority controls the growth of base money (and thus of inflation) subject not only to equation (1) but also to the necessity to satisfy the intertemporal government budget constraint. The fiscal authority follows an exogenous path of fiscal expenditure $G_s$ (for s = t..∞). The one period budget constraint is therefore defined as:

$$D_{t+1} = (1+r)D_t + G_t - \frac{M_{t+1} - M_t}{P_t} \qquad (2)$$

where the last term defines the amount of seignorage. Note that the last term can be expressed in term of the rate of growth of base money

$$\frac{M_t - M_{t-1}}{P_t} = \frac{M_t - M_{t-1}}{M_t}\frac{M_t}{P_t} = \mu_t \frac{M_t}{P_t} \tag{3}$$

Substituting (3) and (1) in (2) we can express the budget constraint as:

$$D_{t+1} = (1+r)D_t + G_t - k\mu_t \tag{4}$$

Integrating (4) forward, we obtain the government intertemporal budget constraint

$$D_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} G_t = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(k\mu_s) \tag{5}$$

$$\lim_{T\to\infty}\left(\frac{1}{1+r}\right)^{T-1} D_T = 0$$

Given a constant level of budget deficits a the constant real interest rate, (5) can be rewritten as:

$$D_t + \frac{1+r}{r}G = \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(k\mu_s) \tag{6}$$

Equation (6) defined a necessary condition. If it were not satisfied, it would mean that the value of the present debt is not covered by future surpluses and therefore no rational agent would want to invest in an asset without value. Given equation (6), it is clear that the only choice faced by the Central Bank is to choose the time profile of monetary growth μ. For example, if the objective function of the Central Bank is

$$L_{CB} = \frac{1}{2}\sum_{s=t}^{\infty}\beta^{s-t}(\mu_s)^2$$

where μ is also the inflation rate (from equation 1), and β is the subjective discount factor of the monetary authority. If *β=1/(1+r)*, the solution is clearly a constant inflation rate equal to:

$$\mu = \frac{1}{k}\left(\frac{r}{1+r}D_t + G\right) \tag{7}$$

Any other path different from (7) would be sub-optimal. In particular, any attempt to reduce inflation now without a contemporaneous stabilisation of the fiscal position would produce higher inflation in the future. Consider for example the case that the central Bank tries to maintain zero inflation until a certain time T. Then, in the period T, the government budget constraint would be:

$$D_T = (1+r)^{T-1} D_t + \sum_{s=t}^{T} (1+r)^{s-t-1} G$$

and the level of money growth that satisfies the budget constraint from time T onward will be:

$$\mu = \frac{1}{k}\left(\frac{r}{1+r} D_T + G\right) = \frac{1}{k}\left\{\frac{r}{1+r}\left[(1+r)^{T-1} D_t + \sum_{s=t}^{T} (1+r)^{s-t-1} G\right] + G\right\} \qquad (8)$$

In the words of Sargent and Wallace, "Without help from the fiscal authorities, fighting current inflation with tight monetary policy must eventually lead to higher future inflation".

On the other hand, the introduction of rational expectations has the effect of anticipating the inflationary pressure at time zero. This eliminates even the possibility of choosing the desired time profile of inflation consistent with the long run solvency of the public sector.

The Sargent Wallace result has been highly influential. Many authors have re-examined the issue in more sophisticated theoretical frameworks. For example, Weil (1984) conducts the same exercise using a model of infinitely lived overlapping generations with money in the utility function. In his analysis, the set of monetary policies compatible with a permanent budget deficit is much wider than in the original Sargent and Wallace contribution, because of distributive intergenerational effects and effects on interest rate.

Nonetheless the basic intuition of their contribution has been largely confirmed: in the

presence of a permanent budget deficit, the monetary policy cannot be used independently (see also McCallum, 1984, Liviatan, 1984)[4].

However, the most influential result of the Sargent and Wallace contribution has probably been the fact that the policy conflict between fiscal and monetary policy could be resolved simply assigning policy leadership to the Central Bank. If it were possible to give the "first move" to the monetary authority, than the fiscal authority would be constrained in its policy choice by the amount of seignorage provided by the Central Bank.

In fact, in the Sargent and Wallace model, the monetary authority is the loser of the policy game simply because is not able to influence the spending decision of the fiscal authority. Sargent and Wallace themselves recognise that the conflict could be resolved with appropriate institutional arrangements. As they say "..One can imagine a monetary authority sufficiently powerful vis-à-vis the fiscal authority that by the imposition of a slower rates of growth of base money, both now and into indefinite future, it can successfully constrain fiscal policy by telling the fiscal authority how much seignorage it can expect now and in the future".

At the same time another stream of literature (Kinland and Prescott, 1977, Barro Gordon, 1982, Rogoff, 1985 being the most influential contributions) has advocated the total independence of the monetary authorities. In this way, the so called "inflationary bias" which is introduced in the economy by the use of discretionary monetary policy in a world of forward looking agents would be solved. From the seminal paper of Rogoff (1985), the idea of having an independent and "conservative" central bank has become the standard

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[4] - Other contributions in this area have emphasised the effects that uncertainty about future fiscal policy can have on the dynamics of macroeconomic variables. In particular Drazen and Helpman (1990) study how expectations of a policy switch whose timing or mix between expenditure cuts, tax increases or increases in money growth are uncertain affect economic dynamics before the switch takes place. Even in this case fluctuations in the rate of inflation are related to the "possibility" that future money growth will be used to finance present budget deficits, but the presence of uncertainty makes this direct relation less immediate than in the Sargent and Wallace approach. A similar argument has been discussed by Kawai and Maccini (1995). Other contributions using stochastic methods into the analysis of fiscal adjustment are Miller, Skidelsky and Weller (1990), Bertola and Drazen (1992) and Sutherland (1996)

means to achieve monetary stability. It is evident how this "central bank credibility literature" combines with the Sargent and Wallace contribution. It shows that a credible and "conservative" central banker, not only can reduce the inflationary bias of time consistent monetary policy, but also he can impose discipline on the fiscal authorities by limiting the amount of seignorage available to finance public expenditure. On the other hand, if this institutional solution is not sufficient to insulate the central bank from fiscal pressure (as may be argued in the case of EMU) then limits to its ability to borrow should be imposed.

Recent contributions have linked explicitly these two streams of literature. In an influential paper Tabellini (1986) studies the Sargent and Wallace conflict between fiscal and monetary policy in a dynamic game setting. As in Sargent and Wallace the results show a trade off between credibility and solvency of the public sector, with feedback strategies producing a lower level of fiscal stabilisation than open loop strategies in which the monetary authorities can commit to certain defined monetary target. Expanding this setting in a multi-country context, Van Aarle, Bovemberg and Raith (1997) replicate the Tabellini's results in a monetary union, although the feed-back strategies are now less damaging because the fiscal authorities are individually less influential vis-à-vis the European Central Bank. Consequently, with a monetary union fiscal policy absorb a relatively larger share of the adjustment burden from stabilising government debt than with national monetary policy. Hence fiscal policy is more disciplined with a monetary union than with national monetary policy[5]. Moreover, they also show that granting "Stackelberg" leadership to a "conservative" monetary authority produces the lowest degree of money growth and fiscal deficit.

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[5] - On the other hand, fiscal authorities were shown to regain the power they have with national central banks if they cooperate with each other, because by cooperating they operate "as if" they were a single European fiscal authority. This confirms the result derived by Rogoff (1985b) that incomplete co-operation can be harmful.

These contributions seems to confirm that an institutional fixing that gives to the Central Bank both an high degree of credibility (i.e. ability to pre-commit) and a formal "Stackelberg" leadership (i.e. the ability to impose its own preferences on the other players), can resolve both the inflationary bias and the over-expansionary bias at once.

The Maastricht fiscal criteria are derived directly from this interpretation of the interdependence of monetary and fiscal policy. If the main objective of economic policy should be price stability (and in a Ricardian world cannot be otherwise), giving leadership to an independent central bank committed to price stability and constraining the behaviour of the fiscal authorities are necessary and sufficient conditions to achieve this objective.

Given the dominance of the ideas illustrated above, a question naturally arises: how robust are these conclusions either from a theoretical point of view and, more importantly in the European context, from a practical one. In the next part, and in the next chapter we will look and extend a recent theoretical debate that, arguing for a central role of fiscal policy behaviour in the determination of the price level, ultimately reinterprets the linkage between discretionary fiscal policy and aggregate demand in a way that closely reminds the traditional Keynesian analysis. In doing so, it also forces us to rethink at the role of Central Banks in determining the macroeconomic equilibrium.

### *3.3. The Fiscal Theory of Price Determination*

A recent stream of research (Woodford 1995,1996 Simms, 1993,1995, and Bergin, 1997a, 1997b), building on previous works of Calvo (1990) and Leeper (1991) among others, has renovated the interest in the analysis of the interrelation between monetary and fiscal policy, partly questioning the conclusions derived from the Sargent and Wallace approach. The main innovation introduced by these contributions is that the interrelation between fiscal policy on one side, and monetary policy and the private sector on the other, manifests itself though changes in the level of prices that move to achieve public sector

solvency, independently of the institutional arrangements between fiscal and monetary authority.

Variables like net government liabilities and expectations regarding the stream of future surpluses are given an immediate role in the determination of the equilibrium price level. If the government's solvency condition were not satisfied at a particular point in time, (i.e. the stream of current and expected future surpluses would not pay the existing debt) price will move to ensure that it does hold.

The first goal of this approach to monetary and fiscal policy interdependence is to derive conditions under which the level of price is determined even in a regime of nominal short run interest rate targeting. In the quantity theory tradition, when the monetary authority targets the nominal interest rate, it supplies any amount of money demanded by the private sector. Given that the demand of money is a demand for real money balances, a given quantity of real money can be determined by an infinite number of combinations of nominal money supply and prices, producing indeterminate levels of prices and money stocks (Patinkin, 1961, Sargent and Wallace, 1975). On the contrary, the fiscal theory of price determination (FTPD) finds an anchor for the price level in the dynamics of expected future fiscal surpluses.

The basic mechanism behind the theory can be illustrated using an infinite horizon model with money in the utility function similar to the one used by Bergin(1997). In this model, a representative agent solves a standard optimisation problem,

$$\max_{B,M} U(C) = E_{t-1}\left[\sum_{t=0}^{\infty} \beta^t \left(\log C_t + \mu \log \frac{M_t}{P_t}\right)\right] \qquad (1)$$

subject to

$$C_t + \frac{B_t}{P_t} + \frac{M_t}{P_t} = (1 + i_{t-1})\frac{B_{t-1}}{P_t} + \frac{M_{t-1}}{P_t} + Y_t - \tau_t \qquad (2)$$

and

$$B_t \geq 0 \qquad M_t \geq 0 \qquad C_t \geq 0$$

where all the variables have the standard meaning, $i_t$ is the nominal interest rate, the income $Y_t$ is an independent and normally distributed positive random variables and $\tau$ is a lump sum tax imposed by the government. The government budget constraint, expressed in nominal term, is:

$$B_t + P_t\tau_t = (1+i_{t-1})B_{t-1} - (M_t - M_{t-1}) \tag{3}$$

The government must fix two of the five variables in (3), or define a function for each of them, in order for the model to be complete. The other three variables will then be determined by the private agent first order conditions. The F.O.C are given by:

$$\frac{\delta U}{\delta C}: \qquad \frac{1}{C_t} = \lambda_t \tag{4}$$

$$\frac{\delta U}{\delta B}: \qquad \frac{1}{P_t C_t} = \beta(1+i_{t-1})E\frac{1}{P_{t+1}C_{t+1}} \tag{5}$$

$$\frac{\delta U}{\delta M}: \qquad \frac{M_t}{P_t} = \mu\frac{1+i_t}{i_t}C_t \tag{6}$$

Suppose that the government follows a policy of nominal interest rate targeting and fixes *i* and the level of taxes. Then the government budget constraint divided by $P_tC_t$ is given by:

$$\frac{B_t}{P_tC_t} = \frac{P_{t-1}C_{t-1}}{P_tC_t}\left((1+\bar{i})\frac{B_{t-1}}{P_{t-1}C_{t-1}} + \frac{M_{t-1}}{P_{t-1}C_{t-1}}\right) - \frac{M_t}{P_tC_t} - \frac{\tau}{C_t} \tag{7}$$

Taking the expectations of (7) and using the private sector FOCs and the fact that in equilibrium is C=Y, we have (using condition 5 and 6):

$$E_{t-1}\left(\frac{B_t}{P_tY_t}\right) = \beta^{-1}\frac{B_{t-1}}{P_{t-1}Y_{t-1}} - \tau E_{t-1}\left(Y_{-1t}^{-1}\right) - \mu\left[\frac{1-\beta-\beta\bar{i}}{\beta\bar{i}}\right] \tag{8}$$

Equation (8) is an unstable difference equation ($\beta<1$), with the last term representing the expected constant seignorage revenues, given the policy pegging nominal interest rate. Condition (8) has a single stable solution, as:

$$\frac{B}{PY}=\frac{\beta}{1-\beta}\left[\tau E_{t-1}\left(Y_t^{-1}\right)+\mu\xi\right] \tag{9}$$

where $\xi$ is the constant term in equation (8). Given the level of taxes and the nominal interest rate, (9) is the only value of real debt compatible with the solvency of the public sector. Implicitly (9) represents the net present value of expected future surpluses, therefore any movement in the present income, or taxes or interest rate will produce a movement in prices such that the intertemporal budget constraint of the public sector is satisfied. Substituting this equilibrium value of future surpluses, called $\Phi$, in (7) it is possible to express the movement in prices respect the other real variable in the model:

$$\frac{P_t}{P_{t-1}}=\frac{(1+i_t)Y_{t-1}\Phi}{\Phi Y_t+\tau+(\mu\xi)} \tag{10}$$

Equation (10) shows the relation between income and price dynamics when the government follows an exogenous fiscal policy as the one studied by Sargent and Wallace.

This negative correlation between movements in prices and movement in real income is determined only by the particular fiscal policy followed by the Government. A level of income greater then its trend value eases the pressure on the level of prices coming from the fiscal side, therefore reducing the level of prices itself. On the other hand, the fiscal authorities can influence the level of prices via changes in the tax rate with a result that is observationally equivalent to the traditional demand effects of fiscal policy of the Keynesian tradition. A reduction in taxes increases the wealth effect of the debt outstanding, thus increasing private demand and prices until the real value of debt has not came back at its sustainable value.

The mechanism behind this relation totally depends on the wealth effect of public debt. In what is this approach differ from the traditional way to describe the determination of fiscal policy effects in a General Equilibrium Model? In building up a general equilibrium model similar to the one described above, it is usual practice to close the model with two trasversality conditions, one for each agent. On one hand a rational private agent is required to plan is consumption-leisure choice in such a way that in the limit he will use all his available resources:

$$E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} C_s\right\} = (1+r)\frac{B_t}{P_t} + \frac{M_t}{P_t} + E_t\left\{\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}\left[(Y_s - \tau_s)\right]\right\}$$

On the other hand the same condition is also imposed on the behaviour of the government derived by integrating forward with a condition like (3), and imposing the final condition

$$\lim_{i\to\infty}\left(\frac{1}{1+r}\right)^{t+i}\frac{B_{t+i}}{P_{t+i}} = 0 \text{ or}$$

$$D_t = \sum_{i=0}^{\infty}\left(\frac{1}{1+r}\right)^{t+i-1}(\tau_{t+i}) \qquad (11)$$

where D is the real value of debt issued by the government. As argued by Buiter (1998) "These decision rules determine, jointly with the market clearing conditions, initial conditions and other system wide constraints, the equilibrium sequences of prices. The Budget constraints must be satisfied, however, both for equilibrium and for out of equilibrium sequences of endogenous variables in order for these budget constraints to co-determine these equilibrium sequences" (pp17-18). But in doing so, the equilibrium is imposed "ex ante", as a condition for the formulation of the model itself, and it is not the result, ex post, of possible disequilibrium dynamics[6].

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[6] - As we will see in the following section, the correspondence between planned use of resources ex-ante and its effective use ex-post, as postulated in the traditional theory of fiscal policy, is

In the FTPD instead, because the actual fiscal policy is expressed in nominal terms but the trasversality condition (11) is expressed in real terms, it is possible that a disequilibrium behaviour of the government produces a movement in prices that generates a new equilibrium in which (11) is satisfied at an higher nominal debt and an higher level of prices. Only a policy the explicitly follows a Ricardian rule, as defined by (11), produces total independence of prices from fiscal dynamics.

For example, consider the case of a government following a tax policy that adjusts the level of taxes to the level of real debt, as:

$$\tau_t = -\theta_0 + \theta_1 \frac{B_t}{P_t} \tag{12}$$

Substituting this policy rule in the budget constraint (8) we obtain:

$$E_{t-1}\left(\frac{B_t}{P_t Y_t}\right) = \beta^{-1} \frac{B_{t-1}}{P_{t-1} Y_{t-1}} + \theta_0 E_{t-1}\left(Y_{-1t}^{-1}\right) - \theta_1 E_{t-1}\left(\frac{B_t}{P_t Y_t}\right) - \mu\left[E_{t-1}(Y_t) - \beta^{-1} Y_{t-1}\right]$$

or, simplifying:

$$E_{t-1}\left(\frac{B_t}{P_t Y_t}\right) = \frac{1}{\left[(1+\theta_1)\beta\right]} \frac{B_{t-1}}{P_{t-1} Y_{t-1}} + \frac{1}{(1+\theta_1)} \left\{\theta_0 E_{t-1}\left(Y_{-1t}^{-1}\right) - \mu\left[E_{t-1}(Y_t) - \beta^{-1} Y_{t-1}\right]\right\} \tag{13}$$

that is a stable difference equation as long as $(1+\theta_1)\beta$ is greater than 1. The meaning of equation (13) is pretty obvious: if taxes react to the increase in debt strongly enough, equation (13) is stable and a policy of pegging the level of prices does not conflict with the equilibrium of the public sector[7].

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particular problematic when analysing issues like the effect of overexpansionary fiscal policies. At the same time it seems at odds with the fact that while our conventional measure of fiscal sustainability (based on the intertemporal budget constraint as defined by equation 11) seems to indicate that the majority of industrialised countries has followed for long period of time unsustainable fiscal policies, at the same time no one has defaulted its debt (see for example, Uctum and Wickens, 1997, Artis and Marcellino, 1998).

[7] - Leeper (1991), Sims (1994) and Canzoneri and Diba (1997) separately analyse the all possible rules that provide the same stability condition than (13), demonstrating that even less stringent rules than the one illustrated can provide the same "Ricardian" result (as defined by Woodford,

It is clear that the above approach greatly reduces the role of the monetary authorities in determining the price level and, at the same time, casts serious doubt that the independence of the central bank should be the sole instrument for price stability. As argued by Posen (1993), Central Bank independence is not the instrument for achieving price stability by itself, but is the way in which the fiscal authorities have signalled to the market their willingness to stabilise the fiscal position, therefore achieving price stability through a change in fiscal stance. On the other hand monetary policy independence without a fiscal policy coherent cannot achieve the proposed objective of price stability.

### *3.4. Price Adjustment and Short Sighted Government: Is it a Necessary Feedback Mechanism?*

The fiscal theory of price determination is troublesome because it violates one of the fundamental principle of constructing a general equilibrium model. As argued strongly by Buiter (1998, pag.17) in a well posed general equilibrium model "household and government decision rules, whether derived from optimising behaviour,.., or imposed in an ad hoc manner,.., are constrained by intertemporal budget constraints that must hold for all price sequences (and other sequences of endogenous variables) and for all initial non-monetary debt stocks".

As we saw before, the Woodford -Sims approach, instead, implicitly assumes that the fiscal authority follows a policy rule independently of what the private sector or the monetary authority does. Given this autonomous behaviour, the difference between different policy rule is that for some auto-stabilising policy rules, the price level will not be effected because, as in a Ricardian world, fiscal policy does not change the expected value of private wealth. On the other hand, fiscal policy rules which do no automatically produced a stabilisation of expenditure or, using Leeper terminology (Leeper,1991,pp.13) an "active" fiscal policy that "is not constrained by current budgetary position", changes

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1995). Bergin (1998) analyses the same rules in a monetary union and concludes that the Maastricht rules are sufficient but not necessary to achieve Ricardian fiscal policies.

the expected value of private wealth, and therefore induces changes in nominal demand. This will induces changes in prices, until the real value of private wealth is not stabilised again at its long run value[8]. What matter is that the equilibrium is determined totally by the reaction of the private sector to the action of the fiscal authority. Although ex-ante the fiscal plans can be inconsistent (in the expectations of the private sector) with long run solvency, the reaction of the private sector is such that the ex-post equilibrium satisfy all the long run equilibrium conditions.

We believe the theory can be an useful tool every time any imposition of an ad-hoc equilibrium behaviour of the government is not a safe assumption to make. In particular, an important implication of this literature that is often overlooked is the fact that the change in prices could represent a feedback mechanism from a forward looking private sector and a short sighted government[9].

Traditionally (see for example Agell, Calmfors, Jonsson, 1996, Beetsma and Boovemberg,1997) a short sighted government produces inferior welfare outcomes because it does not take in consideration the future in forming the plan for the present. A government can decide to cut taxes without consideration of the debt accumulation that it will produce, at least until the intertemporal budget constraint is binding, or, in our previous setting, until the taxes required to stabilise the debt are equal to the income

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[8] - The exposition of the theory assumes perfect flexibility of prices and therefore expansionary fiscal policy will produce an immediate jump in the level of prices. Woodford (1996) extend the basic model to a monopolistic competitive framework and shows that, in presence of slow price adjustment, the effect of an "active" fiscal policy is similar to traditional Keynesian models. It would be possible to build up a fix price model in which active fiscal policy has only real effects. Therefore Buiter critics that the FTPD is only a theory of the initial price level (Buiter 1998, pp.24-25) is true only assuming perfect flexibility of prices. In this respect the FTPD is only an attempt to give micro-foundations at the traditional Keynesian analysis of fiscal policy. See also Sims (1998).

[9] - Short run governments is not a pathology of democracies. Although it is beyond the scope of this thesis, it is relevant to ask if short sighted governments play a role in the stability and development of our economies. As an inverted overlapping generation model, our society are characterised by long living citizens and short lived government.

generated in the economy. At that moment, and only at that moment, a shortsighted government will realise the necessity to stabilise its fiscal position[10].

This scenario is particularly worrisome in the case of monetary union, as we saw in the previous chapter, because if the fiscal position is close to collapse, it could trigger an automatic transfer of wealth toward the country in fiscal distress, allowing the short sighted government to achieve the improvement in private wealth that was trying to achieve in the first place.

On the other hand, if we apply the fiscal theory of price determination, a fiscal default cannot happen[11] because the prices will move to restore the equilibrium of the fiscal sector, but fiscal in-discipline will be accompanied by price movement that will reduce the private wealth at the level prior of the fiscal manoeuvre. Therefore even a government that cares only about the wealth of its citizens during its period in office, would have to consider the inflationary effect of its actions in deciding its fiscal plan.

Consider for example a version of the model described above without, for simplicity, explicit consideration of real money balance holding[12]. Therefore now the private sector maximises a logarithmic utility function in real consumption:

$$\max_{C_t, B} U(C) = E_{t-1}\left[\sum_{t=0}^{\infty} \beta^t (\log C_t)\right]$$

subject to the following budget constraint and the usual trasversality conditions:

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[10] - At the same time a short sighted government will never default voluntarily because the present cost of default is always higher than the cost of increasing taxes permanently, as we have noted in chapter 2.

[11] - This is closely related to the discussion if the debt crisis in developing economies at the beginning of the 80' was a solvency crisis or a liquidity crisis (Cline 1982). In the Woodford and Sims approach, only liquidity crisis can produce a fiscal default, because long run solvency is an equilibrium condition.

[12] - This simplification is required only as an exposition device of the core argument that follows. The introduction of real money balances is appropriate when considering the interrelation between fiscal and monetary policy, as in the previous part and in the following chapter. Because we want to concentrate the attention on a particular future of the theory, non dependent on the presence of real money balance in the analysis, we have preferred to clear the exposition of unnecessary

$$C_t + \frac{B_t}{P_t} = (1+i_{t-1})\frac{B_{t-1}}{P_t} + Y_t - \tau_t \qquad (13)$$

$$\lim_{i\to\infty}\left(\frac{1}{1+r}\right)^{t+i}\frac{B_{t+i}}{P_{t+i}} = 0$$

Integrating forward the single period budget constraint and applying the trasversality condition, the result is the following intertemporal budget constraint:

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} C_s = \left[(1+i)\frac{B_{t-1}}{P_t} + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - \tau_s)\right]$$

and, given the Euler equation for the consumption,

$$C_t = (1-\beta)\left[(1+i)\frac{B_{t-1}}{P_t} + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - \tau_s)\right] \qquad (14)$$

Consider a pure myopic government, which lasts for a finite number of periods only[13]. At the same time, assume that the only policy objective of this government is to maximise the wealth of its citizens during the period in office. Because the financial wealth of the private sector, in our highly simplified framework, is formed only by public debt, the objective function for the government can be described as:

$$\max_{\tau}\sum_{s=t}^{T}\left(\frac{1}{1+r}\right)^{s-t}\frac{B_T}{P_T} = \left[(1+i)\frac{B_{t-1}}{P_t} + \sum_{s=t}^{T}\left(\frac{1}{1+r}\right)^{s-t}(Y_s - \tau_s) - \sum_{s=t}^{T}\left(\frac{1}{1+r}\right)^{s-t} C_s\right] \qquad (15)$$

According to equation (15) the best possible way to achieve this objective is to set taxes to zero for the remaining period in office. In a Ricardian world the private sector will increase savings for the same amount that the fiscal expansion in the belief that another government will come, sooner or later, to ask the money back through the tax system.

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complications. Moreover, because we are considering a situation of possible iperinflation, a bounded utility function would be more appropriate if considering real money holding.

[13] - An old Italian tradition.

This will induce a continuous accumulation of debt until the adjustment will become unavoidable or a default will happen[14].

The problem with this sequences of events is that, in principle, the government has only one way to determine where is the limit of this process of accumulation of debt, and this is the default itself. There is no way to determine ex-ante where the limits of debt accumulation are.

If instead we look at the same problem from the point of view of the fiscal theory of price determination, the policy followed by the short sighted government will produce an immediate effect on the level of demand, and therefore on the level of prices, as long as the private sector believes that the policy will not be reverted by a future government. Formally, consider the extreme case that the expectations of the private sector are that no future government will follow a policy different from the present government. The difference equation governing the dynamics of public debt accumulation will be:

$$E_{t-1}\left(\frac{B_t}{P_t Y_t}\right) = \beta^{-1}\frac{B_{t-1}}{P_{t-1}Y_{t-1}} - \tau E_{t-1}\left(Y_{-1t}^{-1}\right) \qquad (16)$$

With $\tau = 0$ and $B_{t-1} > 0$ will have an unique stable solution equal to:

$$\frac{B}{PY} = 0$$

that implies a jump in the level of prices to $+\infty$, leaving a real private wealth equal to:

$$W_t = \left[\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s)\right] - \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} C_s \qquad (17)$$

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[14] - In the classical model fiscal uncertainty is the main channel of influence of fiscal policy on the economy. It is when the private sector is uncertain and tries to anticipate when and how the fiscal stabilisation will be promoted that a fiscal expansion can have an effect on consumption, interest rate and so on (See Bertola and Drazen,1988, Drazen and Helpman, 1990, Wiplotz 1991, Sutherland 1996).

The private sector, because all the public liabilities are private wealth, increases the level of consumption by the value of the public debt outstanding, and, given fixed amount of supply, would produce a jump in prices such that the perceived increase in private wealth will be completely reverted.

Note that the solution is an equilibrium solution, in which all the trasversality conditions are respected, although only ex-post. In particular the government intertemporal budget constraint is certainly respected.

Given the initial amount of debt, any government find itself in front of a trade off between present taxes and present jump in price level. Moreover, any dynamics of taxes produces one only dynamic of prices compatible with the long run equilibrium condition of the public sector. The kind of dynamic that any government will choose will depend on the perceived marginal cost of inflation and taxes.

In general, fiscal policies not consistent with long run solvency of the public sector, will produce jump in price level, or inflationary pressure in the economy depending on how the supply side is modelled

As in the previous chapter, there is no need to impose unrealistic behaviour of the government. Because the private sector is ultimately the only agent in the position to form long run plans, its expectations about the future determines the impact of a certain fiscal policy, and in doing so gives a signal to the fiscal authority on the feasibility of the fiscal plan itself.

## *3.5 Conclusions*

The discussion of this chapter partly changes the analysis of chapter two. In fact the application of the Woodford and Sims approach clearly reduces the importance of possible fiscal default and any measure to prevent it is superfluous. Fiscal policy rules becomes an important element of macroeconomic stability, and therefore either fiscal institutions and fiscal authority preferences become central in the discussion of the

macroeconomic dynamics and equilibrium. A short sighted government does not produce only an inefficient debt dynamics, but it affects price dynamics as well. Or a government with a low propensity towards the control of inflation, has a de-facto "Stackelberg" leadership in determine the macroeconomic equilibrium, regardless its institutional relationship with an independent central bank

Our analysis show the importance of potential future inflation and the need to impose "at any time" sound fiscal policies, in order to maintain full control of prices. In an European context, the analysis clearly complicates the channels of interdependence between fiscal policies of different member country and between fiscal and monetary authorities.

In the next chapter we will apply the previous theoretical contributions to a two country monetary union in order to analyse closely these channels of interdependence.

# CHAPTER 4.

# FISCAL AND MONETARY POLICY INTERDEPENDENCE IN EMU REVISITED

## *4.1 Introduction*

The fiscal theory of price determination reviewed in the previous chapter represents a significant departure from the "seignorage" based analysis of fiscal and monetary interaction. It emphasises the role of fiscal policy in determining the macroeconomic equilibrium and, in doing so, it questions a mechanistic interpretation of the role of the Central Bank in providing monetary stability. In fact, ultimately the prime responsibility for monetary stability is relocated in the fiscal rules followed by the fiscal authority.

This is particularly important in the context of European Monetary Union. In EMU, the institutional linkages between monetary and fiscal policy are weakened, if not totally removed. One single central bank confronts multiple fiscal authorities, with potentially different objectives and constituencies. These institutional characteristics open the possibility of free riding on the common good, however defined, and this is more likely, higher are the potential gains.

In this respect, the theoretical framework illustrated magnifies the cross border effects of fiscal policies, and consequently increases the potential gains of free riding. Rather than being limited to effects on interest rates or real exchange rate, as normally argued in modern macroeconomic theory (Frenkel and Razin, 1987, Brociner and Levine, 1995, Obstfield and Rogoff 1996), overexpansionary fiscal policies in a monetary union can

produce spillovers onto the common price level. It can produce direct transfers of wealth. It can force contractionary fiscal policies of the partners. It is therefore important to consider this hypothesis not for its intrinsic meaning, but because it represents the most extreme theoretical case in which to test the robustness of the common institutions.

The objective of this chapter is to give a contribution in this direction, analysing some of the implications of the fiscal theory of price determination in the institutional setting designed at Maastricht. In doing so, we will also look at the best way to minimise the risks of overexpansionary bias, as defined in chapter 2. In particular we will look again at the question if the enlargement or deepening of the Union can help in overcoming these risks. In part two, the model will be described. Thereafter we will analyse the effect of fiscal expansion in one country under two different monetary policy rule. Finally, the effect of changing the relative dimension of the members of the union will be analysed, to see if there is a possible solution in enlargement.

## *4.2 The Model*

The model is a direct expansion to a two country monetary union of the closed economy model derived in the previous chapter. In doing so we follow the contributions of Bergin (1997a, 1997b) and Woodford (1996). As in the previous chapter, each country is populated by an infinitely -lived agent who maximise a logarithmic utility function in terms of consumption and real money balance:

$$\max_{C_1,M_1B_1} U_1 = E_t\left[\sum_{s=t}^{\infty}\beta^{s-t}\left(\log C_{1s} + \mu\log\frac{M_{1s}}{P_s}\right)\right] \qquad (1)$$

subject to:

$$C_{1t} + \frac{B_{1t}}{P_t} + \frac{M_{1t}}{P_t} = (1+i_{t-1})\frac{B_{1t-1}}{P_t} + \frac{M_{1t-1}}{P_t} + Y_{1t} - \tau_{1t} \qquad (2)$$

where the index *(1)* is the country index, *i* is the nominal interest rate[1], and

$M_{1t} \geq 0 \qquad C_{1t} \geq 0 \qquad B_{1t} \geq 0$

Equation (2) is the usual budget constraint, equating consumption, assets accumulation and real money balance, to the returns on wealth and exogenous non-asset income *Y*. Optimisation of the private agent requires that all the wealth will be used in the available time horizon, a condition that can be formalised with the usual trasversality condition on total financial assets.

$$\lim_{T\to\infty}\left(\prod_{s=t}^{T-1}\left(\frac{1}{1+r_s}\right)\right)\left(\frac{B_{1T}}{P_T}+\frac{M_{1T}}{P_T}\right)=0 \tag{3}$$

This, combined with the consumer budget constraint, implies:

$$\frac{W_{1t}}{P_t}=\sum_{s=t}^{\infty}\left(\prod_{j=t}^{s-1}\frac{1}{1+r_j}\right)\left[C_{1s}+\tau_{1s}-Y_{1s}+\frac{i_s}{1+i_s}m_{1s}\right] \tag{4}$$

where $W_{it}$ is the beginning of the period nominal financial wealth[2]:

$$W_{1t}=(1+i_{t-1})B_{1t-1}+M_{1t-1} \tag{5}$$

The first order conditions for the maximisation problem are:

$$\frac{1}{(1+i_t)}=\beta E\left(\frac{P_t}{P_{t+1}}\frac{C_{1t}}{C_{1t+1}}\right) \tag{6}$$

$$\frac{M_{1t}}{P_{1t}}=\mu\frac{1+i_t}{i_t}C_{1t} \tag{7}$$

The private sector of country (2) faces an identical optimisation problem with analogous constraints and solutions. In particular, the private sector of country (2) has an intertemporal budget constraint analogous to (4) as:

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[1] - As in Chapter 2, we abstract from the possibility that differential bond default risks produces differential bond prices. See p.30 n.13. Moreover in the context of the fiscal theory of price

$$\frac{W_{2t}}{P_t} = \sum_{s=t}^{\infty}\left(\prod_{j=t}^{s-1}\frac{1}{1+r_j}\right)\left[C_{2s} + \tau_{2s} - Y_{2s} + \frac{i_s}{1+i_s}m_{2s}\right] \qquad (4')$$

The two governments finance a fix stream of public consumption *G* with lump sum taxes $\tau_{1t}$ and issues of one period government debt $D_{it}$, but do not have direct control over creation of money, a function delegated to the common central bank. The government budget constraint is thus expressed as:

$$\overline{G}_1 + (1+i_{t-1})\frac{D_{1t-1}}{P_t} = \tau_{1t} + v_{1t} + \frac{D_{1t}}{P_t} \qquad (8)$$

where *v* is the rebate that each government receives from the common central bank as return from the profits the central bank does in its open market operations. Thus, the budget of the common central bank will look like:

$$\frac{B_{mt}}{P_t} + v_{1t} + v_{2t} = (1+i_{t-1})\frac{B_{mt-1}}{Pt} + \frac{M_t - M_{t-1}}{P_t} \qquad (9)$$

in which the revenues from the operation of creation of new monetary base are redistribute in equal share between the two governments composing the union ($v_{it}$=$v_{2t}$). Finally, the market clearing conditions for all the markets are required:

$$C_{1t} + C_{2t} + \overline{G}_1 + \overline{G}_2 = Y_{1t} + Y_{2t} \qquad (10)$$

$$M_{1t} + M_{2t} = M_t \qquad (11)$$

$$B_{1t} + B_{2t} + B_{mt} = D_{1t} + D_{2t} \qquad (12)$$

As in the previous chapter for the case of the single economy, the model is not closed, as commonly done, with individual intertemporal budget constraints for each single policy authority[3]. In fact, the optimising behaviour of the private sector does not restrict the

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determination it is not clear how default should be defined, because any fiscal imbalances will be absorbed by the variation in the level of prices.

[2] - See Appendix (1) for the derivation of condition (4) above

[3] - In a monetary union the interpretation of this issue is less contentious than in a single country economy that we analysed in the previous chapter. As argued by Bergin (1997b, pag. 8)"In a one-

possible strategies confronted by the authorities. What it does restrict and determine is the real equilibrium values of the private wealth compatible with the long run equilibrium of the economy. In particular, consolidating the two private sector budget constraints (4) and (4') we have:

$$\frac{W_{1t}}{P_t}+\frac{W_{2t}}{P_t}=\left(\frac{(1+i_{t-1})(B_{1t-1}+B_{2t-1})+M_{t-1}}{P_t}\right)= \\ =\sum_{s=t}^{\infty}\left(\prod_{j=t}^{s-1}\frac{1}{1+r_j}\right)\left[C_{1s}+C_{2s}+\tau_{1s}+\tau_{2s}-Y_{1s}-Y_{2s}+\frac{i_s}{1+i_s}m_s\right] \quad (13)$$

It is clear that the consolidated private sector's budget constraint above is equal to the sum of the real value of government liabilities at date t.

As in the second chapter, monetary union breaks the independence of each national authority. It is therefore the aggregate behaviour of the policy authorities that determines the characteristics of the "common" economic equilibrium. While in our analysis of the second chapter the probability of default and bailing out produces this interdependence between fiscal policies in a monetary union, now the same interdependence grows from the structural characteristics of the model.

Moreover, once the idea that long run equilibrium is guaranteed ex-ante by "no -Ponzi game" conditions is abandoned, the solution of the model becomes very sensitive to the behaviour of the different actors. The fiscal authorities, controlling fiscal deficit and surplus, influence real and nominal variables and influence each other. The Central Bank is not isolated from the fiscal authorities, but its policy rules determines the way in which fiscal policy interacts. And finally, the private sectors ultimately determine, with their expectations about future surpluses, the impact of each fiscal policy.

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country model, the household intertemporal budget constraint would be identical to the consolidated government intertemporal budget constraint, so the government solvency would indeed be required for an equilibrium. However here in a monetary union, these solvency conditions appear in a form that consolidates and then decomposes them along different lines, by household rather than by government." We argue, instead, that the central point of the theory, i.e. that the intertemporal government budget constraint is an equilibrium condition that is the result of the interaction of individual and government plans, is not changed by the different dimensionality

## *4.3 Monetary Policy Rules and Price Stability in EMU*

The effect of a consolidated budget constraint as (13) is not totally dissimilar from what we have already analysed in chapter two. In order to push our analysis one step forward, we consider a fiscal expansion in one country, that is not expected to be reverted in the future, with both fiscal policy of the partner country and the monetary policy inactive, or pegged to the desired level of real taxes and nominal interest rate. If the shock of the fiscal deficit of country one is small enough, it is sufficient to consider a linearisation of the equilibrium conditions described in the previous section.

We will consider two monetary policy rules, represented by pegging nominal interest rate and by pegging the level of prices. In the first case all the policy authorities are passive, while in the second monetary policy has to react to the fiscal policy shocks to achieve its stated objective, representing a situation more similar to the one that characterises EMU.

In both cases we will use a linearized version of the model above around a generic steady state.

### 5.3.1 - Fiscal Expansion with Nominal Interest Rate Pegging

Given the monetary policy rule

$$(1+i_t)=(1+\bar{i}) \tag{14}$$

the two first order conditions (6) and (7), in linearized form are simply:

$$E_t\tilde{c}_{1t+1}+\overline{C}_1E_t\tilde{p}_{1t+1}=\tilde{c}_{1t}+\overline{C}\tilde{p}_{1t} \tag{15}$$

$$\tilde{m}_{1t}=\frac{\mu}{(1-\beta)}\tilde{c}_{1t} \tag{16}$$

where tildes mark deviation from the steady state. Moreover the private sector intertemporal budget constraint in country one can be written as:

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of the problem (from one country with one policy authority to a monetary union with different policy players). What changes is the mechanism with which this equilibrium is reached.

$$\widetilde{W}_{1t} - \widetilde{p}_t = \left(\frac{\overline{W}_1}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{\infty} \beta^{s-t}\left(\widetilde{c}_{1s} + \widetilde{\tau}_{1s} - \widetilde{y}_{1s} + (1-\beta)\widetilde{m}_{1s}\right) + \sum_{s=t}^{\infty} \beta^{s-t-1}\left(\widetilde{p}_{s+1} - \widetilde{p}_s\right)\right] \tag{17}$$

Using the two linearized first order conditions and the goods market clearing condition, we can solve (17) for current consumption[4]:

$$\widetilde{c}_{1t} = \left(\frac{1-\beta}{1+\mu}\right)\left[\left(\widetilde{W}_{1t} - \widetilde{p}_t\right) + \left(\frac{\overline{W}_1}{\overline{P}}\right)^{-1} E_t \sum_{s=t}^{\infty} \beta^{s-t}\left(\widetilde{y}_{1s} - \widetilde{\tau}_{1s}\right)\right] \tag{18}$$

equation (18) simply states that the present consumption is a function of the difference between present public liabilities and expected tax revenues. In order to determine an analogous equation for prices we have to consider linearized version of the aggregate relation (13). Imposing the market clearing condition, we have:

$$\widetilde{p}_t = \widetilde{W}_t - \left(\frac{\overline{W}}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{\infty} \beta^{s-t}\left(\widetilde{\tau}_{1s} + \widetilde{\tau}_{2s}\right)\right] \tag{19}$$

Remembering the definition of $W$ given in equation (5), equation (19) can be rewritten as:

$$\widetilde{p}_t = \left(\frac{\widetilde{D}_{1t-1} + \widetilde{D}_{2t-1}}{\beta} + \widetilde{M}_{t-1}\right) - \left(\frac{\overline{W}}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{\infty} \beta^{s-t}\left(\widetilde{\tau}_{1s} + \widetilde{\tau}_{2s}\right)\right] \tag{20}$$

Equation (20) illustrates the symmetry between government debt and money, once the Ricardian linkage between present debt and future surpluses is broken. As noted by Sims, issuing debt is equivalent to the issue of money, and does not need to be backed by any future real wealth. Therefore "whatever the level of future surpluses, government debt represents a claim on them. Additional Government debt simply dilutes the claims of existing government debt" (Sims, 1997, p.3). The change in the level of prices produces this dilution of the value of debt. The same mechanism is in operation when a change in the quantity of nominal money is not backed by a change in present and future income.

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[4] - See appendix 2 for the derivation

Given the desired level of real money balance, the price level has to adjust to satisfy, ex post, the private sector's optimality conditions.

The main implication of equation (20), in the context of monetary union, is that each government can engineer a de-facto "monetary" expansion simply increasing the level of government debt, or reducing the level of future surpluses. This creates a more direct, and permanent, spillover effect of an expansionary fiscal policy in the whole union

Consider the effect of a change in expected taxes in country one for T periods as:

$$S_t = \sum_{s=t}^{\infty} \beta^{s-t}(\tilde{\tau}_{1s}) \qquad < \qquad 0 \tag{21}$$

Given the monetary policy and the fiscal policy of the other fiscal authority, the level of prices will be:

$$\tilde{p}_t = -\left(\frac{\overline{W}}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{T} \beta^{s-t}(\tilde{\tau}_{1s})\right] \tag{22}$$

where the negative sign indicates a positive change in the level of prices given the negative change in the level of taxes. Consequently, substituting (21) and (22) in (18), the effect on national consumption is:

$$\tilde{c}_{1t} = -\left(\frac{1-\beta}{1+\mu}\right)\left[\left(\frac{\overline{P}\left(\overline{W}-\overline{W}_1\right)}{\overline{W}\overline{W}_1}\right)\sum_{s=t}^{T} \beta^{s-t}(\tilde{\tau}_{1s})\right] \qquad > \ 0 \tag{23}$$

Contrary to the single economy case, this expansionary fiscal policy has a permanent effect on the level of consumption because it changes permanently the value of national wealth. This is possible because this expansionary fiscal policy produces a change in the level of prices across the union, affecting value of real wealth in country 2. In fact it will be:

$$\tilde{c}_{2t} = \left(\frac{1-\beta}{1+\mu}\right)\left[\left(\frac{\overline{W}}{\overline{P}}\right)^{-1} \sum_{s=t}^{T} \beta^{s-t}(\tilde{\tau}_{1s})\right] \qquad < \ 0 \tag{24}$$

The operation of reduction in expected surpluses produces a direct transfer of wealth from country *2* towards country *1*.

Moreover, it is clear that the government of country *2* can avoid being the loser in this policy game only by following the fiscal policy of the most indisciplined government. In fact, if both governments follow the same policy of fiscal expansion:

$$\widetilde{c}_{2t} = \widetilde{c}_{1t} = 0$$

but the change in the level of prices will now be equal to:

$$\widetilde{p}_t = -\left(\frac{\overline{W}}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{\infty} \beta^{s-t}\left(\widetilde{\tau}_{1s} + \widetilde{\tau}_{2s}\right)\right] \qquad (25)$$

This is a particularly strong kind of overexpansionary bias not dissimilar to the one shown by Viegi (1997) in a game theoretical framework. In a monetary union the otherwise most disciplined countries would have no incentive to maintain discipline, confronted with indisciplined behaviour of some members. Therefore they will use their fiscal instrument as much as the more indisciplined country in order not to penalise their own private sector[5].

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[5] - Canzoneri, Cumby and Diba (1998) argue that, in a monetary union, only one undisciplined government determines the level of prices consistent with satisfaction of the government budget constraint, while any other government, even if follows a fiscal dominant policy, takes the level of prices as given and consequently has to adjust its budget position. This is because they do not agree that the relevant budget constraint is the Europe wide one, and not the single government ones. Moreover the change in the level of prices is not a mechanic jump to satisfy the budget constraint, but is brought by the change in consumption that the "uncovered" fiscal policy produces. An increase in unfunded fiscal policy by one member state increases national consumption and increases the level of prices. The increase in prices reduces the wealth of the private sector in the other country and induce a surplus in the fiscal position in the partner member states. If the governments do not react, the continuing surplus in one country de-facto finances the continuing deficit in the other. Otherwise, if governments react to rebalance their budgets again, the reduction in future expected taxes increases consumption in the disciplined member countries, putting pressure again on the level of prices until level of consumption, wealth and budget position are not returned at their steady state, characterised now but an higher level of prices. Having one or more fiscal indisciplined countries does not change the basic dynamics of the model. See also Dupor (1997), Sims (1998) and Woodford (1996) for applications of the theory in open economy.

## 5.3.2 - Fiscal Expansion with Price Pegging

Consider now the case that the monetary authority follows a policy of price level pegging at its average (EU wide) value. Once again we analysed a linearised version of the model around a generic steady state, under the specified monetary policy rule.

Now, the two first order condition (6) and (7) in linearized form are simply:

$$\tilde{c}_{1t} = E_t \tilde{c}_{1t+1} - \beta(\tilde{i}_t) \qquad (26)$$

and

$$\tilde{M}_{1t} = \mu \frac{1+\bar{i}}{\bar{i}} \tilde{c}_{1t} \qquad (27)$$

Where we have applied the assumption of price pegging. Aggregating (26) at the European level we have:

$$\tilde{c}_{1t} + \tilde{c}_{2t} = E_t \tilde{c}_{1t+1} + E_t \tilde{c}_{2t+1} - 2\beta(\tilde{i}_t)$$

Because of the assumption we made about the constancy of the aggregate European income, and the resource constraint (10), we have that

$$\tilde{c}_{1t} + \tilde{c}_{2t} = 0 \qquad \text{for every } t$$

and therefore

$$\tilde{i}_t = 0^{6}$$

What this means is that, in world of perfectly flexible prices, the European monetary authority cannot control a instantaneous jump in the price level with the use of the interest rate. Price pegging therefore require that:

$$\tilde{p}_t = (\tilde{W}_{1t}) - \left(\frac{\overline{W}}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{\infty} \beta^{s-t}(\tilde{\tau}_{1s} + \tilde{\tau}_{2s})\right] = 0$$

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[6] - Canzoneri and Diba (1996) analyse the possibility that the Central Bank uses its profits from holding government debt to cover the deficit in excess and demonstrate that, although theoretically possible, the increase of interest rate necessary to achieve the objective is highly unrealistic.

or, given the fact that nominal liabilities are predetermined at the beginning of the period,

$$\left(\frac{\overline{W}}{\overline{P}}\right)^{-1}\sum_{s=t}^{\infty}\beta^{s-t}\left(\tilde{\tau}_{1s}\right)=-\left(\frac{\overline{W}}{\overline{P}}\right)^{-1}\sum_{s=t}^{\infty}\beta^{s-t}\left(\tilde{\tau}_{2s}\right) \qquad (27)$$

In this policy regime, the responsibility of price pegging is totally on the shoulders of the fiscal authorities. The only way to maintain price stability is for country *(2)* to offset completely the fiscal expansion in country *(1)*, therefore producing the same amount of transfer of wealth previously produced by the increase in the level of prices.

As noted by Woodford (1996), this in effect means that the government of country *2* becomes a net creditor, while the debt of country *1* grows forever. Considering this scenario in strategic terms, it is unrealistic to consider the possibility that a government would follow this sort "bail out" policy in normal circumstances. It is more likely for country *(2)* simply to abandon the price pegging and follow the policy of country *(1)*. That would reproduce that undiscipline contagion described in the previous section.

## *4.4 - Rules Vs Institutions: An Europe of Regions Once Again?*

In principle, the respect of Maastricht like criteria solves the problem created by undisciplined fiscal policy behaviour, simply removing the possibility of indiscipline[7]. But because price stability is also a matter of private sector expectations about future surpluses, no monetary or fiscal policy rule can actually guaranteed against lack of credibility of the rules themselves.

The issue is mainly a theoretical one in the standard interpretation of fiscal and monetary policy interdependence. As we have shown in chapter two, only if a government risks default on its debt, fiscal rules loose their credibility. But this scenario is arguably quite unrealistic in the European context. On the other hand the framework we have used in this chapter significantly lowers the credibility threshold at which the fiscal rules lose their ability to maintain price stability. As long as the private sector is expected not to be asked

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[7] - Canzoneri and Diba (1996) and Bergin (1997a) show that also less stringent requirements could achieve the same objective.

to pay for a present fiscal expansion in the future, any kind of fiscal policy, of any dimension and any design, can have a significant impact on price determination. It is therefore useful to consider if an institutional setting exists which would provide the lowest impact of fiscal policy on the level of prices.

As in chapter two, it is interesting to observe the effect of enlargement, i.e. increasing the number of countries, or of deepening, i.e. regionalising the fiscal functions, on the price adjustment mechanism described above. Consider once again the case that the monetary union is formed by *n* symmetric countries, with same initial conditions. The monetary policy follows a nominal interest rate pegging rule. As before, the government in one country decides to reduce future taxes for T periods.

In a symmetric steady state, the total amount of private wealth in the union is given by:

$$\overline{W} = n\overline{W}_i$$

where *i* is the generic country index. If the government in country *1* follows the same expansionary policy described above, the effect on national consumption is given by:

$$\tilde{c}_{1t} = -\left(\frac{1-\beta}{1+\mu}\right)\left[\left(\frac{\overline{P}(n-1)}{n\overline{W}_1}\right)\sum_{s=t}^{T}\beta^{s-t}(\tilde{\tau}_{1s})\right] \qquad (28)$$

(28) shows that the effect of fiscal expansion on consumption is a function of the number of union members. Increasing the number of members increase the real effect of a fiscal expansion, as shown by the following limit:

$$\lim_{n\to\infty}\tilde{c}_{1t} = -\left(\frac{1-\beta}{1+\mu}\right)\left[\sum_{s=t}^{T}\beta^{s-t}(\tilde{\tau}_{1s})\right] \qquad (29)$$

At the same time the external effect of such policy mix is given by:

$$\tilde{c}_{jt} = \left(\frac{1-\beta}{1+\mu}\right)\left[\left(\frac{n\overline{W}_i}{\overline{P}}\right)^{-1}\sum_{s=t}^{T}\beta^{s-t}(\tilde{\tau}_{1s})\right] \qquad (30)$$

Equation (30) is clearly negative related to the number of members of the union, as the following limit shows.

$$\lim_{n\to\infty}\tilde{c}_{jt} = \left(\frac{1-\beta}{1+\mu}\right)\left[\left(\frac{n\overline{W}_i}{\overline{P}}\right)^{-1}\sum_{s=t}^{T}\beta^{s-t}\left(\tilde{\tau}_{1s}\right)\right] = 0 \qquad (31)$$

The reason for this asymmetric effect of enlargement is the fact that the level of prices for the whole union is only marginally affected by a change in consumption in a part of the union. Although, as long as the number of member is finite, an expansionary fiscal policy not backed by future surpluses will always produces an increase in the price level, the limit behaviour of prices is given by:

$$\lim_{n\to\infty}\tilde{p}_t = -\left(\frac{n\overline{W}_i}{\overline{P}}\right)^{-1} E_t\left[\sum_{s=t}^{T}\beta^{s-t}\left(\tilde{\tau}_{1s}\right)\right] = 0 \qquad (32)$$

Although, as in chapter two, enlargement reduces the external costs of indisciplined fiscal behaviour, it does not reduces the possibility of fiscal indiscipline. On the contrary, if for example the fiscal authorities plays a Cournot game among themselves, each one would regard a fiscal expansion as a "free lunch", providing the maximum beneficial effect in term of private wealth, without any significant costs in term of prices. In doing so each one of them will engineering an unfunded fiscal expansion that will produce a immediate jump in the level of prices without producing any wealth gain.

In conclusion enlargement is an important instrument to reduce the risks of external effects of local crisis, but should be supported by other institutional arrangements that reduces the possibility of free-riding on the common institution[8]. In fact, without appropriate safeguards, decentralisation and enlargement could increase the probability

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[8] - This possibility of free riding on the common institutions is the main motivation of the Maastricht criteria and the stability pact. Many contributions have linked the possibility of free riding with the inability of the Central Bank to commit. See for example Tabellini (1986), Betsma and Bovemberg (1996), van Aarle (1996) Chari and Kehoe (1997) and Castren (1998), among many others. It is obvious that in this context Maastrict rules eliminate the problem because eliminate the use of fiscal policy from the model. Nevertheless it is dubious that they can eliminate the need or the willingness to use the fiscal instrument, if are not accompanied by other

of fiscal undiscipline by the local fiscal authorities, because of the increase possibility of free riding that the interdependence of fiscal policies provides.

## *4.5 Conclusions*

This chapter has applied the fiscal theory of price determination in the context of a monetary union. The main implication of the theory is that fiscal policy can have a significant spillover effect on other member countries through the effect that it has on the common price level. Moreover the undisciplined behaviour of one country can force other members either to back the increasing debt with increasing fiscal surpluses, or to follow the same undisciplined policy, in order to avoid an undesired loss of national wealth. This will than produce a corner solution where everybody follow the same policy at expenses of an higher price level.

Some of the feature of the model are remarkably similar to the "fiscal default" analysis of chapter two. The interdependence between fiscal policies is such that the relevant government budget constraint to consider when performing the private sector maximisation is the European aggregate one. This arises the possibility of a strategic use of fiscal expansion to produce wealth transfer. Finally Decentralisation of the fiscal functions reduces the external cost of fiscal expansions, although at the same time increases the free rider problem.

What is important is that this scenario does not require "extreme" fiscal policies to be relevant. Even limited fiscal expansions, not backed by future surpluses, could produce significant change in the level of prices, and therefore significant spillover effects.

The model is certainly extreme in its conclusions, also because based on a simplified macroeconomic structure, that has allowed us to concentrate our attention on the theory main implications. Moreover a game theoretical framework would be necessary to fully consider the strategic solutions briefly described above.

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institutional measures that rends the fiscal rules incentive compatible in the long run. On this point see Demertzis et al (1998) and the following chapter.

In the next chapter we will instead consider how fiscal and monetary policy interact in standard model of monetary union. This will focus our attention on the institutional arrangements which can reduce the possibility of policy conflict between fiscal and monetary authority, either coming from risk of default, or from an excessive use of fiscal instruments, or from difference in preferences, or from political uncertainty.

In this respect the fiscal theory of price determination remains in the background, as the scenario in which fiscal policy would have the bigger impact on macroeconomic variables, and therefore where the possibility of conflict is higher.

## *Appendix 1*

## *Derivation of Private Sector Intertemporal Budget Constraint*

Although the derivation of the private sector budget constraint (1) in the main text follows standard lines, the porpoise of this appendix is to illustrate the method used as reference for readers.

The individual financial constraint presented in the main text is:

$$\frac{B_{1t}}{P_t}+\frac{M_{1t}}{P_t}=(1+i_{t-1})\frac{B_{1t-1}}{P_t}+\frac{M_{1t-1}}{P_t}+Y_{1t}-C_{1t}-\tau_{1t} \qquad \text{(A1)}$$

Taking it one period forward, we have:

$$\frac{B_{1t+1}}{P_{t+1}}+\frac{M_{1t+1}}{P_{t+1}}=(1+i_t)\frac{B_{1t}}{P_{t+1}}+\frac{M_{1t}}{P_{t+1}}+Y_{1t+1}-C_{1t+1}-\tau_{1t+1} \qquad \text{(A2)}$$

We use the Fisher parity equation

$$(1+i_t)=(1+r_t)\frac{P_{t+1}}{P_t} \qquad \text{(A3)}$$

to express (A2) in terms of real interest rate. Substitute it in (A2) and dividing everything for $(1+r_t)$, we obtain:

$$\frac{B_{1t+1}}{P_{t+1}(1+r_t)}+\frac{M_{1t+1}}{P_{t+1}(1+r_t)}=\frac{B_{1t}}{P_t}+\frac{M_{1t}}{P_{t+1}(1+r_t)}+\frac{Y_{1t+1}-C_{1t+1}-\tau_{1t+1}}{(1+r_t)} \qquad \text{(A4)}$$

that can be rewritten as:

$$\frac{B_{1t+1}}{P_{t+1}(1+r_t)}+\frac{M_{1t+1}}{P_{t+1}(1+r_t)}=\left(\frac{B_{1t}}{P_t}+\frac{M_{1t}}{P_t}\right)-\frac{M_{1t}}{P_t}\left(1-\frac{P_t}{P_{t+1}(1+r_t)}\right)+\frac{Y_{1t+1}-C_{1t+1}-\tau_{1t+1}}{(1+r_t)} \qquad \text{(A5)}$$

Substituting (A5) in (A1) and integrating forward we have:

$$\frac{(1+i_{t-1})B_{1t}}{P_t}+\frac{M_{t-1}}{P_t}=\sum_{s=t}^{T}\left(\prod_{j=t}^{s-1}\frac{1}{1+r_j}\right)\left[C_{1s}+\tau_{1s}-Y_{1s}+\frac{i_s}{1+i_s}m_{1s}\right]+\left(\prod_{s=t}^{T-1}\frac{1}{1+r_s}\right)\left(\frac{B_{1T}}{P_T}+\frac{M_T}{P_T}\right) \qquad \text{(A6)}$$

where we have used the relation

$$1-\frac{P_t}{P_{t+1}(1+r_t)}=\frac{i_t}{1+i_t} \qquad \text{(A7)}$$

Applying the usual trasversality condition

$$\lim_{T\to\infty}\left(\prod_{s=t}^{T-1}\left(\frac{1}{1+r_s}\right)\right)\left(\frac{B_{1T}}{P_T}+\frac{M_{1T}}{P_T}\right)=0 \tag{A8}$$

we obtain the intertemporal budget constraint as expressed in the main text

$$\frac{W_{1t}}{P_t}=\sum_{s=t}^{\infty}\left(\prod_{j=t}^{s-1}\frac{1}{1+r_j}\right)\left[C_{1s}+\tau_{1s}-Y_{1s}+\frac{i_s}{1+i_s}m_{1s}\right] \tag{A9}$$

## *Appendix 2*

### *Derivation of Condition (18)*

Under the monetary policy rule of constant nominal interest rate, the linearized form of demand for money balance can be written in term of present consumption as:

$$\widetilde{m}_{1t} = \mu\left(\frac{1}{1-\beta}\right)\widetilde{c}_{1t} \qquad \text{(A1)}$$

Condition (A1) is used to substitute money balance in the intertemporal budget constraint. Moreover, the intertemporal optimality condition required:

$$\widetilde{c}_{1t} + \bar{c}_1\widetilde{p}_t = \widetilde{c}_{1t+1} + \bar{c}_1\widetilde{p}_{t+1} \qquad \text{(A2)}$$

Summing it with the analogous condition for the private sector of country 2 we have:

$$\widetilde{c}_{1t} + \widetilde{c}_{2t} + (\bar{c}_1 + \bar{c}_2)\widetilde{p}_t = \widetilde{c}_{1t+1} + \widetilde{c}_{2t+1} + (\bar{c}_1 + \bar{c}_2)\widetilde{p}_{t+1} \qquad \text{(A3)}$$

and imposing the goods market clearing conditions:

$\widetilde{c}_{1t} + \widetilde{c}_{2t} = 0$ for every $t$

we have that

$$E\widetilde{p}_{t+1} = \widetilde{p}_t \quad . \qquad \text{(A4)}$$

suggesting, as noted by Buiter (1998), that no further price change is expected after the first period, when the shock in expectations occurs. This allows us to eliminate the last term of equation (17).

Finally substituting (A4) in (A2) we have:

$$E\widetilde{c}_{1t+1} = \widetilde{c}_{1t} \qquad \text{(A5)}$$

Substituting (A1) and (A5) recursively in equation (17) allows us to derive the consumption function presented in the main text

# CHAPTER 5

# ACCOUNTABILITY AND INDEPENDENCE OF THE EUROPEAN CENTRAL BANK: DOES FISCAL POLICY MATTER?

## 5.1. Introduction

The Maastricht Treaty aims to insulate the E.C.B. from any external influence that could jeopardise its pursuit of price stability. In doing so the ECB has been closely modelled on the Bundesbank[1], and its independence has been reinforced by imposing limits to the use of others economic policy instruments.

The importance of delegating the conduct of monetary policy to an independent authority to achieve a stable monetary environment is a result of modern economic policy theory all but unanimously accepted among economist and practitioners alike. In a society in which unrealistic policy objectives (Barro and Gordon, 1993) or political conflict over economic policy objectives (Alesina and Gatti, 1995) produce inflationary bias and political cycles, delegation eliminates the effect of these distortions on price stability and ultimately provides an optimal social solution.

Without any doubt, Central Bank Independence has been a useful policy in the '80 because:

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[1] - It would be more appropriate to say that the ECB has been modelled in such a way to achieve, in principle, the same level of credibility that the Bundesbank has achieved throughout the years. In order to achieve this objective the ECB is, institutionally, much more independent than the Bundesbank itself. In particular the policy objective of the ECB are stated in general term in the Treaty itself and is left to the ECB in total autonomy to define the quantitative content of that objective. Strict rules are imposed regarding the nomination and the contacts between member of the Executive Board of the ECB and national authority (see art. 105, 106 and 107 of the Treaty and the art. of the Statute of the ESCB).

- It signalled to the market a policy emphasis on controlling inflation as long-term objective.
- It reduced the power of intervention of short run monetary policy instruments by the political authorities, and increased the credibility of the monetary policy itself.
- At the European level at least, it consolidated a homogeneous set of policies for a relatively long period of time. This policy was isolated from policy changes happening elsewhere, giving a stable base to the European economy.

The success of this approach to economic policy making is evident in the institution of the EMU. There, the idea of central bank independence as the way to provide first best policies has become a institutional dogma - so much so that all national governments have abandoned (at least in principle) any attempt to influence central bank decisions.

At the same time its unprecedented level of independence and the rising importance of economic policy objectives other than controlling inflation have produced a growing debate about the level of accountability of the ECB. As argued by King (1997, p.15) "an effective system of accountability is essential in order to give legitimacy to an independent central bank with delegated powers to set interest rate. Accountability is the precondition for independence in a democratic society". In a changing world, accountability provides the feedback mechanism between the society, its political institutions and the independent monetary policy maker. But at the same time imposing accountability, however defined, might risk the surrender of the independence (and hence the credibility) of monetary policy to political forces. This supposed conflict between independence and accountability is resolved in the Maastricht Treaty in favour of independence: a clear choice that privileges independence and the objective of controlling inflation.

The possibility that an independent and conservative central bank could conflict with wider objectives of economic policies was recognised by Rogoff (1985). Subsequently contributions stressed how this problem could be overcome with two main instruments: on one hand, as shown by Walsh (1989), an efficient contract regulating the relationship between the Principal-Government and the Agent-Central Banker could introduce the

necessary flexibility in the Central Bank action at the moment exogenous shocks hit the economy. On the other hand Svensson (1995) has shown that the same objective can be achieved with an optimal inflation targeting regime, in which the government decides the target followed by the central bank.

Not only can this conflict between accountability and independence be resolved, theoretically, on operative or constitutional grounds. Its empirical relevance has also been questioned by Alesina and Summers (1988) when they do not find any direct relation between independence of the central bank and output variability. In the view of Alesina and Gatti (1995) this is because with central bank independence not only any inflationary bias is eliminated, but also any uncertainty produced by political conflicts is neutralised, and the private sector can correctly form their expectations, whatever happens in the political arena[2].

Although accountability remains central in this debate, it is often taken to be synonymous with transparency (Nolan and Schaling, 1996, Muscatelli 1998, Eijffinger, Hoeberichts and Schaling ,1998). In a world of imperfect information about shocks, preferences etc. if the central bank is not fully transparent in its objectives and in the conduct of monetary policy, this could produce policy "noise" in the market and distort private expectations.

We argue that this debate does not fully cover the particular situation in which the ECB find itself[3]. This debate analyses a situation in which a sovereign and accountable authority (the government) grants policy independence to one of its branch to pursue certain objectives determined by the authority itself. The ECB case, by contrast, is of an institution that, once created, does not have any Principal ultimately responsible and accountable for its action, but faces a multitude of national fiscal authorities acting

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[2] - In the next chapter this observation will be analysed closely, because of its importance for the design of optimal monetary and fiscal policy institutions.

[3] - It is quite remarkable to compare the text book" independence of the Bank of England with the ECB institution. As argued by King (1997), in been granted operational independence, the Bank of England has been subjected to a series of accountability mechanisms to guarantee not only the full transparency of its actions, but also its full compliance with the target defined by the political authority. The Bank is accountable to the Chancellor of Exchequer for implementing his inflation target, to Parliament through frequent appearances in front of the Treasury Select Commitee and to the public at large through the full disclosure of the information and the discussions which provide the basis for each policy choice. This complex mechanism of transparency and accountability did not stop the bank to come under fire when its policy choice didn't seem to be consistent with wider objectives of protecting national industries against overvaluation of the national currencies.

independently and accountable to different constituencies. Although monetary independence cut the link between monetary policy and the political process, it cannot avoid to take in consideration the effects that the conduct of fiscal policy can have on its targets.

If the fiscal authorities follow different economic policy priorities, a possibility of conflict between policy makers can arise and would be reflected in the ability of each policy maker to actually reach his own target. In the previous chapters we have analysed how this conflict could arise. We have given particular emphasis to the possibility that fiscal policy has a leadership role in the determination of the price level and dynamics, thus rendering almost superfluous, from a macroeconomic point of view, any central bank independence. But the possibility of conflict is not limited to a particular macroeconomic framework. On the contrary, as shown in different frameworks by Nordhaus (1994), Rankin (1996) and Blake and Weale (1998), it is simply the inability to take into account the different preferences of others policy makers that produces the conflict. When more than one policy maker is present, accountability it is not simply "give account" but becomes "take in account".

Thus, when more than one policy maker is present, and difference in preferences create the possibility of conflict, accountability becomes the instrument of resolution of conflict. Translating this concept in game theoretic terminology, when the solution of a non-cooperative strategy produces an inferior Nash equilibrium, a cooperative solution can always be found that is Pareto superior for every players (See Demertzis, Hughes Hallett and Viegi, 1998).

The main objective of this chapter is to investigate whether, and by how much, policies would conflict and be rendered ineffective in a typical model of monetary union in Europe, by granting full and unrestricted independence to the Central Bank. We then look at what the consequences of those policy conflicts might be, and whether they can be resolved more effectively by limiting the fiscal policy intervention or by encouraging co-operation between the policy authorities.

Ultimately we want to analyse what the potential costs and gains of various schemes of accountability are in a framework in which monetary and fiscal policy are interdependent and cannot be insulated simply by institutional design.

In the next section the model and the different scenarios analysed will be presented. Thereafter the simulation results will be illustrated an discussed.

## 5.2. The Model

Like Oudiz and Sachs (1985), McKibbin and Sachs (1991) and Hughes Hallett and Vines (1993) before us, we use an adaptation of a Dornbusch model with forward looking financial markets and overlapping contracts. There are two regions "Europe" and "the United States". Europe contains two countries: "Germany", "France" and a common European Central Bank. The distinction between the countries lies only in the asymmetry of shocks or preferences. Finally, the US - representing the rest of the world - is fixed exogenously in relation to Europe.

The model contains both forward looking behaviour and rigidities. First external exchange rate US$/Euro is determined according to uncovered interest parity, and exchange rate developments are perfectly anticipated with the exception of initial shocks. Second, current wages and prices are jointly determined with expected future prices which themselves respond to lagged consumer price inflation and output, but not to expected future inflation rates. That puts some inertia into the system, to reflect the fact that contract wages cannot immediately adjust to market clearing levels but nonetheless retain some sensitivity to the economy's expected evolution. Hence, in the short run, the exchange rate disciplines inflation. But in the long run wages and prices are tied down by the assumption that agents expect equilibrium to be re-established eventually (a terminal condition). Consumption, however, is not forward looking. We adopt this specification on the assumption - broadly in line with experience of the 1990s - that some consumers will be liquidity constrained and therefore unable to carry out the inter-temporal optimizations needed to smooth their consumption (Blanchard, 1985). A full model listing appears in an appendix to this chapter[4].

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[4] - It should be noted that the discussion that follows and the main results obtained from the

### 5.2.1 Policy Authorities, Targets and Policy Instruments

There are three policy players: the two national Fiscal Authorities, and the European Central Bank. While the two national fiscal authorities target national variables, the ECB targets European aggregates, defined here as the weighted average of the national aggregates. In the spirit of the Maastricht Treaty, we take price stability and the deviation of output from full capacity as the main objectives of policy. The weights that each policy authority assigns to each objective will define the scenarios under examination.

For each of the scenarios studied below, we carry out time consistent policy optimizations over 100 periods (a "long run"), in order to determine the best possible responses to shocks to the system.[5] We take each policy variable to be measured as a deviation from its equilibrium or target path. The welfare functions penalize squared deviations of each target and instrument from its equilibrium value in each period in order to generate a rapid return to equilibrium.

The simulations are based on the assumption that the ECB is at least as "conservative" as the most conservative of the fiscal authorities, where "being conservative" is defined

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analysis are not particularly dependent on the specific model used. What we will look at is how interdependence and conflict between policy instruments can be dealt with using appropriate instruments of accountability. While the particular nature of this interdependence can be model dependent (as deriving from fear of default like in our Chapter 2, or because of the direct effect of fiscal policies on prices, like in Chapter 4, or because of the political effect of central bank independence, as in the following Chapter 6), the main issue of how to tackle interdependence remains essentially unchanged. The advantage of this particular model is its generality and transparency of results.

5 - We do not consider optimal (open loop) strategies which do not require a time consistency constraint, despite the fact that "independence" is conventionally taken to imply "credibility". This is because several of our scenarios allow the central bank little or only limited forms of independence. It is impossible to know how independent the central bank would remain in such cases, and hence how much credibility should be granted to their policies. In order to compare like with like, it is better to err on the side of caution and impose credibility. Similarly we distinguish between constitutional independence and actual independence. A constitution which grants independence can never guarantee that independence will actually be exercised in practice, whether for reasons of political expediency or from motivations of the bank's own choosing, especially when it comes under the kind of extreme pressure from the fiscal authorities (who cannot be expected to remain independent or time consistent) such as we find in the next section. Credibility can only be established by reputation and sticking to established procedures. But even if we had assumed sufficient reputation for the Central Bank, the fact that the fiscal authorities are the very people who cannot be trusted to be time consistent means that the Central Bank would have even worse outcomes than those reported here – as the fiscal authorities continually reoptimise in their own favour. Hence there is no point in assuming that credibility automatically applies; it would merely strengthen our conclusions by making independence look even worse than it does in the results which follow.

as putting a higher weight on controlling inflation. This means that the ECB decides its policy by minimising the following objective function:

$$U_{ecb} = \frac{1}{2}\sum_{t} [y^2 + \delta r^2 + \gamma(\pi - \pi^*)^2] \qquad (13)$$

where $\gamma$=5 and $\delta$ = 0.5, r is the nominal interest rate, and $(\pi - \pi^*)$ is the difference between European inflation in period t and its target value (equal to zero in most of the simulations). Inflation and output are defined as European averages here.

The policy instrument in the hands of the ECB is the nominal interest rate. The use of interest rates as the monetary instrument, rather than the money stock, corresponds to actual practice and is not subject to the "indeterminacy of the price level" problem because interest rates are endogenised in order to control inflation.

The two fiscal authorities on the other hand minimise their own objective functions

$$U_i = \frac{1}{2}\sum_{t} [y_i^2 + \eta g_i^2 + \theta(\pi_i)^2] \qquad i = F,G;\ \gamma \geq 0$$

(14)

where $g_i$ is the net fiscal stance, being the instrument in the hands of the fiscal authority. All the variables are defined in national terms: G for Germany and F for France.

The choice of the parameter $\theta$ defines the two different preference schemes we are going to analyze:

*1. Homogeneous Preferences*

In the first scheme the two fiscal authorities have the same preferences, represented by a special case of (14):

$$U_i = \frac{1}{2}\sum_{t} [y_i^2 + 0.5 g_i^2 + (\pi_i)^2] \qquad i = F,G,\ \theta_F = \theta_G = 1 \qquad (15)$$

This objective function states that both fiscal authorities put the same weight on inflation control and output stabilisation. The combination of objective functions (13) and (15) defines a regime in which the ECB is significantly more "conservative" than the national authorities, because $\gamma > \theta$.

2. *Non-Homogeneous Preferences*

In the second scheme, German preferences are geared more towards controlling inflation than French preferences. The German fiscal authority therefore sets policies which minimise the objective function

$$U_G = \frac{1}{2}\sum_t [y_G^2 + 0.5g_G^2 + 5(\pi_G)^2] \qquad \theta_G=5 \qquad (16a)$$

but

$$U_F = \frac{1}{2}\sum_t [y_F^2 + 0.5g_F^2 + (\pi_F)^2] \qquad \theta_F = 1 \qquad (16b)$$

This scenario defines a regime in which Germany shares the preferences of the more conservative ECB, but France does not.

## 5.2.2 The Policy Regimes

In order to capture the effect of different degrees of independence and different degrees of accountability we have tested four policy rules.

*a) A Non-Cooperative Nash Game (Full Independence)*

The three policy authorities optimise simultaneously in their own interest. In this policy rule the ECB has both instrument and target independence. There is no accountability.

*b) The Cooperative Game*

The cooperative equilibrium was computed optimising an equally weighted average of individual objective functions:

$$U=(1/3)U_G+(1/3)U_F+(1/3)U_{ecb} \qquad (17)$$

For identically symmetric cases, this will deliver an optimal Nash bargain. This time the ECB has instrument independence; but its target independence is strictly circumscribed. Each policy maker is symmetrically accountable to the others.

*c) A Fiscal Policy Coalition (Monetary Surrender)*

This equilibrium was computed optimising a weighted average of the individual objective functions with a zero weight on the preferences of the ECB: i.e.

$$U=(1/2)U_G+(1/2)U_F+(0)U_{ecb} \qquad (18)$$

The ECB's preferences therefore play no role in determining the optimal policies (a monetary policy surrender). But since both fiscal authorities have low inflation among their targets, albeit at a lower preference than the ECB, interest rates are now set by the less conservative fiscal authorities – instead of by the more conservative central bankers. In this case the ECB is fully accountable, and has no independence. To match this we have also included cases where the fiscal authorities become accountable through budget restrictions (fiscal surrender).

*d) A Non-Cooperative Nash Game with Inflation Targeting*

In the last regime, the ECB has instrument independence but no target independence. The two fiscal authorities determine, simultaneously and non-cooperatively, their fiscal policy and indicate to the ECB their preferred inflation target. The inflation target itself is determined by the optimisation of the two objective functions in (14), using two «instruments» - public expenditures (g) and the inflation target ($\pi^*$) - to do so . The ECB, meanwhile, has to maximize its own objective function (13), using the nominal interest rate, in which the inflation target is defined as the weighted average of the optimal inflation targets of the two fiscal authorities (should they differ).

Moreover these regimes are compared with the results of a balance budget rule, that replicates what is solution of the policy conflict advocated by the Stability Pact and that we have defined as Fiscal Surrender regime[6].

## 5.3. Simulation Results

In our simulation analysis we have tested the performances of the regimes above under two sets of preferences (Homogeneous Preferences and Non-homogeneous Preferences) and two sets of external shocks: a temporary symmetric inflation shock of

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[6] - We limit our analysis to the strategic interactions inside the union. An important extension would be to introduce the US as an independent strategic player. In fact, as the literature on international interdependence has shown (Currie and al., 1989), the internal effect of economic policies is highly influenced by the external response to national economic policies. For example, increasing US balance of payment deficits have mitigated, in the last years, the impact of fiscal and monetary contractions in Europe. If the US stops to be the "market of last resort" the cost of economic policy conflict inside the union could be increased and with it the gains from co-ordination that we are going to analyse in the rest of the chapter.

10% to Germany and France in period 1; and an asymmetric inflation shock of 0% and 20% in period 1.

Tables 1-3 summarise the results showing the welfare losses of each country, the ECB and for Europe on average, using each player's original objective function.[7] The figures in bold show each country's best choice of policy rule for each regime and each type of shock.

### 5.3.1 Overall Performance (by Regime)

The crucial result in tables 1 and 2 is that the ECB actually does worse, in terms of satisfying its own inflation objectives, when it is granted total independence than when accountability is imposed. That is shown by comparing the first line in each panel, with the second or third. It is true that too much accountability, inflation targeting in this case, may make things even worse for the ECB. But going the other way, i.e. granting the ECB full target and instrument independence, does not give the ECB sufficient policy strength to regain its own inflation objectives either.

The explanation of this result is straightforward. Since granting policy independence without accountability implies non-cooperative decision making, the ECB is free to make whatever policy decisions will bring it closest to its own targets, without concern or consideration for what that may do to other people's targets. And since the ECB's own targets are primarily the elimination of inflation, this regime gives full rein to the idea of a more conservative and independent central bank.

But any central bank has to allow for the fact that there are others in this policy game; and if their reactions are strong enough they will overpower the central bank's policy measures with their own measures, even if the bank has correctly allowed for that. As a result, Germany and France can usually (but not always, depending on their own inflation aversion) do better for themselves the more they impose accountability on the ECB - right through to imposing inflation targets on the ECB. Moreover, it is clear that the ECB is being overpowered since Figures 1 and 2 show that the losses in inflation and output targets are of roughly equal size despite inflation having a penalty weight which is more

than five times larger than that on output; and also because it is the output target which improves most in the early (high penalty, large failure) periods when accountability is introduced. Inflation does not improve by so much, even though inflation has a much higher penalty in the ECB's preferences. In other words, when improvements come they are in output, not in inflation as you would expect if the ECB were in control.

The next section explains in detail how and why this happens. But the key point is that the independence of the central bank is of no avail if other policy makers have the power and the incentive to neutralise it. In short, the logic of wanting an independent central bank remains as strong as ever, but it is of little value if you cannot use it.

### 5.3.2 Why Does Fiscal Policy Dominate?

We can show how these inferior outcomes come from the conflicts between fiscal and monetary policy generated when a Central Bank acts independently, by considering the case where no fiscal interventions are allowed (g and g*, of appendix 1, are constrained to zero). This is the fiscal surrender solution in Table 3. In that situation, we would expect the ECB simply to raise interest rates to counter the Europe-wide inflationary shock. And if the bank were acting alone, that would be all it would do, since it has little interest in (and a low priority on) preserving output levels. Consequently inflation would be steadily squeezed out, at some cost in terms of lower output.

And that is exactly what we find in Table 4. In fact, left to itself the independent central bank raises interest rates quite sharply in the aftermath of the inflation shock - in contrast to the results in Table 5 where governments are allowed to use their fiscal policies (albeit noncooperatively because the bank remains independent). The nominal exchange rate then depreciates as expected, but not by enough to prevent a real appreciation. Moreover there is no overshooting. As a result output, wealth, investment and the current accounts all deteriorate instead of improving. Consequently we get the traditional outcomes: inflation is disciplined away, but at the cost of losses in output and wealth (or investment) which are larger than in the case where fiscal policy is allowed (compare Table 5).

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[7] "Evaluated using the original objective function" means evaluating the policy outcomes by (13) and (15), or by (13) and (16a,b) for each player individually.

Consequently it is obvious that governments would have the incentive to try to recover output and wealth once they are let back into the game, and that fiscal policy will be their only means of doing so. Indeed Table 5 shows exactly that when the Central Bank is not acting alone, although the results are now quite different.[8] In this case, interest rates actually fall; and both inflation and output losses, while large to start with, are reduced pretty rapidly and at fairly equal rates. Paradoxically fiscal policy is now strongly contractionary; and both nominal and real exchange rates depreciate instead of appreciating.

Why this apparently perverse behaviour? Table 5 shows it is the result of a conflict between the bank and the fiscal authorities. Faced with the bank's preference to raise interest rates and appreciate the currency in order to eliminate inflation, the fiscal authorities have to respond to save output – their preferred target. They cannot do that by increasing net fiscal expenditures since that would simply add to the inflationary pressures, and hence slow down the correction of inflation and output losses even further. Instead the fiscal authorities have to do it by decreasing fiscal expenditures (or increasing taxation) since that will help reduce interest rates and depreciate the currency - albeit inefficiently - and hence restore aggregate demand at home and from abroad without immediately adding to inflation. And if they do this strongly enough, the fiscal contractions will eventually overcome the monetary tightening. In that way we end up with a net cut in interest rates (real and nominal) and a net depreciation in the exchange rate (real and nominal). This, in turn, leads to a fairly rapid and even handed elimination of both the inflation and output disturbances, instead of the elimination of inflation at the expense of output. Given that policy independence automatically puts us in a non-cooperative world, where policies are freely chosen to suit "private" objectives, and where one player favours inflation but the other output, we could not expect anything else.

Nevertheless, because any attempts to boost demand through lower interest and exchange rates will eventually add to inflation, the final equilibrium must eventually

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[8] Table 5 removes the balanced budget constraint and allows governments to use fiscal policy noncooperatively (to preserve the independence of the central bank), but freely, subject to the constraints implied by the penalties in their objective functions.

restore interest rates to their original level and the currency depreciations must be brought to an end. Consequently, after the initial overshooting, both players have to allow the currency to appreciate back up – engineered now by removing the initial fiscal contractions and by tightening monetary policy. Consequently the exchange rate has to jump down and then appreciate back up if equilibrium is to be regained.

This sequence of lower interest rates and currency depreciations, together with a fiscal contraction followed by a currency appreciation and rising interest rates, shows that the fiscal authorities do initially overpower the central bank despite its independence.

### 5.3.3 Accountability helps Reduce Fiscal Dominance

To summarise: First , in a world of more than one fiscal authority but one central bank, the former may well try to dominate the latter's policies in order to preserve their own targets. So, even when independence is enforced, we cannot guarantee that it proves effective. Secondly limiting fiscal interventions by the national governments by a stability pact is indeed a way of preserving the independence of the central bank and its policies, (Artis and Winkler (1997)). But that may mean little inflation control: each group of policy makers will simply be able to neutralise the policies of the others. In fact in our case, limiting fiscal interventions achieved little more than doing nothing at all. Far better, therefore, to introduce some accountability in the targets as a means of limiting the excesses of, and conflicts between, these independent policy making authorities.

### 5.3.4 Fiscal-Monetary Coordination

These results need to be compared to the third option which is to impose accountability (Table 6: the cooperative solution). Like the fiscal restrictions in Table 4, accountability also removes the inefficient policy assignments of Table 5. Indeed monetary policy is used to restrain inflation (as you would expect and more strongly than in Table 4). Similarly Table 6 also shows some fiscal expansions in year 1 – but within the limits of the Stability Pact – in an attempt to eliminate the output losses of that year. As a result the output and inflation losses are both smaller than with a fully independent central bank. And Table 7 (inflation targeting) shows exactly the same thing, but in more moderate form. Inflation targeting also produces better investment figures than cooperation, but at the cost of larger current account deficits.

In other words accountability rescues policy effectiveness by reinstating the more efficient policy assignments. That lowers the degree of self-defeating competition between policy makers with different objectives. That in turn allows instruments to be used according to their comparative advantage – interest rates for inflation, fiscal policy for output – and without unnecessary overshooting which has to be corrected again in later periods. As a result the extremes in inflation and output losses are avoided, even if the reduction of inflation is slightly slower between years 2 and 3. That delivers a Pareto improvement over full independence (Table 1) or monetary dominance (Table 3).

### 5.3.5 Capitulation vs. the Incentive to Remain Independent

Nordhaus (1994) has pointed out that a given national income level can always be achieved with a variety of different combinations of interest rates and budget deficits. But these different combinations will have different implications for inflation, which means that the fiscal and monetary authorities would want to take different positions in the diagram showing the different interest rate – budget deficit combinations that could yield the same level of national income (Figure 1).[9]

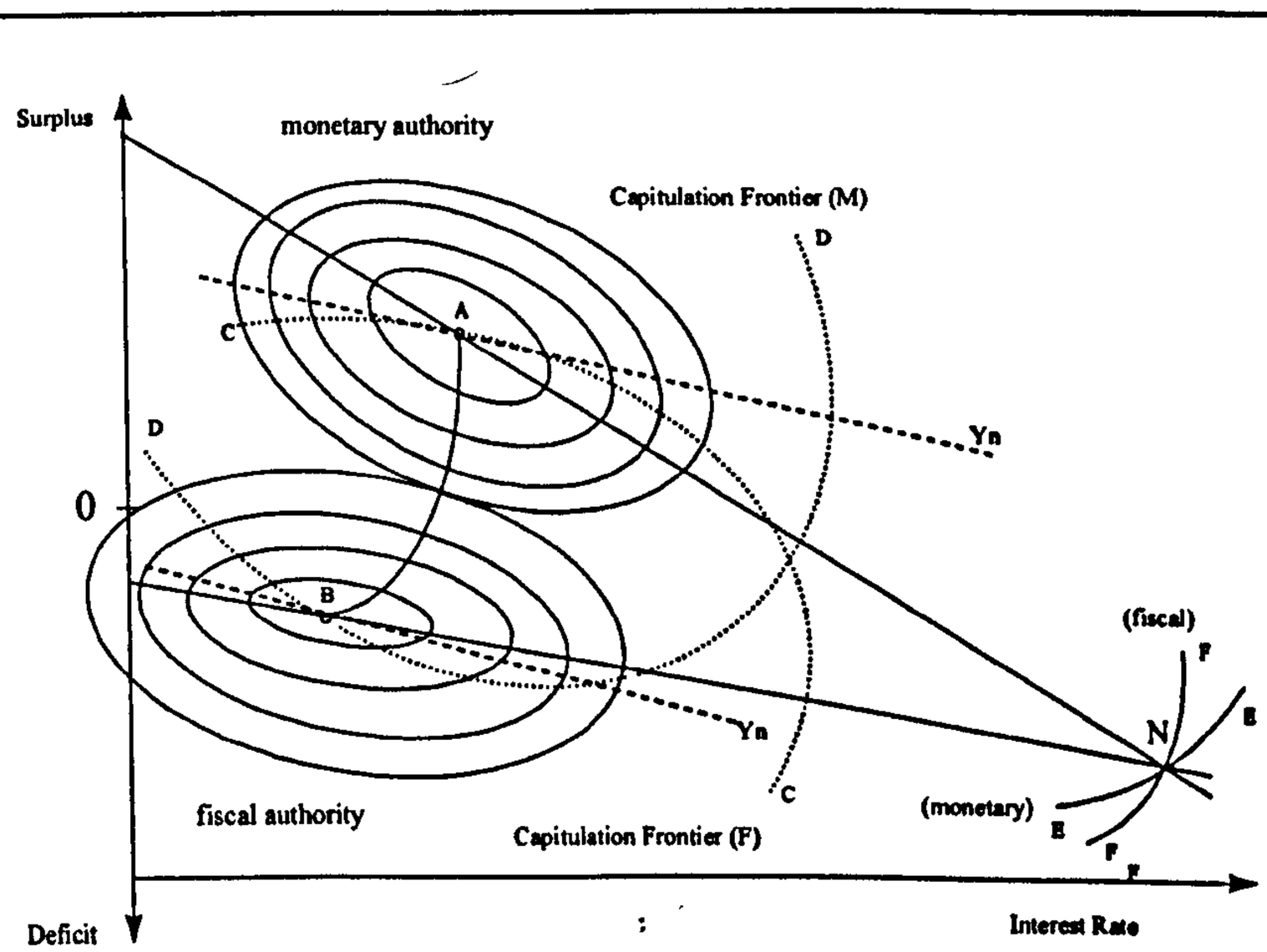


**FIGURE 1: THE INCENTIVE TO REMAIN INDEPENDENT**

[9] Moving along one $y_n$ line in Figure 1 implies accepting different rates of inflation for that $y_n$ (the natural level of output in a neoclassical model). Moving to a different $y_n$ implies a different way of getting to the same set of ($y_n$, inflation) combinations: the fiscal authority prefers to manipulate the budget, the monetary authority interest rates. The difference between the $y_n$ lines and the reaction curves is that the former ignore reactions by the other policy maker, whereas the reaction functions do not.

Explanatory Notes:
1. AB = contract curve for coordination. It provides the incentive compatibility constraint for cooperation, corresponding to that segment of the contract curve which strictly dominates N (the whole contract curve in this diagram).. It has to lie within the intersection of the two utility contours marked E and F.
2. A and B = "bliss" points in constrained optimisation space
   N = Nash (noncooperative) equilibrium.
3. C and D = the indifference contours (one for each player) which go through the other players "bliss" point. They provide the incentive compatibility constraints for remaining independent, corresponding to those segments of the utility and reaction curves which lie inside the indifference contours marked "capitulation frontier". If N lies outside a players own capitulation frontier, then he has no incentive to act independently.

In that case, if one player finds that, given full policy independence, the Nash noncooperative solution lies outside the indifference contour from his own utility function that goes through the other player's most preferred position [at the chosen level of national income], then it would pay the first player to give up and hand over control of his own instrument to the other player. At least he would get the other players preferred outcome that way, and hence a higher level in his own utility[10] - compared to fighting it out, and ending up at the Nash point which represents a lower level of utility for both of them.

Of course there is no guarantee that such a possibility actually exists in any given case; or that capitulation by the other party might not also benefit both of them. Both possibilities will have to be checked out on a case-by-case basis. However it is obvious that capitulation is more likely if the constrained "bliss points" are similar in one dimension, but different in the other; if the players have very different priorities on the two targets; or that at least one of them has a high priority in the dimension in which their aspirations differ; or if they both will accept a reasonable degree of substitution between instruments (e.g. governments will accept low deficits and less intervention, if the central banks agree to keep interest rates low on average). In other words, capitulation is all to do with differences in preferences and very little to do with the kind of model being used.

### 5.3.6 Monetary Surrender (Fiscal Dominance)

In our case, national governments clearly make the greatest gains by imposing strong forms of accountability; e.g. inflation targeting (Tables 1 and 2). At least this is true when shocks are symmetric; and for the country suffering the shock, if not. But these gains come at the expense of the ECB, and those whose preferences are aligned with the

[10] Were the Nash point inside that particular indifference contour, then it would pay the first player to fight it out in order to get the better outcomes in terms of his own preferences, even if it produces worse outcomes for the other player. Note that this is all

ECB. Accountability can therefore go too far. But some degree of accountability is always desirable for everyone.

That result underlines the obvious attraction of allowing a fiscal coalition to take over the design of monetary policy, using equation (A7) to define their preferences in order to strengthen the ability of those governments to reach their own targets. Indeed the outcomes of a fiscal coalition are nearly as good as those from a three party partnership ("coop (1)"). [Compare the monetary surrender results in Table 3]. That illustrates the weakness of an independent ECB. A carefully controlled fiscal policy by France and Germany could deliver results that are almost as good. That is going to be important where there are asymmetries, and where the policy mix between $g_F$ and $g_G$ [equation (A2)], needs to be adjusted to meet those asymmetries. Conversely asymmetries in the preferences and/or structures will cause a lot of damage if fiscal policy is somehow restricted under a single monetary policy.

The crucial point here is that a rational central bank would never want to insist on exercising its independence against the odds when preferences are very different elsewhere. Instead it would either prefer to capitulate to the fiscal authorities and allow them to set interest rates according to their priorities – a relatively unsophisticated response, of the kind we got in the 1970s and 1980s. Or, in a rather more sophisticated approach, it would actively seek accountability to the rest of the economy for the opportunity for mutual cooperation which that offers. At least the central bank would be sure that its priorities would get to influence the outcomes that way. With full independence it could not be so sure. That's the gain in accepting voluntary accountability or coordination.

### 5.3.7 Fiscal Surrender

The alternative, and more relevant possibility, is a capitulation by the fiscal authorities. That would involve either a balanced budget amendment (the preferred choice in the US and what EMU is supposed to achieve),[11] or some version of the stability pact. Is there any incentive for such arrangements? The answer is yes.

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happening in constrained optimisation space.

The balanced budget results were discussed in Section 3.3 and Table 4. The overall evaluation is given in Table 3. Evidently fiscal surrender produces better outcomes, for all parties, than unrestricted monetary independence. So far so good: there is a significant incentive for the fiscal policymakers to surrender. However both Germany and France could do even better for themselves if they could persuade the monetary authorities to surrender instead; and even better again if the ECB could be persuaded to accept an inflation target. That means that, politically, the issue is not yet resolved. But it is not clear who will dominate in practice. Both sets of policy makers may realise that the economy would benefit if conflicts were avoided. But which one should exercise discretion and who should lead? Governments would naturally prefer a monetary surrender, the ECB a fiscal surrender. Only cooperation, by minimising the (expected) losses of both were they to lose the struggle, offers a way out and an improvement over what will happen otherwise. Accountability, directed at obtaining the appropriate policy mix for the economy as a whole, is therefore in the interest of both parties.

## 5.4 Asymmetries

### 5.4.1 Asymmetric Shocks

Figures 3-10 show that an asymmetric shock causes much larger disturbances in the shocked economy (France) than in the unshocked (Germany). We might expect that the burden of adjustment, given a single monetary policy, will therefore fall upon the fiscal instruments of the economy suffering the shock – with the other playing a supporting role.

This we can see is broadly true (Table 11), although the differences in size and persistence are immaterial after year 3. However increasing the degree of accountability clearly has the effect of redistributing the burden of adjustment, and the persistence of the shocks, back towards Germany. Hence if you want to share the gains, you have to share the pain – most noticeably in the transfer of French inflation to Germany. Germany has to provide more support.

How do these results come about? In Hughes Hallett and Vines (1993) we pointed out that monetary union means the impact of shocks cannot be localised and dealt with at

[11] Duisenberg (1997).

source. Accountability extends this "contamination" effect. Table 11 shows that a French inflationary shock would cause monetary conditions to tighten across Europe. But the effects on real interest rates vary with inflation: France first tightens in real terms and then loosens, while Germany tightens by less and then loosens by less. The initial inflationary surge in France is therefore contained by transferring it to Germany; but because France cannot depreciate against Germany she suffers a loss of competitiveness and a slump. Output price inflation is therefore stopped, with the result that the high nominal interest rates fall but fail to translate into lower real rates. So the recovery is still-born and France's slump persists Europe-wide. Note that France's inflation transfer, plus the boom in Germany caused by the sudden fall in relative prices, causes inflation in Germany. Germany therefore, also moves into recession, with an appreciating real exchange rate like France and persistently high real interest rates. Meanwhile, as in the symmetric case, fiscal policy in France has to do the perverse thing and contract in order to ease the inflationary pressures and to cause a nominal depreciation in the Euro with the hope of restoring aggregate demand. But fiscal policy in Germany is expanding in order to counteract the wealth loss caused by higher European interest rates and France's slump. So the fall in the nominal exchange rate engineered by France is strictly limited and, given the inflation figures, not large enough to prevent an appreciation in real terms. Consequently these policies are only partly successful. Inflation is eliminated relatively quickly, but the output slump continues and Germany suffers a large wealth loss (the French deflation causes a current account deficit; and high interest rates damage investment). This wealth loss is not shared by France (the German expansion and a Euro depreciation preserve the current account).

Thus there are unstable financial conditions, both internally and externally, which affect Germany and France quite differently. In fact what you see is much the same instrument values for Europe as a whole, but rather larger losses in the targets because the burden of adjustment has clearly shifted to France. That underlines the difficulty of trying to manage a single currency when there are large asymmetric shocks, even when fiscal policy is relatively unrestricted. Germany's attempt at counterbalancing is simply too

small. Thus inflation is accommodated in the usual way. But, given the asymmetries, the price of that has been more instability in output and the financial variables.

It is important to note that it is the single currency, not accountability, which is at fault here. With an independent monetary policy, we get much the same outcomes on average - but much worse effects for France since she now has to proceed with even less help from Germany; and because she has to suffer more of the inefficiency of the usual perverse policy assignment. Thus accountability actually helps - especially the weaker parties.

### 5.4.2 Asymmetric Preferences

Suppose Germany becomes as inflation averse as the Central Bank but France remains less conservative. Table 12 and Figures 11-18 apply. There is not a lot to add here. As long as the shocks are symmetric our conclusions hold as far as imposing accountability is concerned, although inflation targeting is no longer the favoured form of accountability. This is because Germany now does a little worse in output and better in inflation since her preferences have shifted towards more inflation control. In other words, setting $\square^{*}>0$ would be counterproductive. And with Germany aligned with the Central Bank, France is obliged to accept the same result from year 2 when stronger Europe-wide monetary policies take hold. At that point, interest rates (real and nominal) are higher; the real appreciation of the Euro stronger; and the fiscal expansion of the symmetric case is completely destroyed.

These results show a "polarisation" in the burden of adjustment between a stronger monetary policy from the ECB, and more effort from France (alone) to get the Euro to depreciate. The latter is a new development which is sustained until we get into the inflation targeting regime where the fiscal policy assignment is reversed. In that case Germany contracts and France expands, in order to get interest rates down so that the higher inflation targets can be met. But the associated loss of competitiveness means that equilibrium can only be re-established if the Euro exchange rate jumps up and then starts to depreciate quite sharply.

The other major change is that the anti-inflation coalition of Germany and Central Bank is now more powerful than France. So, even under independent policies, we no longer get fiscal policies dominating monetary policies; inflation is controlled by higher interest rates and currency appreciations. Since monetary policy is tighter in this case, this means France has to do even more (and can succeed less) to protect her own targets. Thus, with sufficient asymmetries and/or sufficient conservatism, the attempt to limit output losses when one party doesn't care about them will produce unstable financial conditions and more instrument fluctuations in the economy that does still care. Size is import here. Eventually, France will have to carry the full burden of adjustment, and will become increasingly unstable, as shown in Figures 11-18. That proves our point: increasingly diverse preferences can lead to increasingly unstable policies and eventual collapse.

### 5.4.3 Increasing Conservatism

Finally we experimented with increasing the degree of inflation aversion, first in the central bank alone and then in Germany as well. This changes the numerical results, but not their character. For example, raising the inflation aversion parameters $\gamma$ from 5 to 100 produces larger output losses in year 1, but smaller losses thereafter, given independent policy making. Similarly inflation is larger in year 1 but more quickly removed; and the same perverse instrument assignment appears in stronger form. Consequently nothing has changed, except that the conflict between an independent central bank and the fiscal authorities has been increased.

The same also holds true with asymmetric preferences. If Germany becomes a lot more conservative, Germany's output losses are large enough to trigger a fiscal contraction there (in addition to France) in order to produce a much larger depreciation of the Euro. This reinforces our conclusion that a combination of asymmetries and excess conservatism forces too much of the adjustment onto one policy instrument and one economy. The result is greater instability all round.

## 5.5. Conclusions

a) An independent monetary policy is undoubtedly the most efficient regime for controlling monetary policy when the central bank is acting alone - as is usually assumed in the

literature. But if there are multiple policy makers and conflicts over priorities, as there must be if accountability is an issue, then there will be conflicts between the different instruments of economic policy. The independence of the central bank becomes only useful if its policies are not overpowered by others.

b) Our results show that policy conflicts between an independent conservative central bank and fiscally liberal governments are unavoidable. In such a world, the more conservative the central bank, the more counterproductive the results.

c) Our results support earlier studies (Masson and Melitz 1991, Agell et al 1996) which demonstrated that fiscal policies would need to be more active in monetary union. To limit fiscal policies, in order to prevent them overpowering the bank's monetary controls, would therefore be counterproductive since that would leave the economy both unstabilised and without effective inflation controls. Thus a stability pact in Europe may well preserve monetary credibility and discipline; but it destroys their impact at the same time.

d) Accountability, by contrast, does the opposite. It has its affect by creating improvements in the targets instead of limiting the use of the instruments. Hence target independence without accountability is no more likely to succeed, than accountability without instrument independence.

e) In our case, inflation was never as high as under an independent central bank. Similarly output losses were never as large as under an independent central bank. Accountability removed these extremes, and provided a "soft landing", rather than shock therapy, for both variables.

f) Asymmetries shift the burden of adjustment onto the country in disequilibrium. Consequently, increasing asymmetries can lead to increasing instability, stronger cycles, and greater financial volatility. Independence without accountability therefore just exaggerates the difficulty of managing a single currency successfully in a union with significant differences in structures or preferences.

## Appendix 1: Tables and Figures

### Table 1: Symmetric Inflation Shock (10%,10%) in period 1.

1.1 - Homogeneous Preferences

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Non Coop. | 160.58 | 160.58 | 160.58 | 376.89 |
| Coop (1) | 104.98 | 104.98 | 104.98 | **318.10** |
| Infl. Target | **70.42** | **70.42** | **70.42** | 497.92 |

1.2 - Non homogeneous Preferences

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Non Coop. | 220.77 | 288.01 | 153.54 | 342.11 |
| Coop (1) | **177.47** | **228.30** | 126.64 | **313.89** |
| Infl. Target | 199.59 | 339.08 | **60.09** | 443.43 |

### Table 2: Asymmetric Inflation Shock (0%,20%) in period 1

2.1 - Homogeneous Preferences

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Non Coop. | 359.86 | **4.85** | 714.88 | 376.89 |
| Coop (1) | 271.52 | 45.45 | 497.59 | **318.10** |
| Infl. Target | **142.20** | 24.85 | **259.54** | 497.92 |

2.2 - Non Homogeneous Preferences

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Non Coop. | 390.47 | **22.18** | 758.76 | 372.16 |
| Coop (1) | 314.64 | 58.16 | 571.11 | **309.48** |
| Infl. Target | **210.14** | 169.55 | **250.74** | 434.14 |

### Table 3: Capitulation Solutions

3.1 - Homogeneous preferences, Symmetric inflation shocks

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Monetary Surrender | **92.74** | **92.74** | **92.74** | 354.10 |
| Fiscal Surrender | 115.91 | 115.91 | 115.91 | **309.97**(BB) |

3.2 - Homogeneous Preferences, Asymmetric inflation shock

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Monetary Surrender | **263.77** | 71.71 | **455.84** | 354.10 |
| Fiscal Surrender | 269.23 | **27.60** | 510.87 | **309.97**(BB) |

3.3 - Non homogeneous Preferences, Symmetric Inflation Shocks

| Policy Regimes | Europe | Germany | France | ECB |
|---|---|---|---|---|
| Monetary Surrender | **173.12** | **219.14** | 127.10 | 316.86 |
| Fiscal Surrender | 209.43 | 302.95 | **115.91** | **309.97**(BB) |

N.B. a) Coop(1) refers to full co operation between France, Germany and the ECB; see equation (17)
b) Each figure is the objective function evaluation of the first 5 years, for the specified player, preference scheme and shocks
c) BB = balanced budget imposed.

**Table 4: Two Country Monetary Union, the Balanced Budgets Case**

Time Consistent Policy Rule - Non-Cooperative Nash Equilibrium

Symmetric Inflation Shock (10%,10%), homogeneous preferences

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -10.41 | -4.96 | -2.4 | -1.16 | -0.56 |
| CPI Inflation | D | 9.53 | 1.45 | 0.72 | 0.35 | 0.17 |
| Domestic Price Level | % | 10 | 11.21 | 11.82 | 12.11 | 12.25 |
| Wage Level | % | 1.68 | 10.37 | 11.39 | 11.91 | 12.15 |
| Nominal Interest Rate | D | 4.68 | 2.25 | 1.09 | 0.53 | 0.25 |
| Real Interest Rate | D | 3.47 | 1.65 | 0.8 | 0.38 | 0.19 |
| Nominal Exchange Rate | % | 2.88 | 7.8 | 10.17 | 11.32 | 11.87 |
| Real Exchange Rate | % | -6.65 | -3.19 | -1.54 | -0.74 | -0.36 |
| Fiscal Stance | % | 0 | 0 | 0 | 0 | 0 |
| Wealth | % | -2.6 | -3.84 | -4.44 | -4.73 | -4.87 |
| Investment | % | -2.17 | -1.03 | -0.5 | -0.24 | -0.12 |
| Current Account | % | -0.44 | -0.21 | -0.1 | -0.05 | -0.02 |
| French Economy | | | | | | |
| Output | % | -10.41 | -4.96 | -2.4 | -1.16 | -0.56 |
| CPI Inflation | D | 9.53 | 1.45 | 0.72 | 0.35 | 0.17 |
| Domestic Price Level | % | 10 | 11.21 | 11.82 | 12.11 | 12.25 |
| Wage Level | % | 1.68 | 10.37 | 11.39 | 11.91 | 12.15 |
| Nominal Interest Rate | D | 4.68 | 2.25 | 1.09 | 0.53 | 0.25 |
| Real Interest Rate | D | 3.47 | 1.65 | 0.8 | 0.38 | 0.19 |
| Nominal Exchange Rate | % | 2.88 | 7.8 | 10.17 | 11.32 | 11.87 |
| Real Exchange Rate | % | -6.65 | -3.19 | -1.54 | -0.74 | -0.36 |
| Fiscal Stance | % | 0 | 0 | 0 | 0 | 0 |
| Wealth | % | -2.6 | -3.84 | -4.44 | -4.73 | -4.87 |
| Investment | % | -2.17 | -1.03 | -0.5 | -0.24 | -0.12 |
| Current Account | % | -0.44 | -0.21 | -0.1 | -0.05 | -0.02 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

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**Table 5: Two Country Monetary Union**

Time Consistent Policy Rules - Non-Cooperative Nash Equilibrium

Symmetric Inflation Shock (10%,10%) , homogeneous preferences.

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -11.21 | -4.71 | -2.2 | -1.01 | -0.47 |
| CPI Inflation | D | 10.77 | 1.43 | 0.81 | 0.37 | 0.17 |
| Domestic Price Level | % | 10 | 11.8 | 12.82 | 13.29 | 13.51 |
| Nominal Interest Rate | D | -3.45 | -2.07 | -0.94 | -0.43 | -0.2 |
| Real Interest Rate | D | -5.25 | -3.1 | -1.4 | -0.65 | -0.3 |
| Nominal Exchange Rate | % | 21.72 | 17.9 | 15.62 | 14.58 | 14.1 |
| Real Exchange Rate | % | 10.95 | 5.71 | 2.61 | 1.21 | 0.56 |
| Fiscal Stance | % | -8.78 | -4.44 | -2.04 | -0.94 | -0.44 |
| Wealth | % | 5.98 | 9.24 | 10.73 | 11.42 | 11.74 |
| Investment | % | 3.28 | 1.93 | 0.88 | 0.41 | 0.19 |
| Current Account | % | 2.7 | 1.33 | 0.61 | 0.28 | 0.13 |
| Debt | D | -8.78 | -13.22 | -15.26 | -16.20 | -16.64 |
| French Economy | | | | | | |
| Output | % | -11.21 | -4.71 | -2.2 | -1.01 | -0.47 |
| CPI Inflation | D | 10.77 | 1.43 | 0.81 | 0.37 | 0.17 |
| Domestic Price Level | % | 10 | 11.8 | 12.82 | 13.29 | 13.51 |
| Wage Level | % | 1.03 | 11.4 | 12.48 | 13.14 | 13.44 |
| Nominal Interest Rate | D | -3.45 | -2.07 | -0.94 | -0.43 | -0.2 |
| Real Interest Rate | D | -5.25 | -3.1 | -1.4 | -0.65 | -0.3 |
| Nominal Exchange Rate | % | 21.72 | 17.9 | 15.62 | 14.58 | 14.1 |
| Real Exchange Rate | % | 10.95 | 5.71 | 2.61 | 1.21 | 0.56 |
| Fiscal Stance | % | -8.78 | -4.44 | -2.04 | -0.94 | -0.44 |
| Wealth | % | 5.98 | 9.24 | 10.73 | 11.42 | 11.74 |
| Investment | % | 3.28 | 1.93 | 0.88 | 0.41 | 0.19 |
| Current Account | % | 2.7 | 1.33 | 0.61 | 0.28 | 0.13 |
| Debt | D | -8.78 | -13.22 | -15.26 | -16.20 | -16.64 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

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## Table 6 : Two Country Monetary Union

Cooperative Equilibrium - ECB=1/3

Symmetric Inflation Shock (10%,10%), homogeneous preferences

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -8.78 | -4.91 | -2.76 | -1.55 | -0.87 |
| CPI Inflation | D | 9.43 | 2.74 | 1.55 | 0.87 | 0.49 |
| Domestic Price Level | % | 10 | 12.4 | 13.84 | 14.65 | 15.11 |
| Wage Level | % | 2.98 | 11.11 | 13.11 | 14.24 | 14.88 |
| Nominal Interest Rate | D | 7.17 | 2.94 | 1.66 | 0.93 | 0.52 |
| Real Interest Rate | D | 4.77 | 1.5 | 0.85 | 0.48 | 0.27 |
| Nominal Exchange Rate | % | 1.22 | 8.73 | 11.77 | 13.49 | 14.45 |
| Real Exchange Rate | % | -8.2 | -3.43 | -1.93 | -1.09 | -0.61 |
| Fiscal Stance | % | 1.61 | -0.03 | -0.02 | -0.01 | -0.01 |
| Wealth | % | -3.8 | -4.99 | -5.67 | -6.05 | -6.26 |
| Investment | % | -2.98 | -0.94 | -0.53 | -0.3 | -0.17 |
| Current Account | % | -0.82 | -0.26 | -0.15 | -0.08 | -0.05 |
| Debt | D | 1.61 | 1.57 | 1.56 | 1.55 | 1.54 |
| French Economy | | | | | | |
| Output | % | -8.78 | -4.91 | -2.76 | -1.55 | -0.87 |
| CPI Inflation | D | 9.43 | 2.74 | 1.55 | 0.87 | 0.49 |
| Domestic Price Level | % | 10 | 12.4 | 13.84 | 14.65 | 15.11 |
| Wage Level | % | 2.98 | 11.11 | 13.11 | 14.24 | 14.88 |
| Nominal Interest Rate | D | 7.17 | 2.94 | 1.66 | 0.93 | 0.52 |
| Real Interest Rate | D | 4.77 | 1.5 | 0.85 | 0.48 | 0.27 |
| Nominal Exchange Rate | % | 1.22 | 8.73 | 11.77 | 13.49 | 14.45 |
| Real Exchange Rate | % | -8.2 | -3.43 | -1.93 | -1.09 | -0.61 |
| Fiscal Stance | % | 1.61 | -0.03 | -0.02 | -0.01 | -0.01 |
| Wealth | % | -3.8 | -4.99 | -5.67 | -6.05 | -6.26 |
| Investment | % | -2.98 | -0.94 | -0.53 | -0.3 | -0.17 |
| Current Account | % | -0.82 | -0.26 | -0.15 | -0.08 | -0.05 |
| Debt | D | 1.61 | 1.57 | 1.56 | 1.55 | 1.54 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

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**Table 7 : Two Country Monetary Union, Inflation Targeting**

Non-Cooperative Nash Equilibrium

Symmetric Inflation Shock (10%,10%)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -3.6 | -3.06 | -2.49 | -2.03 | -1.65 |
| CPI Inflation | D | 7.32 | 4.97 | 4.01 | 3.26 | 2.65 |
| Domestic Price Level | % | 10 | 14.43 | 18.04 | 20.96 | 23.35 |
| Wage Level | % | 7.12 | 13.06 | 16.96 | 20.09 | 22.64 |
| Nominal Interest Rate | D | -3.3 | -2.14 | -1.72 | -1.4 | -1.14 |
| Real Interest Rate | D | -7.73 | -5.75 | -4.65 | -3.78 | -3.07 |
| Nominal Exchange Rate | % | -31.04 | -18.33 | -8.57 | -0.66 | 5.77 |
| Real Exchange Rate | % | -38.35 | -30.62 | -24.87 | -20.21 | -16.43 |
| Fiscal Stance | % | 0.73 | 0.79 | 0.65 | 0.53 | 0.43 |
| Wealth | % | -1.63 | -3.18 | -4.45 | -5.48 | -6.32 |
| Investment | % | 4.83 | 3.59 | 2.91 | 2.36 | 1.92 |
| Current Account | % | -6.46 | -5.14 | -4.18 | -3.4 | -2.76 |
| French Economy | | | | | | |
| Output | % | -3.6 | -3.06 | -2.49 | -2.03 | -1.65 |
| CPI Inflation | D | 7.32 | 4.97 | 4.01 | 3.26 | 2.65 |
| Domestic Price Level | % | 10 | 14.43 | 18.04 | 20.96 | 23.35 |
| Wage Level | % | 7.12 | 13.06 | 16.96 | 20.09 | 22.64 |
| Nominal Interest Rate | D | -3.3 | -2.14 | -1.72 | -1.4 | -1.14 |
| Real Interest Rate | D | -7.73 | -5.75 | -4.65 | -3.78 | -3.07 |
| Nominal Exchange Rate | % | -31.04 | -18.33 | -8.57 | -0.66 | 5.77 |
| Real Exchange Rate | % | -38.35 | -30.62 | -24.87 | -20.21 | -16.43 |
| Fiscal Stance | % | 0.73 | 0.79 | 0.65 | 0.53 | 0.43 |
| Wealth | % | -1.63 | -3.18 | -4.45 | -5.48 | -6.32 |
| Investment | % | 4.83 | 3.59 | 2.91 | 2.36 | 1.92 |
| Current Account | % | -6.46 | -5.14 | -4.18 | -3.4 | -2.76 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

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**Table 8 : Two Country Monetary Union, Monetary Dominance**

Symmetric Inflation Shock (10%,10%), Homogeneous Preferences

a) Independent Policy Making (Non-cooperative Policies)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -8.73 | -4.73 | -2.74 | -1.59 | -0.92 |
| CPI Inflation | D | 10.3 | 1.91 | 0.83 | 0.38 | 0.19 |
| Domestic Price Level | % | 10 | 13.31 | 14.06 | 14.12 | 14.04 |
| Wage Level | % | 3.01 | 12.15 | 13.28 | 13.67 | 13.78 |
| Nominal Interest Rate | D | -16.69 | 1.94 | 4.61 | 3.68 | 2.42 |
| Real Interest Rate | D | -20 | 1.19 | 4.55 | 3.75 | 2.5 |
| Nominal Exchange Rate | % | 14.52 | -3.57 | -1.55 | 3.38 | 7.32 |
| Real Exchange Rate | % | 4.22 | -15.78 | -14.58 | -10.03 | -6.28 |
| Fiscal Stance | % | -16.03 | 1.99 | 4.52 | 3.59 | 2.37 |
| Wealth | % | 13.85 | 10.67 | 5.47 | 1.48 | -1.12 |
| Investment | % | 12.5 | -0.75 | -2.84 | -2.34 | -1.56 |
| Current Account | % | 1.35 | -2.43 | -2.36 | -1.64 | -1.04 |
| Debt | D | -16.03 | -14.04 | -9.52 | -5.93 | -3.56 |

b) Cooperative Policy Making (ECB = 1/3), Accountability

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -8.81 | -4.83 | -2.72 | -1.54 | -0.88 |
| CPI Inflation | D | 9.71 | 2.68 | 1.48 | 0.8 | 0.43 |
| Domestic Price Level | % | 10 | 12.66 | 14.12 | 14.87 | 15.26 |
| Wage Level | % | 2.95 | 11.44 | 13.4 | 14.46 | 15.01 |
| Nominal Interest Rate | D | 3.06 | 1.61 | 1.44 | 1.12 | 0.82 |
| Real Interest Rate | D | 0.4 | 0.15 | 0.68 | 0.74 | 0.63 |
| Nominal Exchange Rate | % | 5.52 | 8.61 | 10.23 | 11.72 | 12.89 |
| Real Exchange Rate | % | -4.18 | -3.78 | -3.64 | -2.95 | -2.21 |
| Fiscal Stance | % | -1.84 | -0.79 | 0.19 | 0.49 | 0.5 |
| Wealth | % | -0.37 | -0.78 | -1.66 | -2.53 | -3.25 |
| Investment | % | -0.25 | -0.09 | -0.43 | -0.46 | -0.39 |
| Current Account | % | -0.12 | -0.32 | -0.45 | -0.41 | -0.33 |
| Debt | D | -1.84 | -2.63 | -2.43 | -1.95 | -1.45 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.
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**Table 9 : Two Country Monetary Union, Monetary Surrender**

Cooperative Equilibrium - ECB = 0

Symmetric Inflation Shock (10%,10%)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -6.61 | -4.43 | -2.96 | -1.98 | -1.33 |
| CPI Inflation | D | 9.36 | 4.31 | 2.89 | 1.93 | 1.29 |
| Domestic Price Level | % | 10 | 14.07 | 16.83 | 18.67 | 19.91 |
| Wage Level | % | 4.71 | 12.51 | 15.78 | 17.97 | 19.44 |
| Nominal Interest Rate | D | 7.52 | 4.64 | 3.1 | 2.08 | 1.39 |
| Real Interest Rate | D | 3.45 | 1.88 | 1.26 | 0.84 | 0.56 |
| Nominal Exchange Rate | % | 0.22 | 7.98 | 12.75 | 15.94 | 18.08 |
| Real Exchange Rate | % | -9.14 | -5.69 | -3.81 | -2.55 | -1.71 |
| Fiscal Stance | % | 1.64 | 0.75 | 0.51 | 0.34 | 0.23 |
| Wealth | % | -3.29 | -5.15 | -6.4 | -7.23 | -7.79 |
| Investment | % | -2.15 | -1.18 | -0.79 | -0.53 | -0.35 |
| Current Account | % | -1.14 | -0.69 | -0.46 | -0.31 | -0.21 |
| French Economy | | | | | | |
| Output | % | -6.61 | -4.43 | -2.96 | -1.98 | -1.33 |
| CPI Inflation | D | 9.36 | 4.31 | 2.89 | 1.93 | 1.29 |
| Domestic Price Level | % | 10 | 14.07 | 16.83 | 18.67 | 19.91 |
| Wage Level | % | 4.71 | 12.51 | 15.78 | 17.97 | 19.44 |
| Nominal Interest Rate | D | 7.52 | 4.64 | 3.1 | 2.08 | 1.39 |
| Real Interest Rate | D | 3.45 | 1.88 | 1.26 | 0.84 | 0.56 |
| Nominal Exchange Rate | % | 0.22 | 7.98 | 12.75 | 15.94 | 18.08 |
| Real Exchange Rate | % | -9.14 | -5.69 | -3.81 | -2.55 | -1.71 |
| Fiscal Stance | % | 1.64 | 0.75 | 0.51 | 0.34 | 0.23 |
| Wealth | % | -3.29 | -5.15 | -6.4 | -7.23 | -7.79 |
| Investment | % | -2.15 | -1.18 | -0.79 | -0.53 | -0.35 |
| Current Account | % | -1.14 | -0.69 | -0.46 | -0.31 | -0.21 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

FAIRTAYLOR Algorithm by Warwick McKibbin

**Table 10 : An Asymmetric Two Country Monetary Union**

Cooperative Equilibrium - ECB = 1/3

Asymmetric Inflation Shock (0%,20%), homogeneous preferences

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | 4.93 | -1.22 | -1.15 | -0.95 | -0.64 |
| CPI Inflation | D | -0.24 | 3.48 | 1.31 | 0.84 | 0.47 |
| Domestic Price Level | % | 0 | 3.7 | 4.73 | 5.49 | 5.91 |
| Wage Level | % | 3.94 | 1.25 | 4.18 | 5.07 | 5.68 |
| Nominal Interest Rate | D | 7.17 | 2.94 | 1.66 | 0.93 | 0.52 |
| Real Interest Rate | D | 3.47 | 1.91 | 0.9 | 0.51 | 0.28 |
| Nominal Exchange Rate | % | 1.22 | 8.73 | 11.77 | 13.49 | 14.45 |
| Real Exchange Rate | % | -7.42 | -3.95 | -2.04 | -1.14 | -0.63 |
| Fiscal Stance | % | 9.27 | 3.3 | 1.23 | 0.48 | 0.18 |
| Wealth | % | -8.04 | -11.64 | -13.16 | -13.87 | -14.21 |
| Investment | % | -2.17 | -1.2 | -0.56 | -0.32 | -0.17 |
| Current Account | % | -5.88 | -2.4 | -0.95 | -0.4 | -0.17 |
| French Economy | | | | | | |
| Output | % | -22.49 | -8.6 | -4.38 | -2.15 | -1.11 |
| CPI Inflation | D | 19.09 | 1.99 | 1.78 | 0.9 | 0.51 |
| Domestic Price Level | % | 20 | 21.1 | 22.96 | 23.82 | 24.31 |
| Wage Level | % | 2.01 | 20.96 | 22.04 | 23.41 | 24.07 |
| Nominal Interest Rate | D | 7.17 | 2.94 | 1.66 | 0.93 | 0.52 |
| Real Interest Rate | D | 6.07 | 1.08 | 0.79 | 0.44 | 0.26 |
| Nominal Exchange Rate | % | 1.22 | 8.73 | 11.77 | 13.49 | 14.45 |
| Real Exchange Rate | % | -8.98 | -2.91 | -1.83 | -1.04 | -0.59 |
| Fiscal Stance | % | -6.06 | -3.36 | -1.26 | -0.49 | -0.19 |
| Wealth | % | 0.44 | 1.65 | 1.82 | 1.78 | 1.69 |
| Investment | % | -3.79 | -0.68 | -0.5 | -0.28 | -0.16 |
| Current Account | % | 4.23 | 1.89 | 0.66 | 0.23 | 0.08 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

FAIRTAYLOR Algorithm by Warwick McKibbin

**Table 11 : An Asymmetric Two Country Monetary Union**

Cooperative Equilibrium - ECB = 1/3

Symmetric Inflation Shock (10%,10%), asymmetric preferences

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| German Economy | | | | | | |
| Output | % | -10.05 | -4.54 | -2.56 | -1.34 | -0.71 |
| CPI Inflation | D | 7.45 | 1.05 | 0.82 | 0.39 | 0.21 |
| Domestic Price Level | % | 10 | 9.41 | 9.84 | 9.97 | 10.05 |
| Wage Level | % | 1.96 | 8.79 | 9.15 | 9.66 | 9.88 |
| Nominal Interest Rate | D | 8.78 | 2.97 | 1.53 | 0.82 | 0.43 |
| Real Interest Rate | D | 9.37 | 2.54 | 1.41 | 0.73 | 0.39 |
| Nominal Exchange Rate | % | -1.42 | 7.83 | 10.94 | 12.54 | 13.39 |
| Real Exchange Rate | % | -14.87 | -5.5 | -2.96 | -1.55 | -0.82 |
| Fiscal Stance | % | 8.61 | 2.71 | 1.44 | 0.75 | 0.39 |
| Wealth | % | -11.12 | -14.97 | -17.05 | -18.13 | -18.71 |
| Investment | % | -5.86 | -1.59 | -0.88 | -0.46 | -0.24 |
| Current Account | % | -5.27 | -2.26 | -1.2 | -0.63 | -0.33 |
| French Economy | | | | | | |
| Output | % | -7.75 | -6.12 | -2.86 | -1.56 | -0.81 |
| CPI Inflation | D | 11.06 | 4.15 | 1.47 | 0.89 | 0.45 |
| Domestic Price Level | % | 10 | 14.86 | 16.44 | 17.46 | 17.97 |
| Wage Level | % | 3.8 | 12.29 | 15.99 | 17.07 | 17.79 |
| Nominal Interest Rate | D | 8.78 | 2.97 | 1.53 | 0.82 | 0.43 |
| Real Interest Rate | D | 3.92 | 1.39 | 0.52 | 0.31 | 0.16 |
| Nominal Exchange Rate | % | -1.42 | 7.83 | 10.94 | 12.54 | 13.39 |
| Real Exchange Rate | % | -6.47 | -2.55 | -1.16 | -0.64 | -0.34 |
| Fiscal Stance | % | -2.27 | -2.25 | -1.25 | -0.64 | -0.34 |
| Wealth | % | 0.33 | 1.05 | 1.59 | 1.84 | 1.98 |
| Investment | % | -2.45 | -0.87 | -0.32 | -0.19 | -0.1 |
| Current Account | % | 2.78 | 1.59 | 0.86 | 0.44 | 0.23 |

key: % is percent deviation from unchanged baseline;
D is change from unchanged baseline.

FAIRTAYLOR Algorithm by Warwick McKibbin

**Fig.2: Output Dynamics, Germany and France**
symmetric inflation shock - symmetric preferences

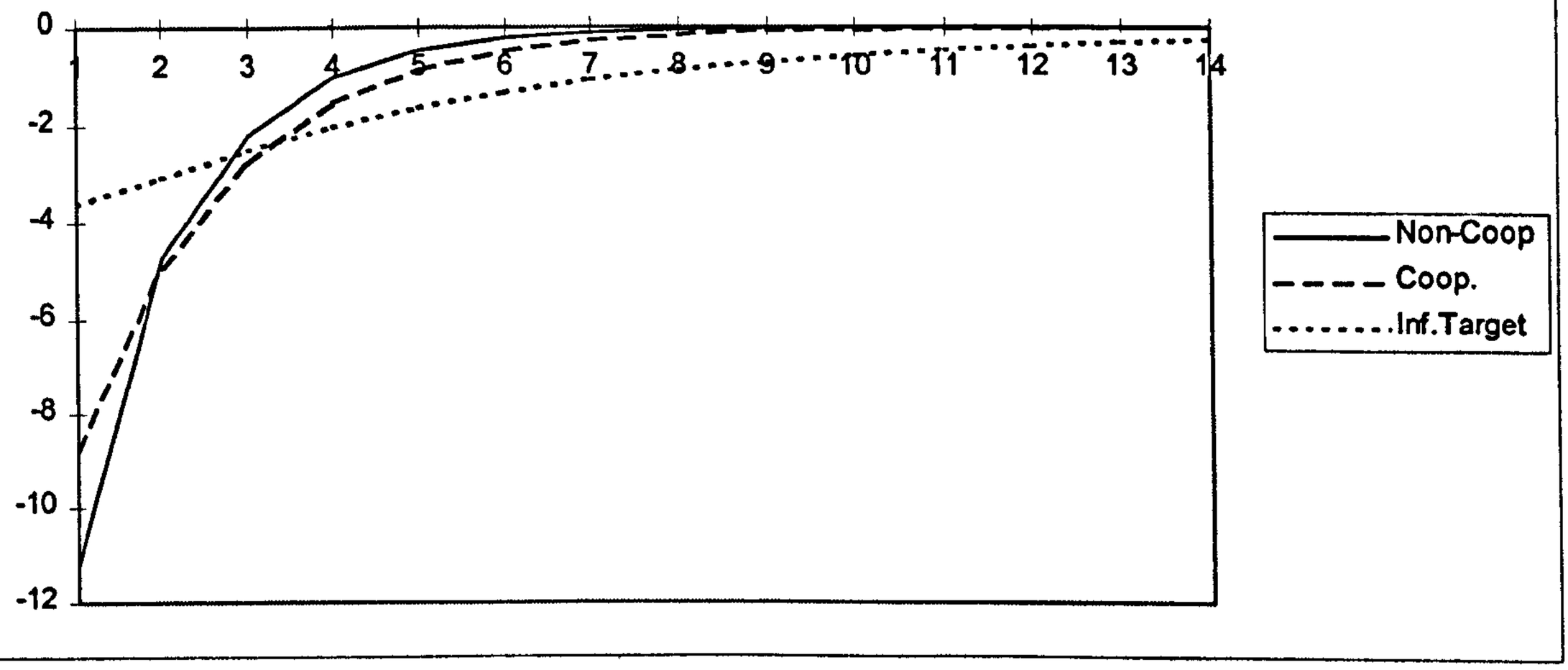



**Fig.3: Inflation Dynamics, Germany and France**
symmetric inflation shock - symmetric preferences

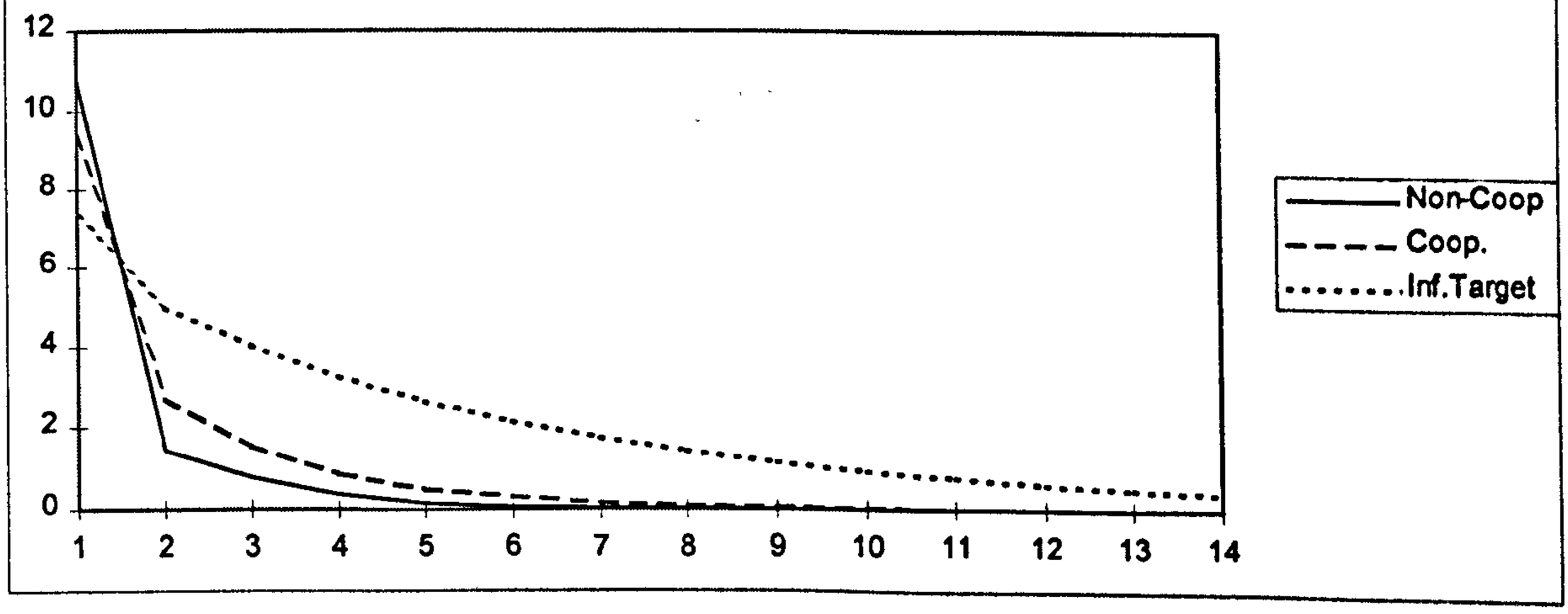


**Fig.4: German Output Dynamics**
asymmetric inflation shock - symmetric preferences

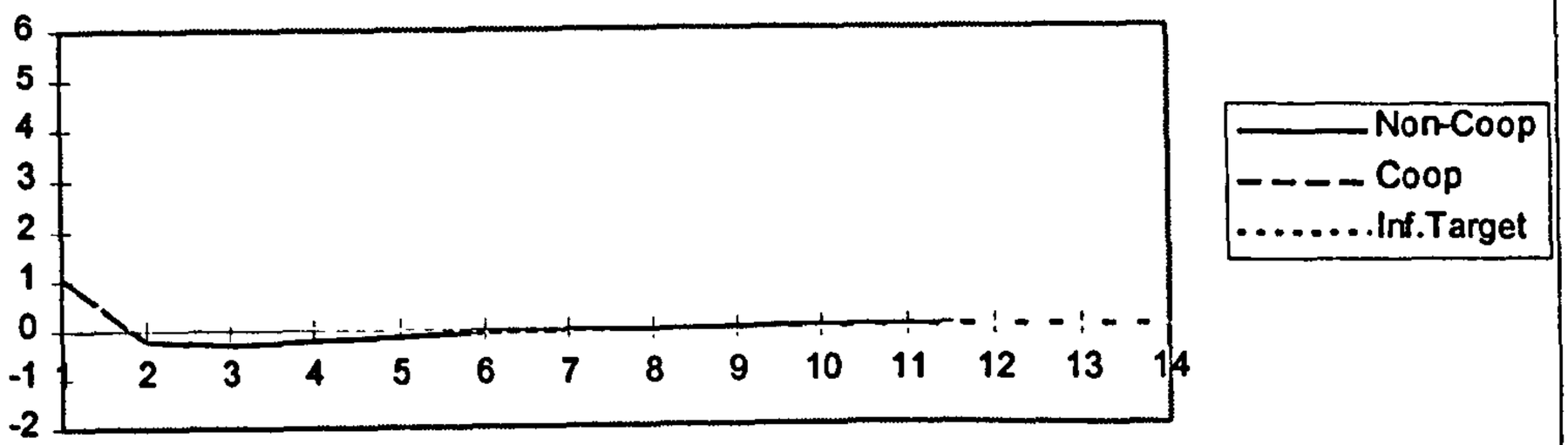



**Fig.5: German Inflation Dynamics**
asymmetric inflation shock - symmetric preferences

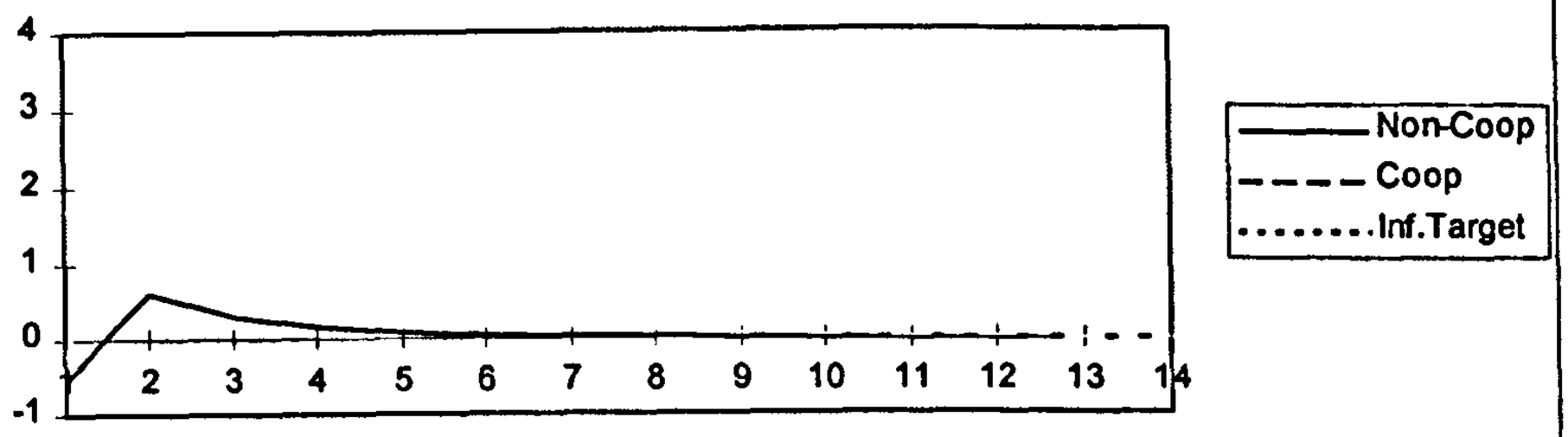



**Fig.6: French Output Dynamics**
asymmetric inflation shock - symmetric preferences

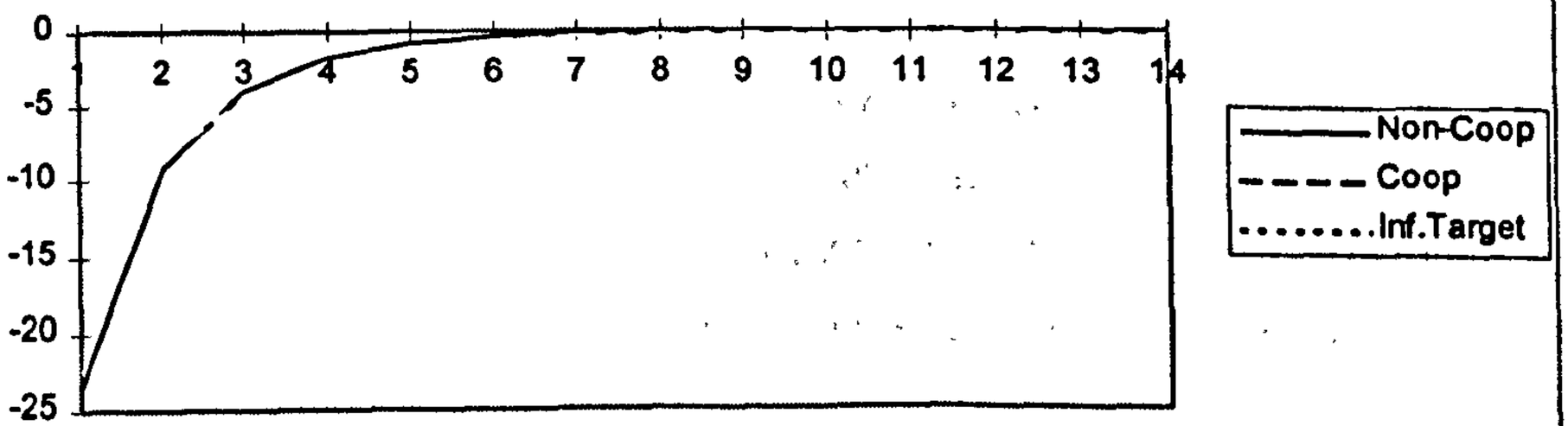
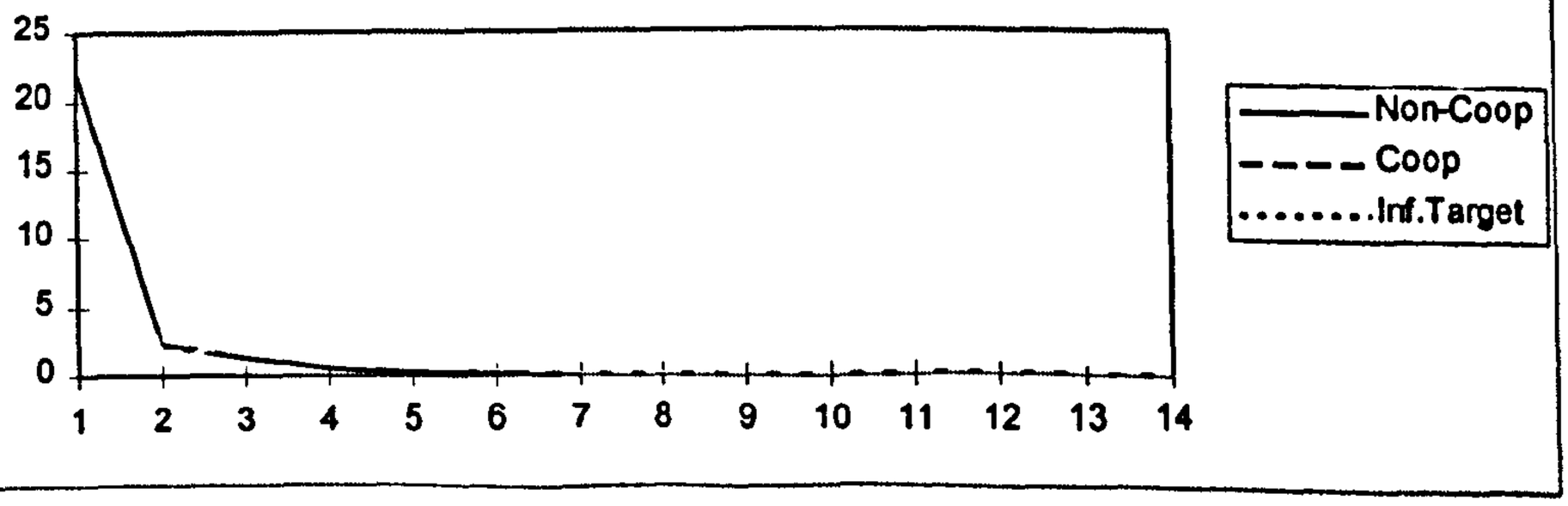



**Fig.7: French Inflation Dynamics**
asymmetric inflation shock - symmetric preferences



**Appendix 2**

# The Model

The model is in levels, and all variables are expressed in deviations from their long run (equilibrium) growth paths. All US variables are exogenous, and are therefore suppressed. The European exchange rate is expressed in terms of the dollar. Parameters have been chosen so as to correspond in a stylized fashion with reality:

i) The Keynesian multiplier has a value of 2.0.

ii) The marginal propensity to import is 0.25 in all countries.

iii) At the margin (that is, in variations around the equilibrium growth paths), 72% of core and periphery trade is between themselves. This means that the marginal propensity of each to import from the other is 18%, and 7% from elsewhere.

iv) Trade elasticities are of a standard size: the sum of the price elasticities of demand for exports and imports is 2.5. This means that a 1% depreciation of the Mark, not matched by a change in the Lira would, ceteribus paribus, improve the German current account balance by 2.5% of the initial level of exports (or 0.625% of GDP).

Equations (1) and (1$^*$) show the determination of aggregate demands. The real exchange rate terms show the effects on the home country trade balance of home country and foreign country exchange rates. The $y^*$ term shows the foreign demand for domestic exports, and vice versa in equation (1$^*$). Equations (2) and (2$^*$) are the Phillips curves, which contain effects on both the level of and change in output. Equations (3) and (3$^*$) relate consumer prices to output and import prices (which are influenced by both exchange rates). Equations (4) and (4$^*$) show current account evolution and equations (5) and (5$^*$) show investment. Equations (6) and (6$^*$) and (10) show exchange rate determination between Europe and US under perfect capital mobility and model-consistent expectations. Finally equations (7), (8) and (9) – also (7*), (8*) and (9*) – are recursive to the rest of the model and describe the evolution of money supplies, the debt ratio, and net wealth respectively.

**Equations** (a "+1" subscript denotes a forward looking variable)

«German» Block

(1) $y = 1.25a - 0.90a^{*} + 0.36y^{*} + 2.0inv + 2.0g$

(2) $p_{+1} = p + pc - pc_{-1} + 0.5y + 0.3(y-y_{-1})$

(3) $pc = p + 0.25a - 0.18a^{*}$

(4) $ca = 0.625a - 0.45a^{*} - 0.25y + 0.18y^{*}$

(5) $inv = -0.625\,(r - p_{+1} + p)$

(6) $a_{+1} = a + (r - p_{+1} + p)$

(7) $m = ky + \ell r$

$k>0,\ \ell<0$

(8) $d = (1 + r - \Delta y - \Delta p)\, d_{-1} + g$

(9) $w = (1 + r)w_{-1} + inv + ca$

«French» Block

(1*) $y^{*} = 1.25a^{*} - 0.90a + 0.36y + 2.0inv^{*} + 2.0g^{*}$

(2*) $p^{*}_{+1} = p^{*} + pc^{*} - pc^{*}_{-1} + 0.5y^{*} + 0.3(y^{*}-y^{*}_{-1})$

(3*) $pc^{*} = p^{*} + 0.25a^{*} - 0.18a$

(4*) $ca^{*} = 0.625a^{*} - 0.45a - 0.25y^{*} + 0.18y$

(5*) $inv^{*} = -0.625\,(r - p^{*}_{+1} + p^{*})$

(6*) $a^{*}_{+1} = a^{*} + (r - p^{*}_{+1} + p^{*})$

(7*) $m^{*} = ky^{*} + \ell r$

(8*) $d^{*} = (1 + r - \Delta y^{*} - \Delta p^{*})\, d^{*}_{-1} + g$

(9*) $w^{*} = (1+r)w_{-1} + inv + ca$

European Block

(10) $n = (a + a^{*}) + (p + p^{*})$

A star denotes a «French» variable; variables without stars are «German» variables.

*Endogenous Variables*

y : output
p : output prices

pc : consumer prices
ca : current balance
inv : investment
a : real exchange rate in $ terms
n : nominal exchange rate (vs.$)

*Policy Instruments*

g : net fiscal expenditures
r : European nominal interest rate

Recursive Variables

m : money stock
d : debt to GNP ratio
w : national wealth

Policy Multipliers

| | Year | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| g, | incremental | 1.63 | -.58 | -.23 | -.03 | -.02 | -.01 |
| | Cumulative | 1.63 | 1.05 | .82 | .79 | .78 | .77 |
| r, | incremental | .52 | .06 | .04 | .02 | .02 | .01 |
| | Cumulative | .52 | .56 | .62 | .64 | .66 | .67 |

# CHAPTER 6

# A NOTE ON CENTRAL BANK INDEPENDENCE, POLITICAL UNCERTAINTY AND THE CORRECT ASSIGNMENT OF INSTRUMENTS TO TARGETS

## *6.1. Introduction*

From the work of Alesina and Summers (1993) and Alesina and Gatti (1995), it is widely accepted that there is no evidence supporting the idea, initiated by Rogoff (1985), that Central Bank Independence produces higher output variability in pursuing successfully its objective of lower inflation. They argue that this is because Central Bank Independence eliminates the uncertainty created by a polarised political system. Because the political conflict produces inefficiency in the determination of output and prices, delegation of monetary policy solves the problem by eliminating the political source of macroeconomic instability.

This observation has very important implications for any discussion about accountability and independence of the European Central Bank. As we noted before, accountability of the ECB is an issue only in the case that its independent behaviour produces a sub-optimal outcomes, even for a subset of EMU members. In providing the best possible solution for all the participants (or for a large majority of them) , the central bank can overcome any accountability issue. In the Alesina and Gatti interpretation, a totally independent ECB eliminates any possibility of policy conflicts between different national

preferences, and then eliminates any uncertainty produced the heterogeneity of national policy objectives.

In this chapter we want briefly to analyse the question posed by Alesina and Summers empirical findings, looking for other possible sources of explanation[1]. Like in most of the literature in the area, their model does not include the effect of having more than one policy instrument in the hands of policy authorities. We argue that this omission has important implications for the nature of the results. Analysing the effect of introducing fiscal policy (in its crudest form) in the picture described by Rogoff, Alesina and Gatti, we find that the findings of Alesina and Summers are not inconsistent with the Rogoff "trade off" of Central Bank independence. At the same time introducing another instrument allows us to verify how Central Bank Independence affects the political uncertainty itself.

We argue that Central bank independence has two main effects in the conduct of economic policies. First of all it induces an higher activism in the conduct of fiscal policy, in response to the lower propensity of using monetary policy to counteract exogenous shocks. But, more importantly, when there is political polarisation, Central Bank Independence resolves the political uncertainty in favour of the party willing to use more fiscal policy[2]. In fact the median voter, normally indifferent between the two poles, would now choose the party with the highest propensity to expand, in order to reduce the cost of lower output stabilisation provided by the Central Bank. This, while solving the political polarisation, produces a polarised system, in which fiscal and monetary policy now follow different and opposite strategies and targets. The solution provides both an efficient assignment of instruments to targets and a possibility of conflict between policy makers,

---

[1] - The findings of Alesina and Summers are reinforced by the analysis of Cuckierman and al. (1993), which extended the data set including non-industrial countries, and does not find any correlation between central bank independence and output growth or output variability. Crosby (1998) argued that central bank independence is the product of low output variability, and not vice versa. As in Posen (1993) the casual relation is not from the institution to the economy but from the economy to the institutions.

[2] - The interdependence between institutions and political outcomes has been noted in a different context by Persson and Tabellini (1992). In their model Monetary Union will produce a downward competitive pressure on capital taxation that the electorate will try to mitigate electing politicians less sensitive to this strategic use of tax policy. Even in their model, negletting the political

similar to the one illustrated by Nordhaus (1994), Demertzis et al. (1997), Blake and Weale (1998) and analysed in the previous chapter, depending on the underlying economic structure.

In the following section we look at the effect of introducing fiscal policy in the standard Rogoff model. Thereafter we analyse how this changes the choice faced by the median voter in a situation of polarised political systems, as introduced by Alesina and Rosenthal (1995) and Alesina and Gatti (1995). The chapter concludes with some empirical observations not inconsistent with the theoretical argument that Central Bank Independence is not "neutral" respect to the use of fiscal policy and to the political process.

## *6.2 - Rogoff Model with fiscal policy*

Consider an economy described by the following Lucas supply function, in which, by tradition, the level of output (in term of difference from the natural level) is determined by the difference between actual and expected inflation, a random supply shocks $\varepsilon$, with zero mean and finite variance, and by the effect of distortionary taxes on output $\tau$ (Debelle and Fisher, 1994).

$$y_t = \pi_t - \pi_t^e - \tau_t + \varepsilon_t \qquad (1)$$

As always, the private sector moves first, signing wage contracts before the shocks have occurred and the policy of the authorities are implemented. Again following the established literature, the Government wants to minimise the following loss function expressed in terms of inflation, distortionary taxes and output[3].

---

ripercussions cal lead one to overestimate the effects of European integration on domestic policy making.

[3] - Neither the supply function (1) nor the objective function (2) are an optimal representation of the true structure and the true choices faced by the economic actors. The choice we make has many clear advantages: it is the choice made in the great part of the literature we are analysing (Alesina and Tabellini, 1987, Debelle and Fisher, 1994, Beetsma and Bovemberg, 1995, Castren, 1998) in which a supply function like (1) is derived from profit maximisation under a Cobb Douglas technology with labour as the only variable input and in which $\tau$ is equal to distortionary taxes levied on firms total revenue (all in logs). Introducing taxes in this way allows us to compare

$$\min_{\pi,\tau} L = \frac{1}{2}\left[(\pi_t)^2 + (\tau_t)^2 + \beta(y_t - k)^2\right] \qquad (2)$$

The last term among parentheses shows the source of expansionary bias built in the objective function. The government wants to reach a level of output k>0 that is higher than the natural rate. The parameter β is the relative weight given to the output objective, that is also the indication of how "conservative" the policy authority is, with an higher β showing an higher relative interest on the output target, and therefore a less conservative set of preferences. Substituting (1) in (2), minimising the loss function with respect to the two instruments π and τ, and solving the system of first order conditions, ones obtains;

$$\pi_t = \frac{\beta}{(1+2\beta)}\left[\pi_t^e + k - \varepsilon_t\right] \qquad (3)$$

$$\tau_t = -\frac{\beta}{(1+2\beta)}\left[\pi_t^e + k - \varepsilon_t\right] \qquad (4)$$

Solving (3) and (4) for rational expectations and dropping time subscripts one obtains the following time consistent optimal level of inflation and taxes:

$$\pi = \frac{\beta}{1+\beta}k - \frac{\beta}{1+2\beta}\varepsilon \qquad (5)$$

$$\tau = -\frac{\beta}{1+\beta}k + \frac{\beta}{1+2\beta}\varepsilon \qquad (6)$$

and the following expected inflation and output:

---

our results with the ones of Rogoff and Alesina and Gatti, and all the literature of central bank independence and accountability. In the same way, the objective function (2) assumes that the bliss value for both taxes and inflation is zero, while there is a positive objective for output, simply on the grounds of having a structure compatible with the main contributions in the area. Having a different parametric structure, as arbitrary as the one chosen, would not improve the realism of our simplified economic structure, and would confuse the comparisons with previous contributions. Moreover it will not affect the results because we focus on the relative use of the policy instruments. Only if the parameter for taxes was zero, and therefore the preferences were such that no fiscal policy should be used at any time, would the model reduce to the one presented by Alesina and Gatti.

$$\pi^e = \frac{\beta}{1+\beta} k \tag{7}$$

$$y = \frac{\beta}{1+\beta} k - \frac{1}{1+2\beta} \varepsilon \tag{8}$$

The policy rules (5) and (6) show that the government uses a composition of both instruments to achieve both its output and inflation objective and its desired level of stabilisation of shocks. This formulation introduces the traditional inflationary bias in the conduct of economic policies, represented by the first term on the RHS of policy rule (5).

From (5)-(8) it follows that:

$$E(\pi) = \frac{\beta}{1+\beta} k, \tag{10}$$

$$E(y) = \frac{\beta}{1+\beta} k \tag{11}$$

$$Var(\pi) = \left(\frac{\beta}{1+2\beta}\right)^2 \sigma_\varepsilon^2 \tag{12}$$

$$Var(y) = \left(\frac{1}{1+2\beta}\right)^2 \sigma_\varepsilon^2 \tag{13}$$

$$Var(\tau) = \left(\frac{\beta}{1+2\beta}\right)^2 \sigma_\varepsilon^2 \tag{14}$$

It is obvious that discretionary policy making produces an inefficient outcome, although using the fiscal instrument allows partially to reach the output target defined by parameter *k*. Nevertheless, the inability to commit to a zero inflation rule produces the standard inflationary bias of economic policy highlighted by Kyndland and Prescott (1977) and formalised in a similar model by Barro and Gordon (1983).

Following the Rogoff argument, suppose that the Government decides to delegate the conduct of monetary policy to an institution with more conservative preferences (with a

preference parameter $\gamma<\beta$) than the society as a whole. However the Government maintains control of the fiscal instrument. Suppose that the appointed Central Banker wants to minimise the following loss function

$$\min_{\pi} L=\frac{1}{2}\left[(\pi_t)^2+(\tau_t)^2+\gamma(y_t-k)^2\right] \qquad \text{where } \gamma<\beta \qquad (15)$$

while the government wishes to minimise the loss function (2), now using the only instruments remaining in its hands (taxation).

$$\min_{\tau} L=\frac{1}{2}\left[(\pi_t)^2+(\tau_t)^2+\beta(y_t-k)^2\right] \qquad (16)$$

With this institutional specialisation we obtain the following policy rules:

$$\pi=\frac{\gamma}{1+\beta}k-\frac{\gamma}{1+\beta+\gamma}\varepsilon \qquad (17)$$

$$\tau=-\frac{\beta}{1+\beta}k+\frac{\beta}{1+\beta+\gamma}\varepsilon \qquad (18)$$

and the following expected inflation and output:

$$\pi^e=\frac{\gamma}{1+\beta}k \qquad (19)$$

$$y=\frac{\beta}{1+\beta}k-\frac{1}{1+\beta+\gamma}\varepsilon \qquad (20)$$

From (17)-(20) it follows that:

$$E(\pi)=\frac{\gamma}{1+\beta}k, \qquad (21)$$

$$E(y)=\frac{\beta}{1+\beta}k \qquad (22)$$

$$Var(\pi)=\left(\frac{\gamma}{1+\beta+\gamma}\right)^2\sigma_\varepsilon^2 \qquad (23)$$

$$Var(y)=\left(\frac{1}{1+\beta+\gamma}\right)^2\sigma_\varepsilon^2 \tag{24}$$

$$Var(\tau)=\left(\frac{\beta}{1+\beta+\gamma}\right)^2\sigma_\varepsilon^2 \tag{25}$$

As in the standard Rogoff analysis, delegation of monetary policy to a more conservative agent produces a lower inflationary bias and lower inflation variability at the expenses of higher output variability[4]. The introduction of fiscal policy changes the outcome in that the government will now use more taxes to reduce the effect of shocks on output. Therefore, central bank independence could be expected to be associated with a more active use of fiscal policy, a feature already noted, in the literature, although from a different theoretical angle ( Hughes Hallett and Vines, 1993, Nordhaus, 1994, among others).

## *6.3. Political Uncertainty Revisited*

The previous result analysis has simply incorporated fiscal policy in the Rogoff model. As the Rogoff model, it does not explain the empirical findings of no correlation between Central bank Independence and output variability. Although it shows that fiscal policy is used more with an independent central bank, if the explanation of this absence of correlation is in the contemporaneous use of more fiscal policy, the solution should explain why fiscal policy is used more than the optimal level derived before.

In order to do so, we introduce the fiscal policy settings described above in the Alesina and Gatti model of political polarisation. In their model, two parties with different political preferences co-ordinate before the election to appoint an independent central banker with preferences more conservative than the median voter. In doing so, they change the nature of the political choice faced by the electorate, which now has to choose, given the policy of the central bank, the optimal fiscal policy they want. Formally the two parties (D and R) have different and polarised preferences as:

---

[4] -For similar shock (13) is clearly lower than (24), given the assumption $\gamma<\beta$.

$$\min_{\tau} L_D = \frac{1}{2}\left[(\pi_t)^2 + (\tau_t)^2 + \beta^D (y_t - k)^2\right] \tag{26}$$

$$\min_{\tau} L_R = \frac{1}{2}\left[(\pi_t)^2 + (\tau_t)^2 + \beta^R (y_t - k)^2\right] \tag{27}$$

with $\beta^D > \beta^R$

In the absence of central bank independence, if the population have preferences uniformly distributed between these two poles, the election will be decided randomly by the median voter with preferences equidistant from the two poles or :

$$\lambda = \frac{\beta^D + \beta^R}{2} \tag{28}$$ [5]

Therefore, as in the Alesina and Gatti model, the two parties would prefer the appointment, before the election, of an independent central banker, with preference parameter $\gamma$ such that $\beta^R < \gamma < \lambda < \beta^D$ .[6] But what happens after the two parties have agreed to appoint this independent central banker to supersede monetary policy?.

The choice faced by the median voter is now fundamentally changed. Formally the choice can be described as the minimisation of the following expected loss function with respect to the parameter $\beta$,

$$\min_{\beta} L_{MV} = \frac{1}{2} E\left[(\pi_t)^2 + (\tau_t)^2 + \lambda (y_t - k)^2\right] \tag{29}$$

Substituting in equations (17), (18) and (20), we obtain:

---

[5] - The assumption of uniformly distributed preferences is not essential for the development of our argument that the independence of the central bank changes the characteristics, but does not eliminate the conflict of preferences present in the society. On the contrary, with a suitable probability distribution, it could be demonstrated that CBI increase political uncertainty, instead that reducing it, as in Alesina and Gatti or in the rest of the chapter. But doing this would shift the focus of the chapter away from what we consider the central argument, i.e. that institutional design simply relocates economic and political distortions, does not solve them. Unless the origin of the distortion is an inefficient institutional design in the first place (von Hagen and Harden, 1995, Hallerberg and von Hagen, 1997). See *Appendix 1* for a more general analysis of this point.

[6] - In *Appendix 2* we show how the Alesina and Gatti results are extended in our setting of multiple policy instruments. As in their model the two parties are better off appointing a Central Banker with preferences corresponding to the parameterisation $\beta^R < \gamma < \lambda < \beta^D$.

$$\min_{\beta} L_{MV} = \frac{1}{2} E\left[\left(\frac{\gamma}{1+\beta} k - \frac{\gamma}{1+\beta+\gamma}\varepsilon_t\right)^2 + \left(-\frac{\beta}{1+\beta} k + \frac{\beta}{1+\beta+\gamma}\varepsilon\right)^2 + \lambda\left(-\frac{1}{1+\beta} k - \frac{1}{1+\beta+\gamma}\varepsilon\right)^2\right] \quad (30)^7$$

Taking expectations, gives:

$$\min_{\beta} L_{MV} = \frac{1}{2}\left(\frac{\gamma^2+\beta^2+\lambda}{(1+\beta)^2} k^2 + \frac{\gamma^2+\beta^2+\lambda}{(1+\beta+\gamma)^2}\sigma^2\right) \quad (31)$$

The voter has to decide which one of the two alternatives gives the minimum losses as described by equation (31). Formally:

$$\min L_{MV} = \min\left[\left(\frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R)^2} k^2 + \frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R+\gamma)^2}\sigma^2\right), \left(\frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D)^2} k^2 + \frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D+\gamma)^2}\sigma^2\right)\right] \quad (32)$$

Therefore the median voter would choose party D if and only if:

$$L_{MV/R} - L_{MV/D} = \left\{\left(\frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R)^2} k^2 + \frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R+\gamma)^2}\sigma^2\right) - \left(\frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D)^2} k^2 + \frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D+\gamma)^2}\sigma^2\right)\right\} > 0 \quad (33)$$

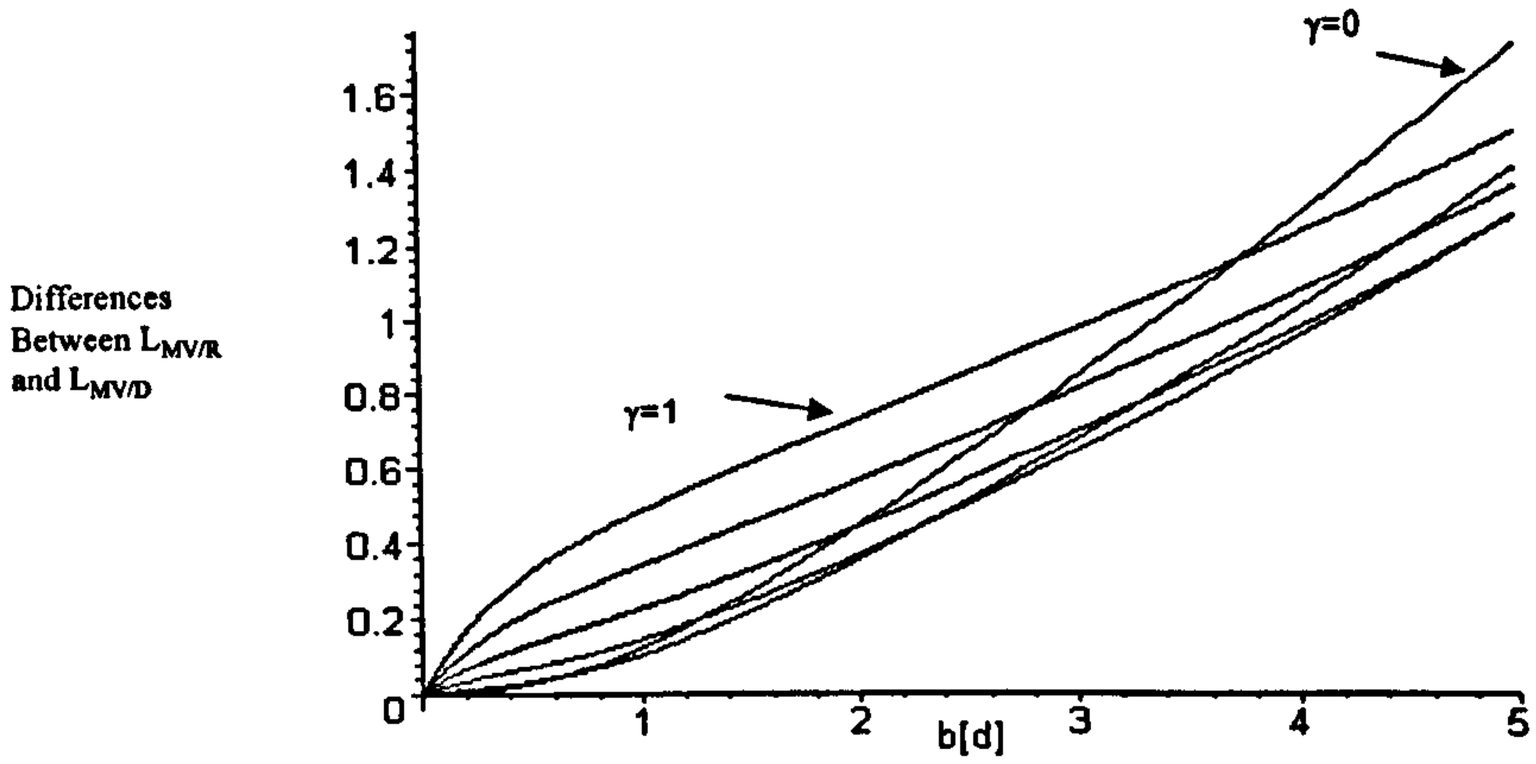
It is possible to show that condition (32) always holds for the subset of the values of the parameters we are interested. To illustrate the characteristics of function (32), consider the values of the parameters analysed in Alesina and Gatti, i.e., k=1, $\sigma^2$=1, $\beta^R$=0. Figure 1

---

[7] - Strictly speaking the parameter β in equation (30) should be equal to the weighted average of the parameters $\beta^D$ and $\beta^R$ where the weight is given by the a-priori probability of the two parties to be elected i.e.: $\beta=P(\beta^R)+(1-P)(\beta^D)$. But while this a priori probability is exogenous as far as the parties is concerned, for the median voter this uncertainty does not exists because he has the possibility to choose the value of the parameter β, among the ones offered by the parties, that minimise his loss function.

shows the value of this function for different values of $\beta^D$ and different degrees of central bank conservativeness $\gamma$.

## Figure 1: Numerical Analysis of Condition (33)*



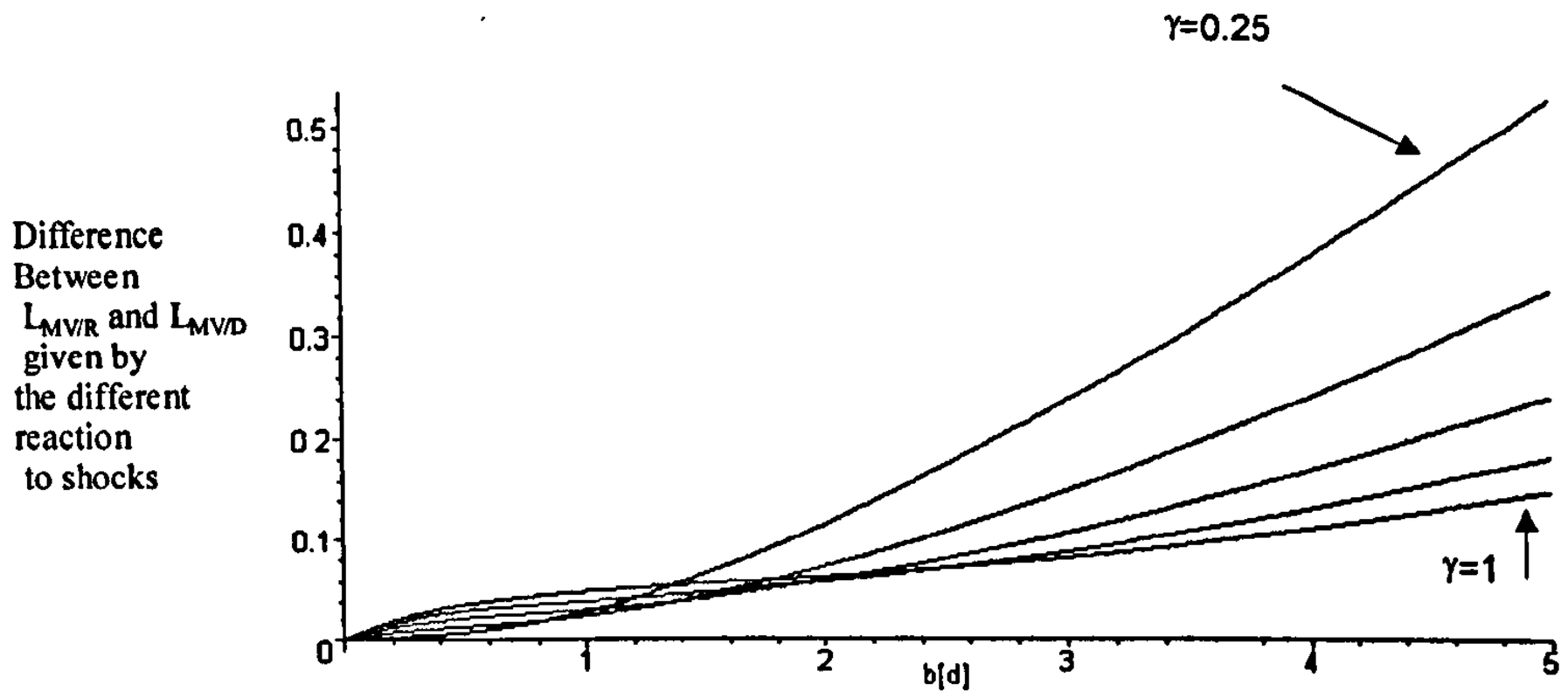

* Since $\beta^R=0$, the values of $\beta^D$ above correspond to the degree of differences in the parties preferences. For increasing value of $\beta^D$ (i.e.$\beta^D - \beta^R$), electing the R party becomes more costly for the median voter with preferences defined by (28)

In order to gain some insights into why this result arises, we consider the two different policy components in (33) separately. On the one hand we have the losses produced by the exogenous shock, that is:

$$\left(\frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R+\gamma)^2}\sigma^2\right)-\left(\frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D+\gamma)^2}\sigma^2\right)>0 \qquad (34)$$

As expected, party R will always produce less overall stabilisation than party D, and the more the two parties are apart in preference terms, the bigger the loss for the median voter in choosing party R instead than party D will be, as shown in figure 2.

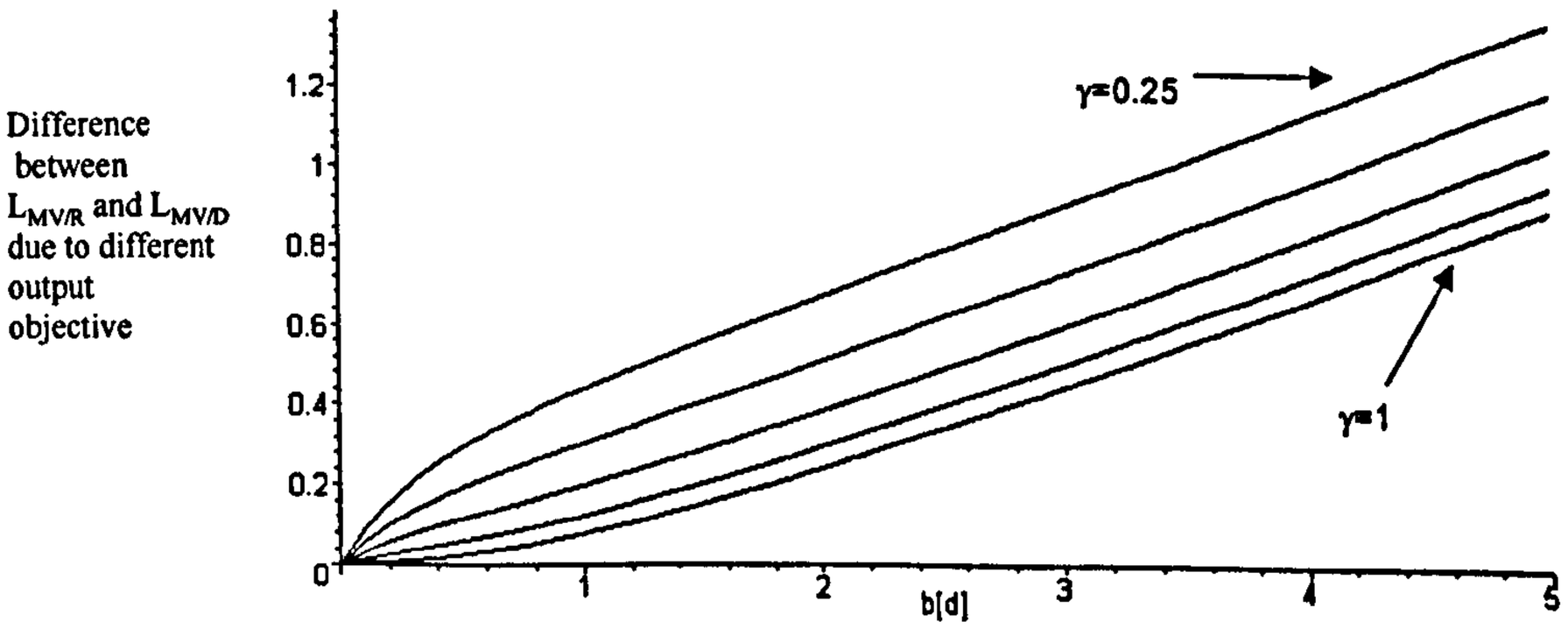
Figure 2: Numerical Analysis of Condition (34)




But perhaps more surprisingly, the median voter has an advantage in choosing party D even considering the effect of following the output objective *k*, as shown in relation (35) and in figure (3)

$$\left(\frac{\gamma^2+(\beta^R)^2+\lambda}{(1+\beta^R)^2}k^2\right)-\left(\frac{\gamma^2+(\beta^D)^2+\lambda}{(1+\beta^D)^2}k^2\right)>0 \qquad (35)$$

Figure 3: Numerical Analysis of Condition (35)




In fact, since $\gamma>0$, as the analysis of Alesina and Gatti shows, a more progressive fiscal authority on one hand arrives closer to the output objective *k*, and on the other it reduces

even more the inflationary bias still present in the Central Bank objective function[8]. Greater use of fiscal policy to achieve output objectives reduces at the same time the need to use monetary policy, therefore achieving a more targeted use of economic policy instruments.

This is the main result we want to highlight. The fact that the political parties choose an independent central bank has important consequences on the set of incentives and choices faced by the electorate. Political choices do not simply disappear, like in Alesina and Gatti, but are transferred from monetary policy to fiscal policy. What condition (33) tells us is that the median voter, confronted with one arm of the policy tied by the preferences of the Central Bank, moves "to the left" searching for higher activism of fiscal policy. In the political model of Alesina and Gatti it means that the electorate will choose D to control fiscal policy.

This will produces the following expected values of inflation and output, and the following variances of taxes, inflation and income:

$$E(\pi)=\frac{\gamma}{1+\beta^{D}}k, \tag{36}$$

$$E(y)=\frac{\beta^{D}}{1+\beta^{D}}k \tag{37}$$

$$Var(\pi)=\left(\frac{\gamma}{1+\beta^{D}+\gamma}\right)^{2}\sigma_{\varepsilon}^{2} \tag{38}$$

$$Var(y)=\left(\frac{1}{1+\beta^{D}+\gamma}\right)^{2}\sigma_{\varepsilon}^{2} \tag{39}$$

$$Var(\tau)=\left(\frac{\beta^{D}}{1+\beta^{D}+\gamma}\right)^{2}\sigma_{\varepsilon}^{2} \tag{40}$$

---

[8] This is clear from (17) above, in which inflation tend to zero for a more progressive government (increasing β).

In the presence of an independent central bank, the appointment of the more progressive government produces a situation in which each instrument of economic policy is targeted to a single objective more directly. Note that inflation will be lower under a progressive government because monetary policy is substituted by fiscal policy in following the output objective. At the same time this will certainly produce lower inflation variance and higher fiscal variance; output variability will be lower depending on how much conservative the central bank is, and how willing to use fiscal policy the government is.

The fact that matters here is that, in world a of multiple policy instruments, appointing and independent central bank changes the political environment, and therefore is not neutral in the outcomes. While it will definitely produce lower inflation, the effect on output will depend on how much the fiscal authority will be willing to use its instrument.

## *6.4. Some Empirical Observations*

The analysis of the previous part suggests that independence of the central bank should be associated with a change of the characteristics of fiscal policy. While Central Bank Independence would produce an increase in output variability, as argued by Rogoff, this negative effect does not materialise, as shown by Alesina and Summers, because, we argue, fiscal policy is used more and the electorate favours those who are willing to use more the fiscal instrument. Therefore, if our hypothesis is correct, a positive correlation between central bank independence and variance of deficits should be present. Previous empirical analyses have not looked at the issue, concentrating instead on the relationship between central bank independence and level of deficits (Parkin, 1987, Marsciandaro and Tabellini, 1988, Grilli, Masciandaro and Tabellini, 1991 among others). The general findings point to the fact that may be a weak negative correlation between the level of deficits and the degree of independence. But what matters, for our point of view, is the degree of activism required to the fiscal authority.

In order to have a first look at the issue, we have selected two indices of Central Bank Independence and we looked at their correlation with the variance of primary deficits of

11 European countries, US, Japan and Canada. The indexes used are the one used by Alesina and Summers (1993) and the one constructed by Grilli, Masciandaro and Tabellini (1991) [9] and are reported in table 1.

Table 1: Indices of CBI

| | Alesina and Summer (1993) index of CBI | Grilli, Masciandaro and Tabellini (1991) Index of CBI |
|---|---|---|
| Austria | 2 | 9 |
| Belgium | 2 | 7 |
| Denmark | 2.5 | 8 |
| Finland | 2 | 8 |
| France | 2 | 7 |
| Germany | 4 | 13 |
| Italy | 1.75 | 5 |
| Netherlands | 2.5 | 10 |
| Spain | 1.5 | 5 |
| Sweden | 2 | 5 |
| United Kingdom | 2 | 6 |
| Usa | 3 | 12 |
| Canada | 2 | 11 |
| Japan | 3 | 6 |

We use two measures of fiscal policy activism, one being the variance of primary deficit adjusted for cyclical components, as defined by Eurostat, to insulate the variations of the fiscal policy produced by active policies pursued by the fiscal authorities. At the same time we looked at the variance of the overall primary deficit. In both case we considered the period 1973-1991, in order to avoid the German Unification period that would have undoubtedly biased the result toward positive correlation. Figures 4a and 4b show the correlation between the Alesina and Summers index and the two measures of variance of fiscal policy. A weak positive correlation is clearly evident considering both the measure of fiscal activism.

[9] - There is a great variety of indexes base on very different criteria. The Grilli, Masciandaro and Tabellini one is based the level of political and economic independence of each central bank. The Alesina and Summers one is instead and average of the GMT index and the Bade and Parkin (1982), which is based only on political independence. A review of these and many others contributions can be found in Eijffinger and de Haan (1995).

**Fig. 4a : Variance Cyclically Adjusted Deficit/GDP**

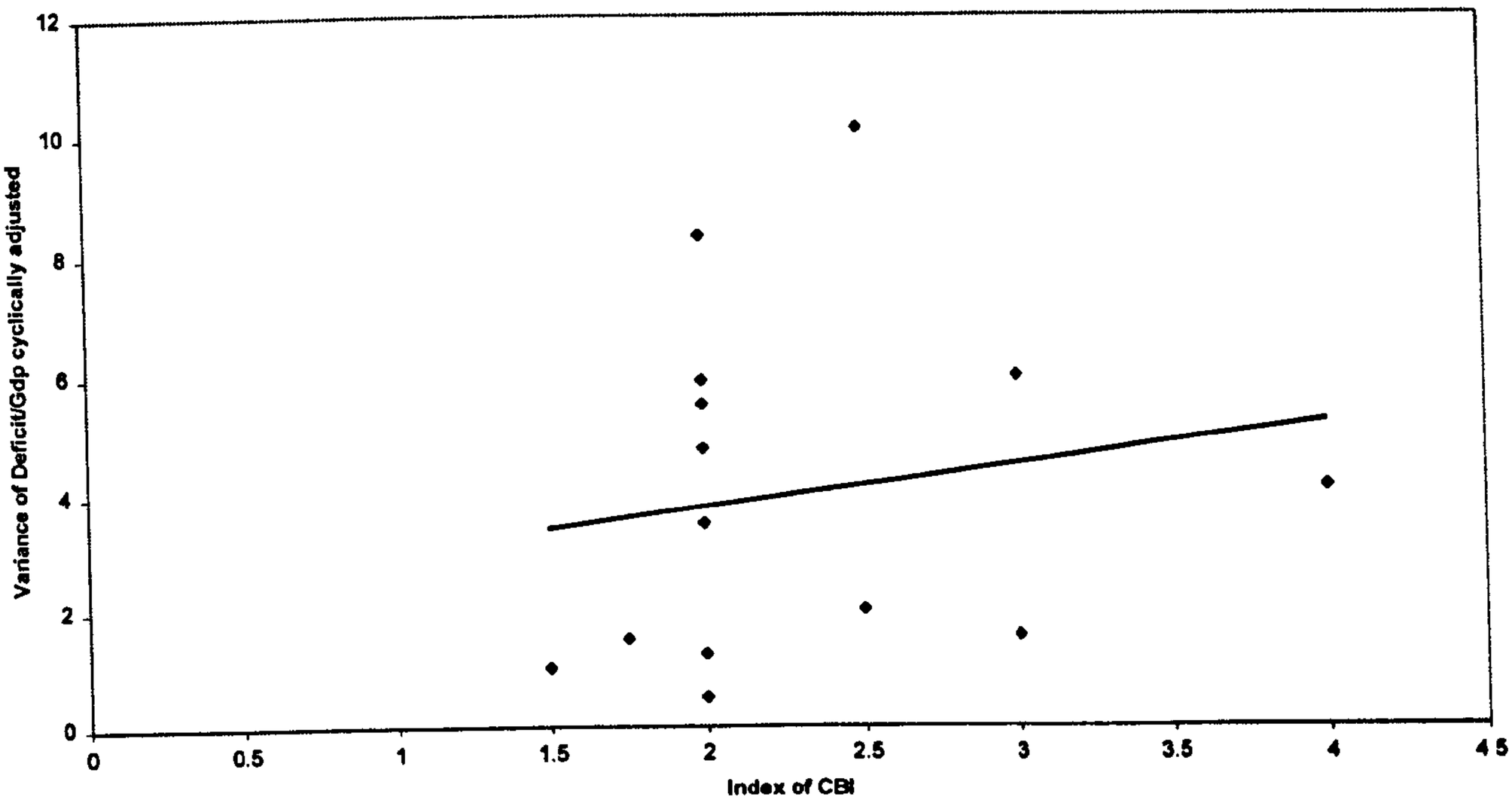
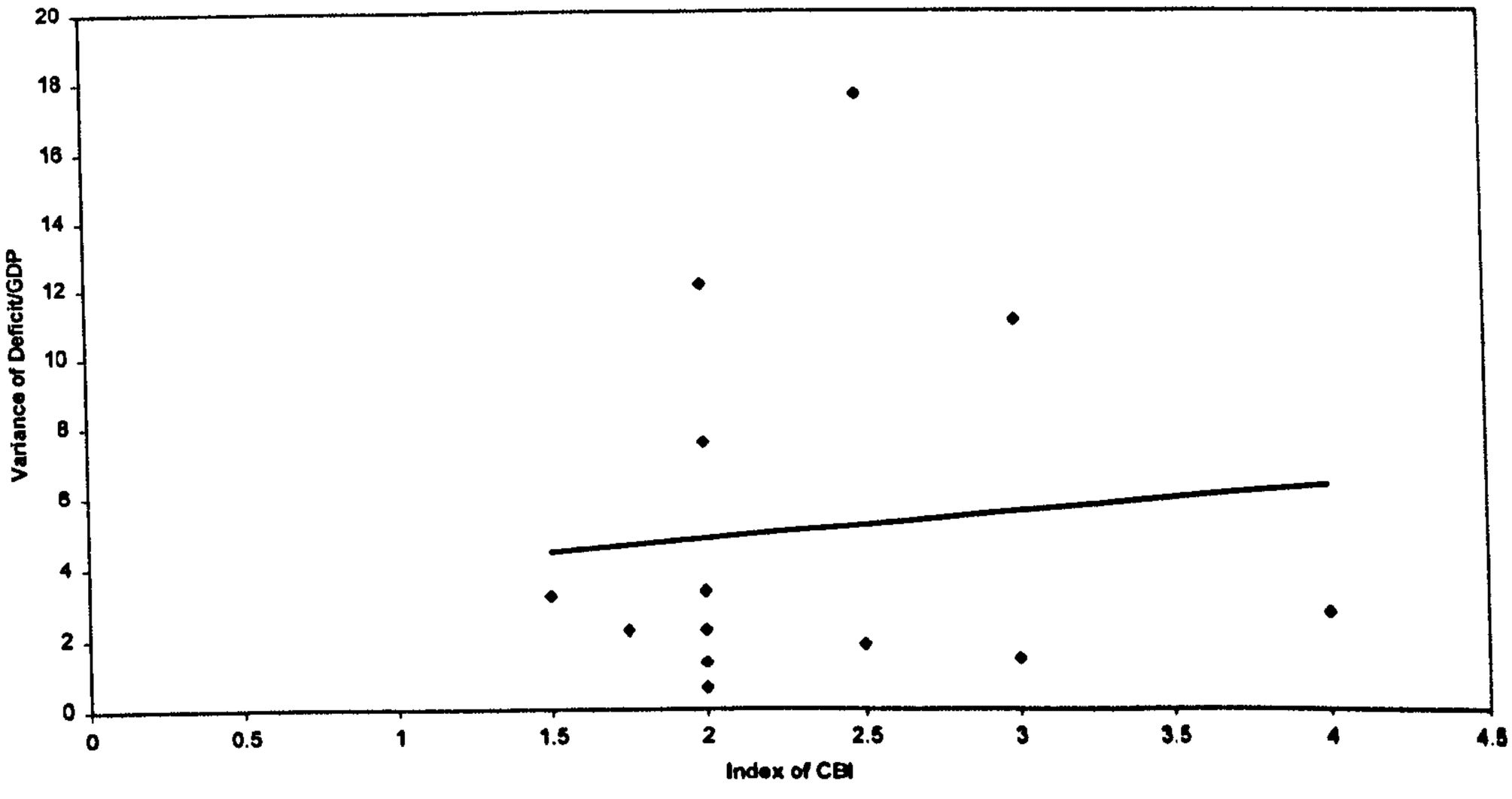



**FIG.4b - Variance Deficit/GDP**




This results suggests that the analysis is maybe able to capture feature of the data. On the other hand figure 4a - 4b shows how the result is highly sensitive to the measure of CBI in use. When using the GMT index, however, the positive correlation disappears, and even reverts to being negative when non adjusted deficit is considered.

**Fig.5a: Variance of Cyclically Adjusted Deficit/GDP**
GMT index of CBI

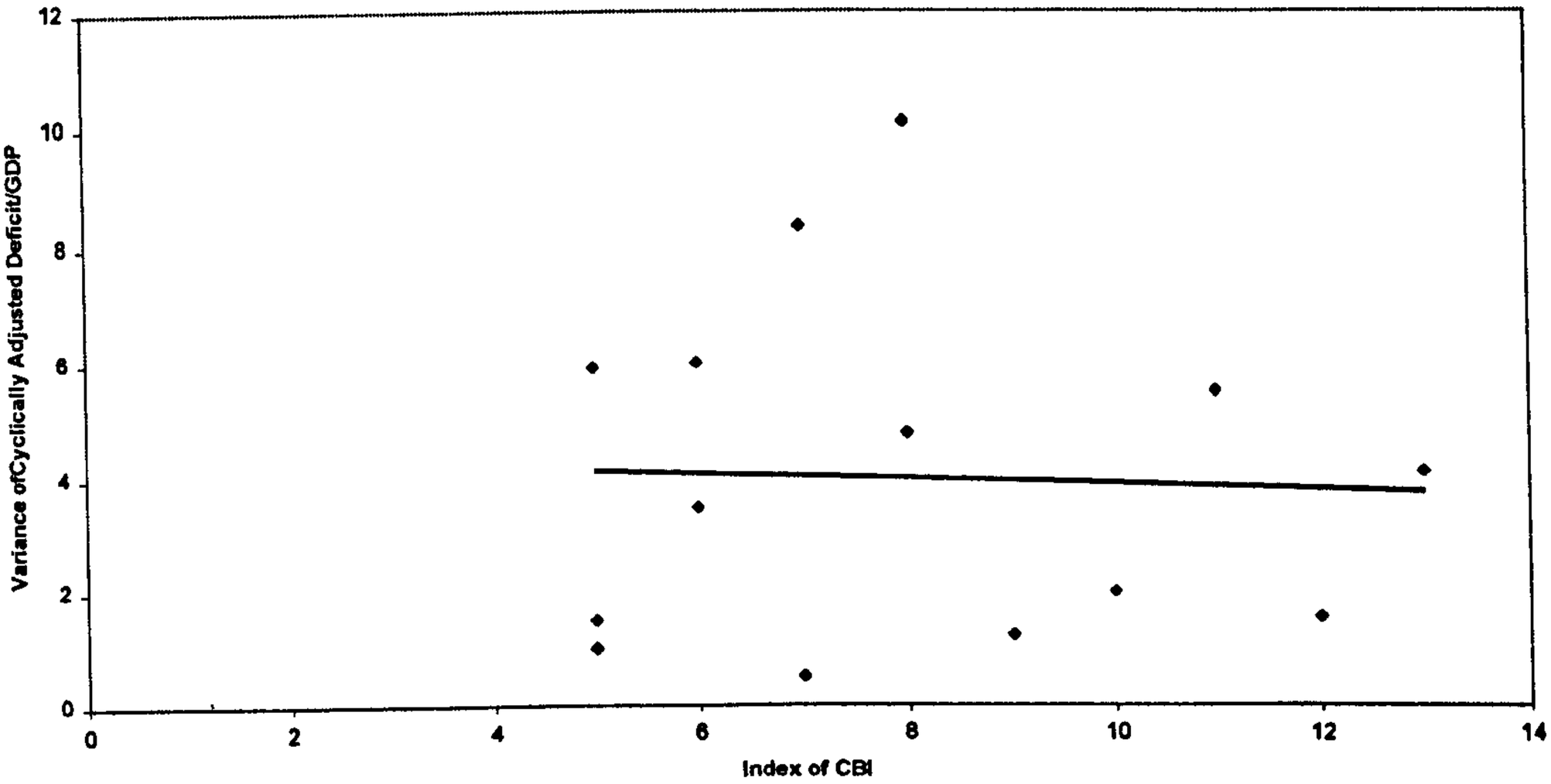



**Fig.5b : Variance Deficit/GDP**
GMT Index of CBI

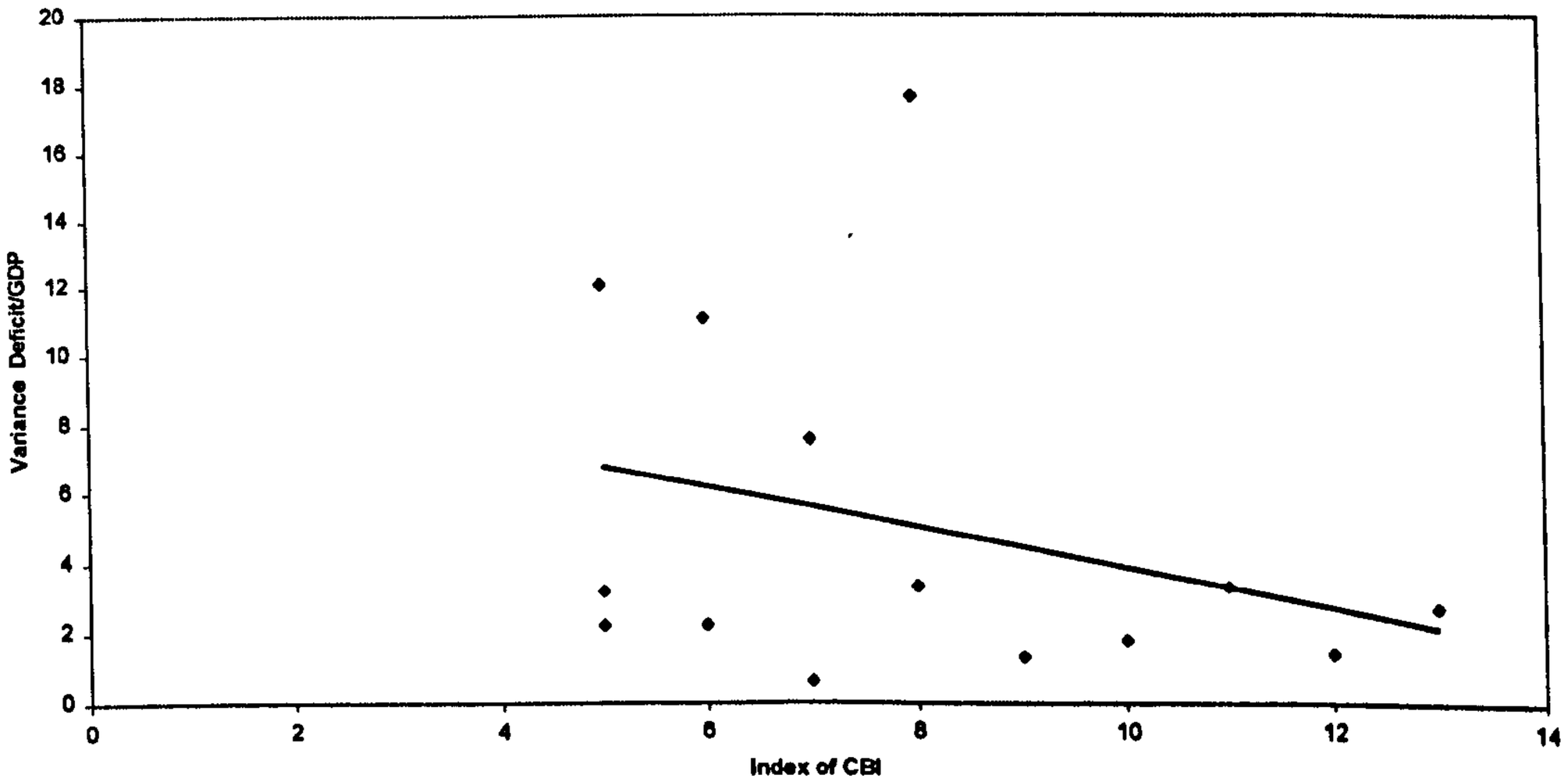



Table 1 shows a synthesis of the OLS in the four case considered. It is clearly evident that the results are not particularly significant, either from a statistical point of view or from a conceptual one, if not for the indication of a possible future research.

```
Var(PDCA)= 2.35 +0.71(AG index)
                   (SE : 1.2)
Var(PD)=3.3 + 0.74(AG index)
              (SE: 2.25)
```

```
Var(PD-CA)= 4.38 -0.05(GMT index)
                  (SE: 0.31)
Var(PD)= 9.65 -0.58(GMT index)
                (SE: 0.52)
```

Data: Eurostat

The fact that the two indices, although similar in principle, give opposite results, shows not only the very tentative nature of the analysis but also the low level of homogeneity among the indexes themselves. As noted by Eijffinger and de Hahn (1995) the correlation between the different indexes of CBI is very low, and this is because each group of authors put weight on different concepts of independence (legal, political or economical); and also interpret the characteristics of each institution quite differently.

On the other hand, the possibility to find a strict positive correlation as described in the model is naturally very small. The factors influencing the variability of deficits are so many and diverse, that even finding a small positive correlation as indicated by the theory is an interesting event in itself.

## *6.5. Conclusion*

In conclusion, this paper has shown that the introducing fiscal policy in the traditional model of monetary policy delegation can change dramatically both the positive and the normative indications of the theory. From the positive point of view, the analysis shows that central bank independence produces a more extensive use of the fiscal instrument and at the same time it changes, without resolving, the nature of the policy choices faced by the private sector. Far from being neutral, the appointment of an independent central bank reduces the importance of inflation as a policy objective and favours those parties more willing to use the fiscal instrument to achieve other objectives of economic policy. Therefore Central Bank Independence is not the instrument to solve any possible conflict of preferences: the difference in preferences that was before on the use of the monetary instruments is simply relocate on the use of the fiscal instrument. The difference now is that the median voter, assured about inflation control, would prefer a more active fiscal authority.

The result of this institutional change is at the same time a more efficient assignment of instrument to targets and a polarised institutional settings, in which the two policy authorities follow opposite policy objectives. The possibility of conflict between the authorities, analysed among others by Nordhaus (1994), Demertzis, Hughes Hallett and Viegi (1997) and Blake and Weale (1998), could therefore be the effect of the institutional change represented by the introduction of an independent central bank

Following this line of thinking, the rigidity of the Maastricht rules and the presence of a very conservative European Central Bank may be not totally uncorrelated with the fact that 11 out of 15 European governments are formed by centre-left parties with agendas often in open conflict with the "stability culture" at the base of the Maastricht design.

## *Appendix 1*

In this appendix we show that the theoretical result that having a "conservative" central bank shifts the preferences of the voter towards the party with more expansionary preferences is independent to the particular distribution of voters preferences. The simplest way to verify this assertion is to perform the minimisation of equation (31) in the main text respect to the parameter β. Therefore each voter will have to determine the optimal value of β (the preference parameter for the government), given the preferences of the central bank, γ, and given his own preferences,λ.

$$\min_{\beta} L_V = \frac{1}{2}\left( \frac{\gamma^2 + \beta^2 + \lambda}{(1+\beta)^2} k^2 + \frac{\gamma^2 + \beta^2 + \lambda}{(1+\beta+\gamma)^2} \sigma^2 \right) \tag{A1}$$

The first order condition for this problem is:

$$\frac{\partial L_V}{\partial \beta} = \left( \frac{\gamma^2 + \beta + \lambda}{(1+\beta)^3} k^2 + \frac{\gamma^2 + \beta(1+\gamma) + \lambda}{(1+\beta+\gamma)^3} \sigma^2 \right) = 0 \tag{A2}$$

that gives an optimal value of β as function of the conservativeness of the central bank and the preference parameter of each individual voter.

$$\beta^* = \beta(\gamma, \lambda)$$

Unfortunately a closed form solution is not generally manageable and we have performed a series of numerical simulations on the function (A1) and (A2) to determine their general characteristics.

First of all, consider the case in which there is not any macroeconomic uncertainty. It easy to show that, with $\sigma^2=0$, the optimal level of β is:

$$\beta^* = \lambda + \gamma^2 \tag{A3}$$

And because, by definition, $\gamma > 0$, (A3) means that, as far as the achievement of output target, the voter distribution moves to the left once an independent (but non necessarily conservative) Central Bank is appointed.

The same can be said if we consider the case in which the output objective is $k=0$[10]. In this case the optimal solution would be:

$$\beta^* = \frac{\lambda + \gamma^2}{1+\gamma} \tag{A4}$$

that once again shows the left shift of the voter distribution once an independent central bank is appointed.

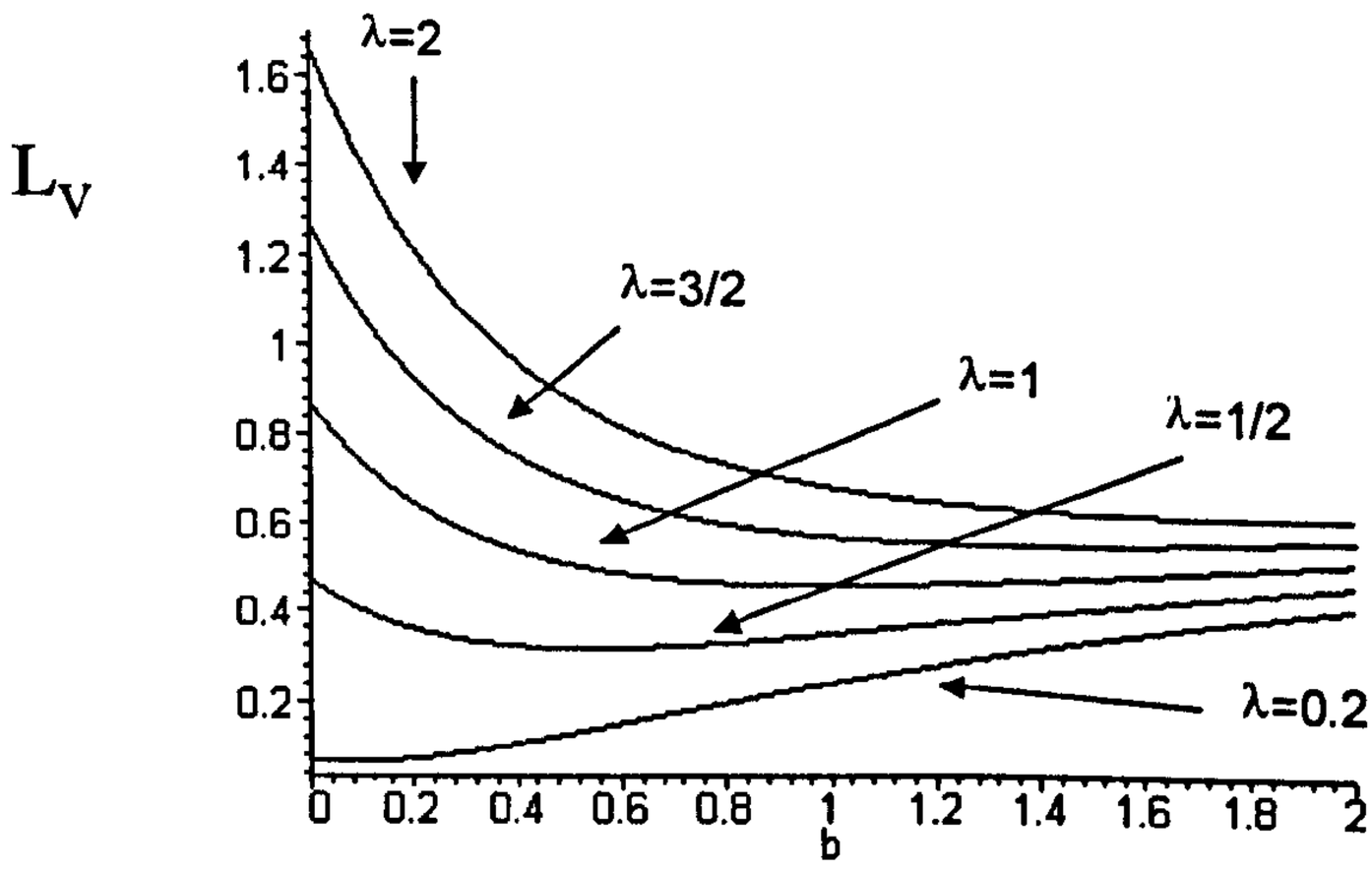
---

[10] This case is considered for illustrative porpoise, even if it is obvious that with $k=0$ there would be no inflationary bias and therefore no need to have an independent central bank in the first place.

When both k>0 and $\sigma^2$>0, the result is less clear cut, although the main future of the model is maintained. In fact what numerical simulations show is that the distribution becomes more concentrated in the middle, with more conservative voters preferring a more progressive fiscal authority than themselves and the more progressive one moving on the left. Nevertheless analysis of the characteristics of the loss function (A1) shows that having both Central bank and the government more conservative than the median voter is not an optimal solution, as argued in the main text.

In figure A1 we present simulation of $L_V$ as function of the government preferences β, for different voters parameter. If we consider the parameterisation used in the chapter and taken from the Alesina and Gatti work, it is clear that the party with more expansionary preferences (β=2) is preferred to the party with more conservative preferences (β=0), not only by the median voter (λ=1) but also by voters with preferences 1/2<λ<1.

Figure A1: Numerical Simulation of $L_V$




Parameters : k=1, $\sigma$2=1, γ =0.3

In conclusion, whatever the distribution of the voters, as long as there is political uncertainty, and therefore there is the ex-ante necessity to appoint an independent central bank, the appointment of an independent central bank will reduce the perceived costs of having a more expansionary fiscal authority, and therefore will favour the party with preferences on the left of the political spectrum.

## *Appendix 2*

The objective of this appendix is to analyse the behaviour of the two political parties in the framework developed in the paper, in order to see whether the incentive for the two parties to co-operate in order to appoint an independent central banker, highlighted by Alesina and Gatti (1995) remains. In fact, the presence of fiscal policy produces a difference between expected and actual outcomes of economic policy after the election even in the presence of an independent central banker. In fact ,without Central Bank Independence (NI) the expected inflation is:

$$\pi^e = p_{NI}\frac{\beta^R}{1+\beta^R}k + (1-p_{NI})\frac{\beta^D}{1+\beta^D}k \qquad \text{(A1)}$$

where *p* is the probability for party R to win the election. With Central bank Independence (CBI) the expected inflation is:

$$\pi^e_{CBI} = p_{CBI}\frac{\gamma}{1+\beta^R}k + (1-p_{CBI})\frac{\gamma}{1+\beta^D}k \qquad \text{(A2)}$$

therefore CBI does not totally eliminate the effects of political uncertainty other than changing the probability of the electoral outcome, as we argued in the main text. This is because the appointment of an independent Central Banker both changes the policy choices faced by the electorate and makes the probability of winning the election endogenous to the model (from $p_{NI}$ to .$p_{CBI}$)

Therefore to find if the incentive to co-operate exists, we have to see which are the expected losses for each political party before the election in the two different policy regimes and to see whether there is a range of values of CBI parameter γ that makes both parties better off appointing an independent central bank, given the change in the probability of being elected that the appointment produces.

Without Central Bank Independence, the expected losses faced by each party are represented by equation (26) and (27) above, i.e.:

$$\min_{\tau} L_D = \frac{1}{2}E\left[(\pi_t)^2 + (\tau_t)^2 + \beta^D(y_t - k)^2\right] \qquad \text{(A3)}$$

$$\min_{\tau} L_R = \frac{1}{2}E\left[(\pi_t)^2 + (\tau_t)^2 + \beta^R(y_t - k)^2\right] \qquad \text{(A4)}$$

with $\beta^D > \beta^R$

Given the private sector expectations, expected inflation, taxes and income are :

$$E_{NI}(\pi) = p_{NI} E\left( \frac{\beta^R}{(1+2\beta^R)} [\pi^e + k - \varepsilon \ ] \right) + (1 - p_{NI}) E\left( \frac{\beta^D}{(1+2\beta^D)} [\pi^e + k - \varepsilon] \right)$$

$$E_{NI}(\tau) = p_{NI} E\left( - \frac{\beta^R}{(1+2\beta^R)} [\pi^e + k - \varepsilon] \right) + (1 - p_{NI}) E\left( - \frac{\beta^D}{(1+2\beta^D)} [\pi^e + k - \varepsilon] \right)$$

$$E_{NI}(y) = E(\pi - \pi^e - \tau + \varepsilon)$$

Substituting these expressions in loss functions (A3) and (A4) we obtain (A5) and (A6) as functions of the parameters of the model and the variance of the shock:

$$L_{NI}^D = L_{NI}^D(\beta^D, \beta^R, p_{NI}, k, \sigma^2) \qquad \text{(A5)}$$

$$L_{NI}^R = L_{NI}^R(\beta^D, \beta^R, p_{NI}, k, \sigma^2) \qquad \text{(A6)}$$

With the same procedure we can find the expected inflation, taxes and income under a CBI regime as follows:

$$E_{CBI}(\pi) = p_{CBI} E\left( \frac{\beta^R}{(1+\beta^R+\gamma)} [\pi^e_{CBI} + k - \varepsilon_t] \right) + (1 - p_{CBI}) E\left( \frac{\beta^D}{(1+\beta^D+\gamma)} [\pi^e_{CBI} + k - \varepsilon_t] \right)$$

$$E_{CBI}(\tau) = p_{CBI} E\left( - \frac{\beta^R}{(1+\beta^R+\gamma)} [\pi^e_{CBI} + k - \varepsilon_t] \right) + (1 - p_{CBI}) E\left( - \frac{\beta^D}{(1+\beta^D+\gamma)} [\pi^e_{CBI} + k - \varepsilon_t] \right)$$

$$E_{CBI}(y) = E(\pi_{CBI} - \pi^e_{CBI} - \tau_{CBI} + \varepsilon)$$

Substituting these relations in (A3) and (A4) gives (A6) and (A7), two more loss functions for the two parties, this time dependent also on the CBI preferences $\gamma$ as well as the parameters of the model:

$$L_{CBI}^D = L_{CBI}^D(\beta^D, \beta^R, \gamma, p_{CBI}, k, \sigma^2) \qquad \text{(A6)}$$

$$L_{CBI}^R = L_{CBI}^R(\beta^D, \beta^R, \gamma, p_{CBI}, k, \sigma^2) \qquad \text{(A7)}$$

The possibility of co-operation in appointing an independent central bank exists only if there exists some $\gamma$ for which the following functions

$$L^D = L_{NI}^D - L_{CBI}^D > 0$$

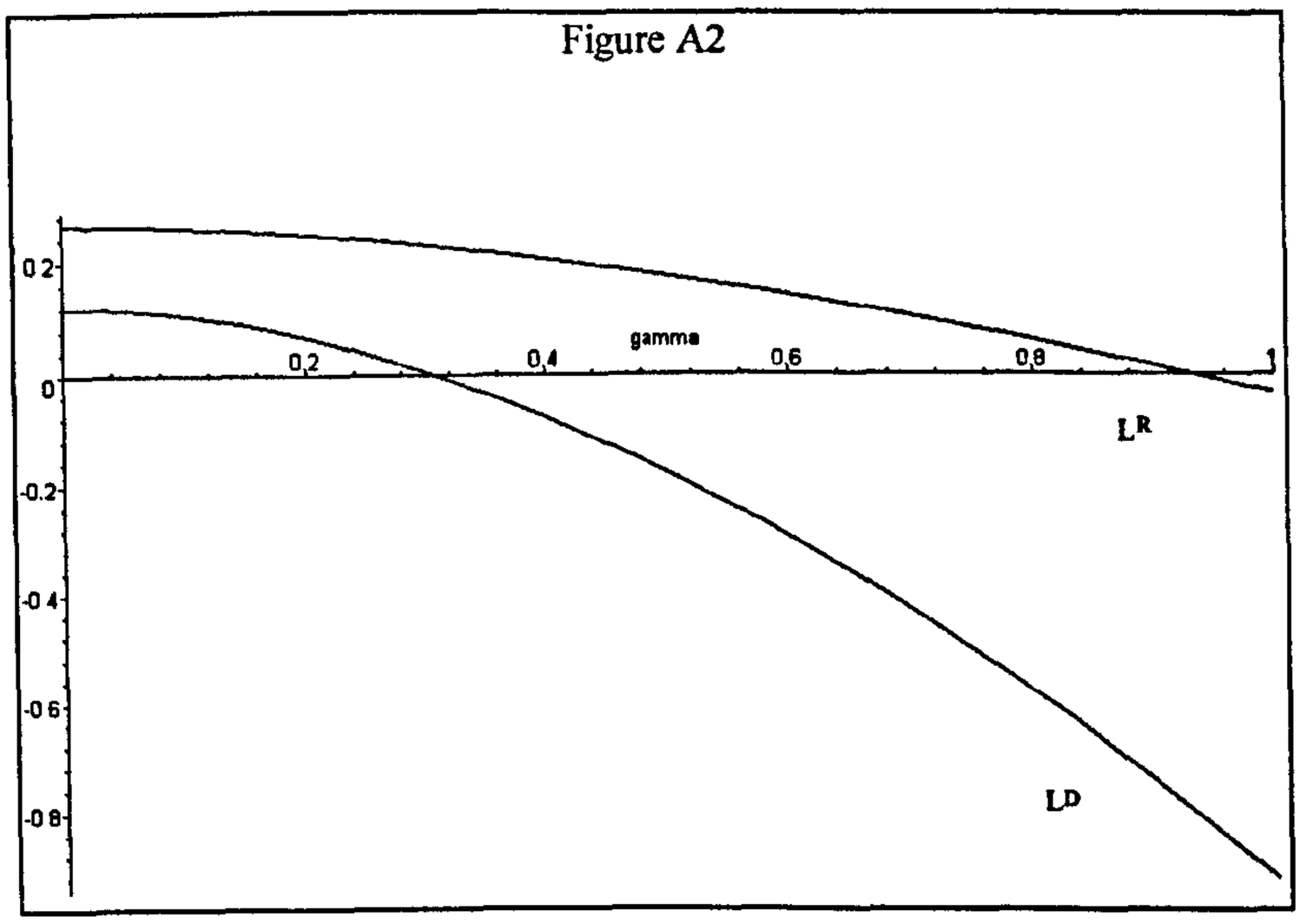
and

$$L^R = L_{NI}^R - L_{CBI}^R > 0$$

In other words, if the losses for both parties are greater without an independent central bank. In what follows we presents some numerical illustration of $L^R$ and $L^D$ for different values of $p$ (the probability of being elected) and for different values of $\gamma$ (the parameter indicating the level of "conservativeness" of the CB).

Figure (A2) is drawn using the values of the parameters mentioned by Alesina and Gatti (note page 200), i.e. $\beta^R=0$, $\beta^D=3$, $k=1$, $\sigma^2=1$, $p=0.5$.

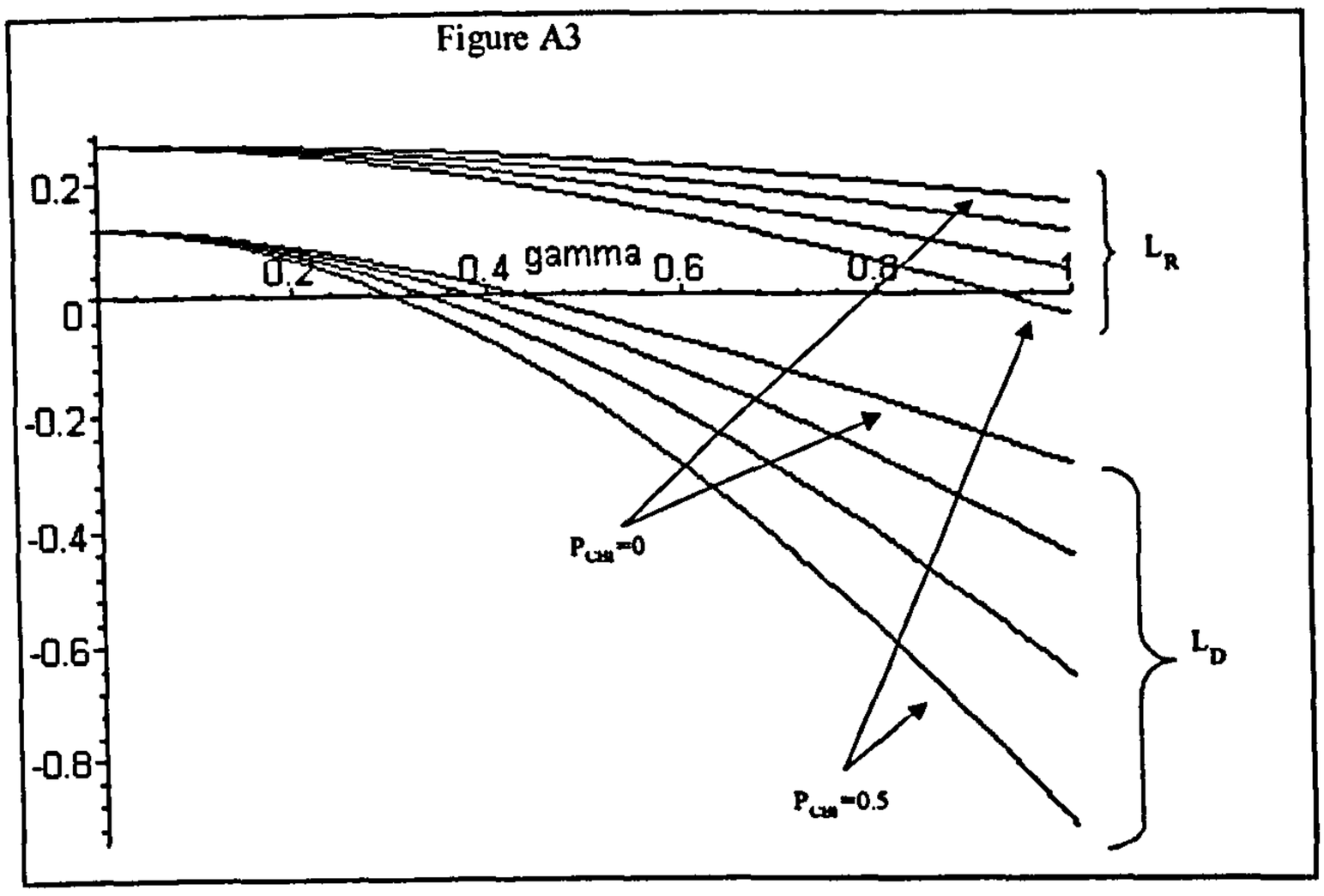
Figure A2




As in their model, both parties have lower losses for values of $\gamma$ that are lower than the preferences of the median voter. But this time the reason for which both parties gain from having a conservative central banker has more to do with the efficiency of the assignment of instruments to targets. In fact now it is the progressive party that would rather have a very "conservative" central banker, to exploit the specialisation of the two policy institutions. On the other hand the Conservative party would gain in having almost any independent central bank, that would fix the monetary policy independently of the election outcomes. For a value of $\gamma$ lower than 0.3 a co-operation between the parties to appoint an independent central banker is, therefore, possible, in line with the Alesina and Gatti results.

This is also true if we consider the possibility, highlighted in our model, that the appointment of the Central banker will change the probability of being elected. Figure (A3) shows how the change in the probability of being elected after having CBI affects the expected benefits for the two parties.

Figure A3




Because appointing an independent central bank reduces the political uncertainty in favour of the more progressive parties, both parties are better off for a wider range of the parameter $\gamma$, and therefore the co-operation becomes even more likely. This result is possible only because each party is not motivated, in its policy choices, by the willingness to stay in office, but only by the objective functions (A3) and (A4). If we were to introduce holding office as an argument in the objective function, the effect would be to render the policies followed by the two parties closer to the preferences of the median voter, and ultimately we will not have any political conflict[11].

In our context instead, increasing political distortion (the difference between $\beta^D$ and $\beta^R$) increases the gains of having CBI, as argued by Alesina and Gatti. Figure (A4) and (A5) shows the gains of having CBI for the two parties with varying degree of political conflict. The parameters are the same than before (with $p_{CBI}$=0, as in the model) except for the preference parameter $\beta^D$ that varies from 1 to 5.

[11] - The assumption of an "ideological" two party system, in which the objective of holding office does not play any important role in defining party policies, has been extensevely used in the rational political cycle literature initiated by Alesina (1986). Although empirically this extreme assumption can be easily questioned, it constitutes a useful simplification that captures a situation in which political differences between parties exist and matter in the conduct of economic policy. The contrary assumption of parties with the sole objective of remaining in office (Nordhaus, 1975) is at least as unrealistic, and moreover does not allow any analysis of the effects of political uncertainty on the economy.

Figure A4. $L_U$ with increasing political polarisation

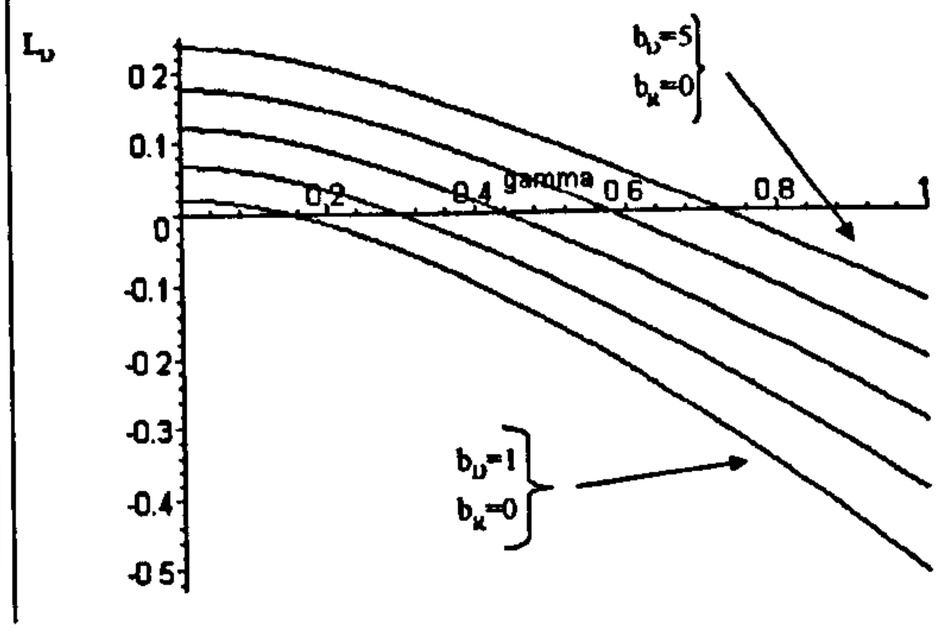
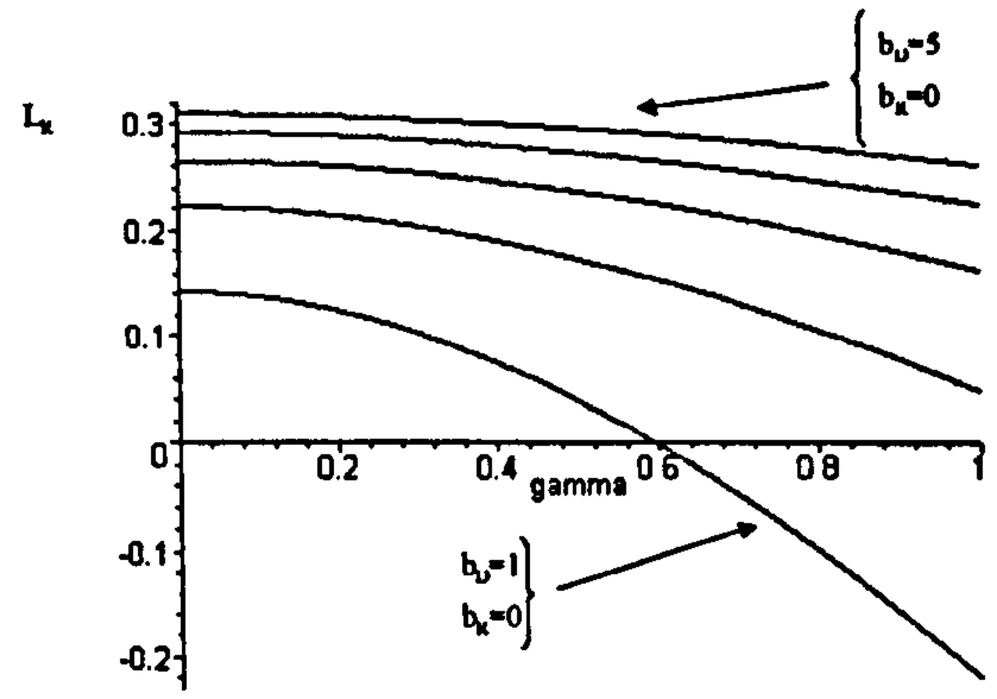



Figure A5. $L_R$ with increasing political polarisation




Once again, the one gaining most from CBI is the more conservative party R, even if the CBI produces a certain loss of the election. Because an increase of political polarisation is particularly damaging for the party more interested in the control of inflation, the introduction of CBI reduces the cost and insulate monetary policy from other objectives of the opposite party.

# CONCLUDING REMARKS AND SUGGESTIONS FOR FUTURE RESEARCH

In this study we have analysed various channels of interdependence between policy instruments in the new European Monetary Union. The objective has been to verify how interdependence affects the efficiency and the robustness of the Maastricht institutional framework.

In Chapter Two we have illustrated how the possibility of default of public debt in one large member country creates interdependence among fiscal positions of all member countries. The main finding was that the No-Bail out clause is not sufficient to guarantee either fiscal discipline or against the possibility of contagion of a fiscal crisis, because it is not optimal ex-post, after a crisis has occurred, and therefore not credible ex-ante. Clearly this result stresses that any rule base fiscal discipline cannot, by itself, be the base for formulating fiscal policy and some more profound structural adjustment should be implemented to rend fiscal discipline "optimal" ex-ante. We have given an example of a possible solution in the enlargement (or deepening) of the union, which, reducing the relative dimension of the participant, reduces the possibility of strong spillover effects of fiscal default and, at the same time, reduces the national efficacy of the fiscal instrument.

Chapter Three and Four show that a similar kind of interdependence between national fiscal position could be determined by the effect that unfunded fiscal expansions have on the level of prices. The theoretical argument, borrowed from the so called Fiscal Theory of Price Determination, is developed both in a closed economy, to illustrate the basic mechanism and its interpretation, and in a two country monetary union model. Although the relevance of this theoretical development is essentially an empirical question, we have shown that it could have important consequences for the design of the new institution. In particular it de-emphasise the role of an independent ECB as the pillar of a stable monetary union.

Chapter Five has analysed, in a game theoretical framework, how the interdependence between policy instruments should be recognised in full, in order for any policy to be effective. In a situation in which a possible conflict of objectives or preferences between policy makers is present, any institutional arrangements which does not deal with it positively is intrinsically inefficient and can result in the policies cancelling each other out. On the other hand, the full internalisation of the differences among policy players in the decision process of each player, through mechanism of accountability or co-ordination, can improve the overall performances therefore increasing the stability of the system as well.

With the last chapter we have given an example on how the conflict between policy institutions can be endogenous to an institutional structure chosen to reduce the influence of policy uncertainty on the economy. It is therefore a note of caution about the common belief that is possible with simple institutional solutions to overcome differences in preferences or objectives that are characteristic of the European environment.

The story we have told can be reassumed in few words: in dealing with a complex environment like the European one, there is a need of complex institutions and complex solutions which take in full account the possibility of conflict of objectives and preferences, the possibility of crises, and the possibility of undisciplined behaviour of sovereign authorities. At the same time the structure should be flexible and able to adapt to a changing economic and political environment. The simple and rigid institutional design of the Maastricht treaty was the political minimum common denominator and was useful as a starting device, but is dangerously weak in dealing both with complexity and with change.

The analysis of this thesis proposes many issues which needs to be analysed further. Chapter Two need to be extended introducing a more complex stochastic structure to verify the robustness of the policy implication derived.

Our analysis of chapter three and four clearly needs an empirical verification, which is absent from the whole literature. The objective of the analysis should be to identify the

character of the private response to particular fiscal shocks, in order to identify the particular fiscal regime in each European country.

The analysis of Chapter Five need to be extended with a particular analysis of specific co-ordination mechanisms which will render our conclusions operational. This means to test different proposal of partial co-operation against the benchmark of full fiscal federalism. Moreover, the analysis should consider the presence of the US as a third strategic player, in order to consider the international effects of any institutional arrangements inside the Union.

Chapter 6 as well requires a more complete empirical analysis. Moreover the analysis should be extended, abandoning the simple Barro Gordon framework, and introducing the political conflict in a more structural macroeconomic model where interdependence between policy instrument is present, as in the one used in Chapter 5.

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