Macroeconomic Policy Interactions in the European Monetary Union

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To Elena and Patrizia
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Summary

EMU raises entirely novel issues because a major currency union has been formed in the absence of fiscal or political union. In fact, while monetary and exchange rate policies are no longer decided at the national level, fiscal policy of countries in the euro area will remain largely under the responsibility of national authorities according to the principle of subsidiarity. Nonetheless, fiscal policy will have to be formulated in the context of the provisions of the Stability and Growth Pact, which implies a commitment to a medium-run budgetary stance close to balance or in surplus. This thesis examines the desirability of both fiscal policy co-ordination and precommitment devices for fiscal policy within this newly established macroeconomic framework. Our analysis is based upon the literature of Time Inconsistency and the assumption that governments are able to finance their public expenditures only by raising distortionary taxes. It is conducted using two alternative scenarios. Under the first scenario monetary and fiscal authorities set inflation and public expenditure independently and simultaneously. Conversely, under the second scenario governments set the tax rate before monetary policy is decided, therefore behaving as leaders à la Stackelberg vis-à-vis the central bank. Our results are in favour of co-ordination under the first Nash-game scenario. In this case fiscal policy co-ordination eliminates the negative fiscal externalities of open-economy policies on output, thereby reducing the optimal degree of conservatism of the ECB. Conversely, when a particular choice for taxes provides the fiscal authorities with a first-mover advantage, our findings remain somewhat more ambiguous. In fact, on the one hand uncoordinated fiscal authorities continue to overestimate the impact of a unilateral increase in expenditures. On the other hand, however, lack of co-ordination induces these to underestimate the strength of the central bank response to a tax increase. This second effect is in fact desirable because it limits adverse effects on expectations. Hence, our main result in chapter four is that co-ordination remains desirable when open-economy effects from fiscal policy are sufficiently strong. Finally, the last chapter focuses on the political economy question of how incentives to reform are likely to be affected under the unique policy regime provided by the EMU. The analysis shows that open-economy effects are – once again – pivotal for the determination of the reform-gap between insiders and outsiders to the monetary union.
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Marco Catenaro (University of Surrey)
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Chapter 1

Monetary and Fiscal Policies in the European Monetary Union: An Introductory Framework

Contents: 1.1 Introduction; 1.2 The Launch of the Euro; 1.3 The Monetary Strategy of the ECB; 1.4 Fiscal Policy and the Stability Pact; 1.5 Summary and Thesis Outline.

1.1 Introduction

A vast amount of literature has been written on the subject of the European Monetary Union (EMU), most of which concerns its desirability and feasibility. National debates - particularly in the case of the United Kingdom - have focused on the pros and cons of entry as a cost and benefit calculation. For most Eurosceptics the major argument against a common currency hinged on the view that Europe was too heterogeneous - significantly more so than the United States - and therefore too vulnerable to country-specific shocks, which could be best dealt with by sovereign monetary policies and letting exchange rates fluctuate.

While a good deal of this analysis remains relevant, more recently the context has changed dramatically. The bilateral parities among eleven European currencies have been irrevocably fixed and announced
to the public on May 2, 1998; moreover, on December 31, 1998, the same countries officially surrendered their monetary policy tool to an independent monetary institution, the European Central Bank (ECB). Indeed, it is the reality of EMU that has transformed the context. Far from implying that these issues and concerns have actually been answered, the creation of EMU has settled the policy debate among members on whether Europe could afford to give up exchange rate flexibility, and shifted the attention to find feasible and desirable ways to make the system work more smoothly (Sachs and Sala-i-Martin, 1992).

It is true that a good deal of the EMU architecture is now in place. The institutional structure of the European Central Bank (ECB) is clear. The Maastricht Treaty sets price stability as the sole objective of monetary policy and assigns to the ECB the task of achieving it. On the other hand, the Stability and Growth Pact (SGP) imposes a ceiling on the budgetary deficit countries can run, leaving some room for countercyclical fiscal policy. Still, there is much that remains to be determined. Above all, there are yet-to-be-resolved issues concerning the role and conduct of fiscal policies. In fact, while monetary policy is being delegated to an independent monetary authority, fiscal decisions in Europe, at least for now, remain decentralised. They will continue to depend on the fiscal actions of the eleven national fiscal authorities. This makes the European Monetary Union a rather unique experiment, significantly different from the one that characterises the United States. Concerns have therefore been raised as to how EMU will cope with what stands as a 'fiscal anomaly'.
The main question this thesis aims to address is the following: are these unusual approaches to fiscal and monetary stance mutually consistent? And if decentralised fiscal policies are a weakness, should then fiscal co-ordination (or, alternatively, precommitment devices for fiscal policy) be advisable?

In this thesis we argue that pressures may arise in the near future that could move the balance in favour of greater fiscal policy co-ordination. This is due to the fact that existence of open-economy (relative price) effects from fiscal policy may induce governments to loosen their fiscal stances for stabilisation purposes. This would in turn seriously compromise the aim of price stability to be achieved by the ECB.

The structure of this chapter is as follows. Section 1.2 casts the analysis of the launch of the Euro in the context of macroeconomic convergence in Europe after the 1992 crisis of the Exchange Rate Mechanism (ERM). Section 1.3 provides a brief discussion regarding the monetary strategy of the ECB, while section 1.4 concentrates on the fiscal policy issues, highlighting some of the weaknesses that characterise the excessive deficit procedure as it stands today. Finally, section 1.5 summarises and sets out the plan of this thesis.

1.2 The Launch of the Euro

The move to monetary union in Europe became irreversible because of the implications of what Wyplosz (1997) defined the Mundell-Fleming's 'impossible trilogy principle'. This asserts that only two of the three following features are mutually compatible: full capital
mobility, independence of monetary policy and fixed exchange rates. The argument goes as follows. Under full capital mobility a nation's domestic interest rate is tied to the world's interest rate. Since uncovered interest parity holds, the country that wants to avoid exchange rate fluctuations cannot allow its interest rate to divert from the rest of the world. Hence this country de facto loses the independence of its monetary policy. Indeed, this was exactly the picture that characterised the European Monetary System (EMS) at the beginning of the 1990s. By then a U-turn was no longer conceivable and monetary union was perhaps the last and only chance for Bundesbank-dependant European governments to collectively regain their instrument of monetary policy.

Despite some initial tensions between Germany and France regarding the appointment of the first ECB president, the launch of the Euro on December 31, 1998 turned out to be almost a formality. The Euro-currencies remained closely aligned for months making the December 31 fixing a mere validation of the status quo. What was truly remarkable about the birth of the euro was not only the smoothness of the delivery, but also the fact that its eight-year gestation largely followed the time-table and modalities agreed upon in December 1991 in Maastricht. This happened despite the European Monetary System (EMS) suffering in 1992-93 its deepest and longest crisis and the widespread scepticism about the prospects for European monetary integration that immediately followed. Although at the time many believed that the EMU project would be most likely postponed, the premises for a successful achievement of EMU were indeed largely set by the institutional response to the EMS crisis. This was rooted in an
unresolved policy conflict between Germany and the rest of the system on how to deal with growing price and output asymmetries – both related to the shock of German unification and the cumulative effect of persistent inflation differentials among member countries. The crisis, which led to a widening of the fluctuation bands around central exchange rate parities up to 15% in either direction, shattered all remaining enthusiasm for the fixed but adjustable exchange rate policies that had supported the concerted European disinflation efforts in the 1980s. It soon became clear that monetary stability and credibility could no longer be borrowed from the Bundesbank and had to be built domestically by other means. Specifically, countries needed to signal a radical break with the past which only enhanced fiscal rectitude and monetary policy reforms could provide.

What constituted a departure from the past was a stronger domestic political consensus to participate in EMU, and therefore to fulfil all the formal prerequisites established in the Maastricht Treaty (Corsetti and Pesenti (1999a)). These prerequisites included complying with the convergence criteria of the Treaty in terms of inflation, fiscal stance, and interest rates, (see appendix 1A) as well as appropriate reforms to guarantee the independence of national central banks from the local fiscal authorities. Within this framework, national monetary strategies during the transition to EMU exhibited some country-specific differences. Austria, Belgium, the Netherlands, and to some extent Ireland and Portugal, retained an exchange rate orientation, while France, Italy, Germany and Greece adopted some form of monetary targeting. Finally, Spain, but also other non EMU countries like
England and Sweden, embraced inflation targeting as a new comprehensive strategy to stabilise prices.

Fiscal policy also diverged but, in spite of the fact that most countries adopted some cosmetic and temporary measures to pull the deficit below the formal 3% limit established in Maastricht, the European fiscal stance did show some fundamental improvements.

[Figure 1.1 here]

In fact, after the ERM crisis of the early 1990s, the deficit over GDP ratios for the majority of EMU countries quickly converged towards the Maastricht ceiling of 3 per cent. The most significant progress was recorded in Belgium and Italy, whose figures had reached a peak of respectively 10 and 6 percent at the end of the 1980s.

In a way, a common monetary policy preceded the birth of the common currency. As the ECB was established in June 1998, it engineered a co-ordinated cut of interest rates in December 1998 by all national central banks to the common level of 3 percent (with the only exception of Italy, which cut its rate to 3.5 percent only).

Overall, EMU was structured to guarantee as much continuity as possible with the past, and notably with the most successful institution that characterised it: the Bundesbank. This was seen as the key to endow the newly created ECB with the anti-inflationary reputation that characterised the German central bank.
Where do we stand today? So far, the ECB seems to pursue its mandate in a balanced way, respecting its anti-inflationary objective while adopting monetary policies that are appropriate for the cyclical conditions of the Euro area. The issue, however, remains to what extent in the future it will be able to keep away from external pressures to relax its monetary stance. Clearly, what matters here is not only the degree of conservatism of the ECB, but also the fiscal stance of the eleven member state governments.

[Fig.’s 1.2-1.3 here]

Looking at the official forecasts of both government deficit and debt to GDP in the Euro-area over the period 1999-2002, all countries are expected to remain below the SGP threshold for excessive deficits. However, the largest economies will run medium-term deficits far from the target of balanced budgets or surpluses (the forecasted deficits as shares of GDP are 1% in Germany in 2002, 0.8% in France in 2002 and 1% in Italy in 2001). At the same time, debt to GDP ratios will fall slowly for all EMU countries, although Italy, Belgium and – to a lesser extend – the Netherlands will remain above the reference values. Hence, for a scenario of near-potential growth and low interest rates, the data suggest that the process of fiscal consolidation in Europe will continue, but at a somewhat more relaxed pace. This confirms the ECB’s worry that the prevailing approach to fiscal stability in the Euro area is becoming rather “minimalist”, in the sense that there is an

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1 See Corsetti and Pesenti (1999a).
2 May issue of the ECB Bulletin. Figures are based on the national programs of fiscal consolidation of the EU member countries.
attempt to comply with the letter of the SGP while ignoring its spirit. Some serious concerns therefore arise. It might be true that, after the drastic process of consolidation to meet the convergence criteria required to qualify for EMU membership, the short term "minimalist" approach is perhaps the only feasible option for several European economies. Yet, serious problems may lie ahead if this trend of fiscal consolidation stops or - worse - is reversed. This thesis identifies one possible reason motivating this concern.

1.3 The Monetary Strategy of the ECB

The Treaty of Maastricht states that "price stability" is the primary objective of the European System of Central Banks (ESCB) and establishes that the ESCB is expected to support the general policies in the EU (Art. 2) as long as this can be done without prejudice to its price stability objective (Art. 105(1), see appendix 1B for details). The definition of price stability is a year-on-year increase in the Harmonised Index of Consumer Prices for the Euro area as a whole of below 2%, which is to be maintained over the medium run. The word "increase" in the definition suggests that the ECB may also be concerned with a "downward risk for price stability", in the sense that it might consider a

3 (**) The 1999 promising forecasts have been confirmed by the actual values released after this chapter had been written. Surpluses have in fact been registered in the following Euroland countries: Ireland (+1.4%), Luxembourg (+1.1%) and Finland (+2.6%).

4 In 1999 most Member States did not pursue an active fiscal consolidation policy, but 'relied on the beneficial effects of relatively strong revenue growth and lower interest payments' (ECB Monthly Bulletin, March 2000).

5 In an excellent seminal paper on the pros and cons of the SGP, Artis and Winkler (1997) remind us of the huge debt build-up - unprecedented in peace-time - that European countries have been able to accumulate in the past twenty years. Despite the recent downward trend, the debt/GDP ratio has in fact nearly doubled in the past 15 years. This, they argue, suggests that sometimes neither the political process nor the discipline of the financial markets is sufficient to induce governments to take heed of the long run budget constraints.
lower bound at zero inflation. The reference to the medium run acknowledges that monetary authorities might be unable to control short-run price variability and may show some flexibility in letting inflation rise temporarily above 2% when the economy is hit by an unexpected disturbance. It is important to observe that the definition of price stability by the ECB differs in two ways from an inflation target as usually understood: first, it is time and state-invariant; second, its time horizon, the medium run, is not precisely quantified.

In addition to the quantitative definition of price stability, the monetary strategy of the ECB consists of two "pillars": a reference value for the growth rate of M3, and a broad assessment of the outlook for future price developments. The reference value for the annual growth rate of M3 is not to be considered a target - but a realistic alternative to a monetary target. Hence, a deviation of current monetary growth from the reference value, far from implying an automatic policy reaction, would nonetheless prompt further analysis to detect possible risks for price stability.

There are three reasons why the ECB might be willing to consider monetary indicators. The first is that monetary aggregates may provide a more reliable guide for monetary policy in the Euro area as a whole than has been the case in the past for single member states. Econometric studies of the pre-EMU European economy (Angeloni et al. (1994), Monticelli and Papi (1996)) show in fact that money demand appears to be more stable in a larger European context than in any

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6 This is essentially a CPI without interest costs.
7 The ECB has chosen to announce a single reference value for M3 growth (4.5 percent), rather than a range as in the tradition of the Bundesbank.
national environment, both in the short and the medium run. A second reason sees the choice of mixing elements from both inflation and monetary targeting as an implicit declaration that the ECB is unwilling to commit to a specific strategy of monetary policy. This is due to the fact that the ECB is aware that it will take time to develop some understanding of the new economic environment and, specifically, of the transmission mechanism of monetary policy in Europe. The other reason is that even the availability and quality of data, while rapidly improving, is still far from adequate. Hence, a monetary policy strategy to be exclusively based on direct inflation targeting would be unfeasible due to the difficulties of forecasting price developments in current circumstances. A third argument is that the first pillar provides a public sign of adherence to the tradition of the Bundesbank, under the presumption that continuity in itself would enhance the ECB's credibility. From this point of view, the larger the extent to which the Eurosystem is able to signal continuity of strategy and behaviour between its experience and the Bundesbank's, the richer the perceived credibility accruing to the new institution.

The second pillar amounts to an analysis of a rather large list of indicators of unequal status and nature. The ECB will in fact "evaluate the full range of inflation forecasts produced by international organisations, other authorities, market participants, etc., and will also produce its own assessment of the future inflation outlook." (ECB Monthly Bulletin, January 1999). But, at least for now, it will not make its forecasts public. This attitude exhibits a striking resemblance to the Bundesbank's, whose monthly and annual reports neither publish forecasts of economic variables, nor discuss private sector forecasts. The
ECB explains its decision not to publish its inflation forecasts by arguing that giving prominence to a single official forecast would not adequately reflect the actual decision-making process of the Council, and would ultimately confuse and mislead the public. It is plausible that, especially in the initial phase of EMU, the ECB does not want to be evaluated as a forecaster and held responsible for any forecast errors, given the considerable uncertainty which it is expected to face.

Finally, as regards transparency and accountability, the president of the ECB holds a press conference immediately after the first meeting of the Governing Council every month, providing an extensive statement of the Council’s analysis and deliberation. The analysis and data in the ECB Monthly Bulletin, as well as speeches by members of the ECB Executive Board, are also meant to supplement the president’s statement. Conversely, the voting records are kept secret, so that no public statement exists on whether a monetary decision has been taken unanimously or not. This feature largely conforms to the model of “collective responsibility” – formally excluding any account of internal disagreement. An annual and four quarterly reports on the activities of the Eurosystem are submitted to the Council of Ministers, to the Commission of the European Communities, and to the European Parliament (EP) which then holds a general debate on the findings. Members of the executive board of the ECB deliver testimony to the committees of the EP, either on their own initiative or on the initiative of the EP.

\[1\] An open issue is to what extent the EP will be willing to exercise its powers, for instance by putting pressure on the ECB to provide more information about its decision-making process. This relates to the important issue of lack of democratic accountability that many associate with the current structure of the ECB. Such a issue is not addressed in this thesis.
1.4 Fiscal Policy and the Stability Pact

While monetary policy lies in the hands of a 'pan-European' central bank, fiscal policy firmly remains within the domain of the member states. However, a number of rules and co-ordinating procedures have been devised to limit discretion in the conduct of domestic budgetary policies. These were finalised at the June 1997 meeting of the European Council of Amsterdam in a sort of 'post-Maastricht' element: the much debated Pact for Stability and Growth.

The declared purpose of the SGP is to provide "both for prevention and deterrence" in securing budgetary discipline while "in no way changing the requirements for the adoption of the euro". The pact consists of two Council regulations, one on the Excessive Deficit Procedure and another on surveillance. There is also a European Council resolution providing guidance to the Council and member states on the application of the SGP. The two council regulations have the force of law. They clarify the meaning of the Maastricht Treaty's provisions regarding excessive deficits, in particular with respect of the exceptional and temporary circumstances under which the reference value for the general government deficit can be exceeded without incurring a penalty.

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9 The Maastricht Treaty introduced requirements on fiscal policy as a condition for suitable convergence and for eligibility for EMU membership. These requirements were spelled out in terms of reference values for both deficit and debt over GDP ratios and with forgiveness clauses to accommodate deviations from these targets (details in appendices 1 A -B).

10 European Council 1997, Annex 1, II and III.
Under the pact's provisions\textsuperscript{11}, participants in the monetary union commit themselves to a medium-term budgetary stance close to balance or surplus. The budget concept referred to is taken to represent a non-cyclically adjusted position. Thus the pact can be read as calling for countries to reach a position in which shocks will not carry the actual deficit past the reference value of 3 per cent.

The pact will automatically consider a deficit in excess of 3 per cent to be exceptional only if a country's GDP declines by at least 2 per cent in the year in question. A recession in which real GDP declines by less than 2 per cent but more than 0.75 per cent may still qualify with the concurrence of the Council. The country, however, will have to show that its recession was exceptional in terms of its abruptness or in relation to past output trends. Finally, countries with annual output declines smaller than 0.75 per cent will not be able to claim exceptional circumstances.

There are further provisions which make the application of the excessive deficit procedure somewhat more discretionary than it might appear at first glance. While countries are obliged to correct excessive deficits as quickly as possible after their emergence and to launch the required corrective budgetary adjustments without delay, they will probably be able to run deficits in excess of 3 per cent for at least two years in a row without incurring a fine. The Commission will in fact receive definitive data that a country's deficit in year \( t \) exceeds 3% around March of year \( t+1 \). By the end of May it will have issued a recommendation for eliminating that excess in accordance with Art.

\textsuperscript{11} See appendix 1C for details.
103(4). The country will then have to take corrective action such that the excess is eliminated by the year $t+2$. If no corrective action is taken by the end of year $t+1$, financial sanctions will be imposed. But, presumably, corrective action that will eliminate the excess in year $t+2$ will suffice to eliminate this threat. Thus, two successive years of budget deficits in excess of 3 per cent will in fact be permitted. Observe that an additional element of flexibility is given by the passage in the Amsterdam Treaty referring to the above time limits and ending with the qualifying phrase 'unless there are special circumstances'. No clarification, however, is provided as to what is meant for such 'special circumstances'.

Sanctions, when required, will take the form of non-remunerated deposits, which start at 0.2 per cent and rise by one tenth of the excess deficit up to a maximum of 0.5 per cent of GDP. Additional deposits will be required each year unless the excessive deficit is corrected. In the absence of corrective measures for two consecutive years, the deposit will be converted into a fine; otherwise it will be returned.

The EMU fiscal target provisions have led to a considerable amount of debate, focusing on the relative merits of a more stringent or flexible interpretation of these criteria. Arguments in favour of such provisions are usually drawn from either political economy or public choice approaches identifying a deficit or public expenditure bias in the political decision-making process. Such a view tends to be shared by economists who are sceptical about the efficiency of fiscal policy interventions and by those interested in reducing the role of the state in the economy more generally. The story often put forward here is that
PAGES MISSING IN ORIGINAL
number of studies regarding Europe, then deficit ceilings represent a rule-based partial substitute for fiscal policy co-ordination\textsuperscript{13}.

Other aspects of fiscal spillovers concern:

- the crowding out of investment from mounting government debts originating from the uncontrolled use of public expenditure for stabilisation purposes;
- increase in default risk in a member country which leads to expectations of an implicit bail-out or a systemic financial crisis across the union;
- external exchange rate appreciation which crowds out other member countries’ net exports (Carlberg (1999)).

Along with the theoretical debate concerning the desirability of measures restricting the discretionary conduct of fiscal policy in a monetary union, there are several practical issues regarding the current set-up of the stability pact that are starting to be addressed. The first is that the strict application of the rules contained in the SGP could increase the incentive to classify more spending as off-budget, deflecting energies from genuine consolidation. In this regard empirical evidence from the United States (Bayoumi and Masson (1995)) suggests that states with the most stringent rules also display the largest increases in off-budget forms of spending over time. Indeed, in the European Union itself, reclassification of expenditures and one-off measures did contribute in many countries to compliance with the Maastricht deficit convergence criteria in 1997. Hence, to prevent such practices from proliferating, accounting rules may need to be strengthened further.

\textsuperscript{13} An excellent survey on the empirical studies on fiscal transmission is provided by
Secondly, by focusing exclusively on the size of the fiscal imbalances, the SGP as it stands today completely overlooks the composition of the deficit. We know, however, that fiscal adjustments relying primarily on wage and transfer cuts are by far more successful than cuts in public investment as far as deficit reduction is concerned. Alesina and Perotti (1996) showed that such cuts may in fact have an expansionary impact in the short run. Therefore, the main recommendation from this line of argument is to formulate any deficit target in terms of a structural deficit rather than an actual deficit (Eichengreen (1997)). Unfortunately, as Artis and Winkler (1997) point out, the problem with adjusted deficit targets, besides disputes about measurement, is that unlike the combination of 60 per cent debt and 3 per cent deficit targets in the Maastricht treaty, they provide no reassurance at all about long run sustainability of public finances.

1.5 Summary and Thesis Outline

After many years of experimentation in monetary policy cooperation in Europe, EMU has been heralded as the endpoint of the long-lasting search for financial stability. Judging by its early performance, monetary union is indeed delivering on its promises. In fact, despite the quite substantial depreciation the Euro has experienced \textit{vis-à-vis} the US dollar and indeed the GB pound, overall the historical break induced by the creation of the single currency has not brought about the kind of financial and systemic instabilities many had worried about.

\textsuperscript{14} See Corsetti and Pesenti (1999a).
Yet, with EMU under way, the problematic issues of the relationships of the individual countries with a common monetary policy move into the spotlight of attention. One might argue that there should be no problems at all. A conservative and independent ECB will simply ensure low and stable inflation, while individual countries will select their preferred fiscal policy. However, two observations are in order. Firstly, even though the ECB is quite independent and attaches great importance to price stability, it is likely that a degree of sensitivity to broader economic developments will remain. Accordingly, under special circumstances, events might suggest that the ECB might temporarily compromise its price stability objective. Secondly, undisciplined budgetary policies might endanger the anti-inflationary stance of the European central bank by raising inflationary expectations and hence the inflation bias, and this despite the independent status of its members. Lax monetary policies would in turn reduce the credibility of the ECB's commitment to price stability unless a mechanism existed for the monetary authorities that is optimal but time inconsistent.

It is quite obvious that the monetary stance and credibility of the central bank will not be independent of the fiscal stance of the eleven national fiscal authorities which have joined EMU. In other words, fiscal irresponsibility, in the form of excessively expansionary fiscal policies, could jeopardise the ECB's commitment to price stability. The questions then are: in a framework of the type that characterises the present set up of EMU, is fiscal policy co-ordination desirable? Specifically, what is the impact of co-ordination on both the monetary performance of the ECB and its optimal degree of conservatism?
Moreover, how do precommitment devices for fiscal policy affect incentives to reform the labour market in a monetary union as compared to outsiders with full fiscal discretionary power?

This thesis aims to provide an analytical framework to study these issues. We believe that a useful starting point is to refer to the literature on *Time Inconsistency* and argue that fiscal policy co-ordination becomes desirable if it reduces the kind of social inefficiencies traditionally identified by high inflation and distortionary taxes.

Although this literature provides us with a useful theoretical framework to develop our analysis, it does present us with a number of limitations. Firstly, the problem of time inconsistency has most intensively been studied within the context of monetary policy. In fact most conventional macroeconomic models specify carefully the connection of monetary policy to the evolution of the price level, while ordinarily leaving both the government budget constraint and fiscal policy entirely hidden. Despite the attempt made by Sargent and Wallace (1981) to demonstrate that sufficiently irresponsible fiscal policy will cause problems for monetary policy, so far the fiscal issue has been treated as no more than an important footnote to the central role of monetary policy. We acknowledge that, only more recently, some economists have begun to take the view that fiscal policy plays a role at least as important as monetary policy in determining the price level. Development of this view has required new models and new forms of analysis. However, the great limit of these models remain two: they either adopt a simple *ad hoc* IS-LM framework (Alesina and Tabellini (1987) and subsequent developments), or they are based upon
rather complicated structures (for example Krichel et al. (1996)). These mainly rely on microeconomic foundations which are often unable to provide analytical results. Simulation techniques are therefore required. An additional limit of this literature, and in particular of the one dealing more specifically with strategic issues in a monetary union (Cuckierman (1992), de Grauwe (1994), Eijffinger and de Haan (1996), Giavazzi (1988) and Persson and Tabellini (1994)) is that it contributes only marginally to the understanding of the relationship of countries after monetary union has taken place.

Starting from the more traditional models of monetary policy, in this thesis we endogenise fiscal policy and introduce an explicit balanced budget constraint. Our aim is to concentrate on the important macroeconomic policy interactions that are likely to characterise the EMU in the coming years. In doing so, we attempt the difficult task of striking a balance between too-much ad hoc macroeconomic models and more complicated models almost entirely relying upon simulation techniques. Our aim is to develop an analytical structure which, although derived from microeconomic foundations, is kept as simple as possible. Its task should be to illustrate the fiscal and monetary policy interactions in a monetary union characterised by countries which are very integrated, their central bank likely to be highly inflation adverse, and where fiscal authorities are unable to finance public consumption by making extensive usage of the debt channel.

A distinguishing feature characterises our analysis. The derivation of our model from microeconomic foundations leads to a reduced form for output which differs from the more traditional output equations in
one important respect. Along with the well known inflation surprise — originating from the monetary authority's inability to precommit —, we derive an additional element standing for relative public expenditure surprises. This is obtained from the assumption of existence of open-economy (relative price) effects from fiscal policy as in Levine and Pearlman (L&P 1998). Moreover, within this framework, we study the important distortionary effects of both income and VAT taxes which are neglected in L&P\textsuperscript{15}.

Two main theoretical models summarise our analysis on the desirability of fiscal policy co-ordination. The model presented in chapter three relies on the assumption that monetary and fiscal authorities move simultaneously, therefore taking the action of their counterpart as given. This means that, while decentralised fiscal authorities set the domestic level of public expenditures, monetary authorities simultaneously set inflation for the entire union. The assumed nature of the welfare function of the monetary authorities, however, requires the latter to take adequate account of the tax distortions affecting the economy as a consequence of the tax financed expenditure programs of the fiscal authorities. We show that, for a sufficiently strong ECB sensitivity to the general output level, important externalities are transmitted on inflation by excessively loose domestic fiscal stances. This is likely to happen when fiscal authorities operate non co-operatively because they may perceive traditional demand-side (open-economy) policies as able to increase their domestic level of output: in this case a public expenditure bias is said to arise. Fiscal policy co-ordination, or alternatively institutional

\textsuperscript{15} Tax distortions are ignored in L&P. They in fact assume taxes to be lump-sum in
precommitment devices like the stability pact will eliminate these externalities bringing about a second best result. The first best would of course be attained if both policymakers were able to precommit to optimal paths for inflation and public expenditures, but this is excluded a priori. Another interesting result that we derive is that the optimal degree of independence of the central bank is higher with uncoordinated fiscal policies. This happens because, to the extent that national authorities engage in expansionary and inflationary fiscal policies, the union central bank will have to pursue a tighter monetary policy in order to get closer to its bliss point for inflation.

In chapter four we extend the analysis by relaxing the assumption of simultaneity in the policy formation process. We therefore set up a modified model which is based on the assumption that fiscal authorities behave as Stackelberg leaders vis-à-vis the central bank, in the sense that a particular choice for taxes gives them a first-mover advantage. We argue that such a modified game theoretical structure is able to capture more elements of the real world because it is grounded on the more realistic assumption that fiscal authorities are relatively slow in delivering their policies while monetary authorities adjust more easily to the cyclical disturbances. Unfortunately, a closer-to-reality theoretical structure does bring about more ambiguity in the results. In fact, if on the one hand the impact of a unilateral increase in expenditures continues to be overestimated without co-ordination, on the other hand uncoordinated fiscal policies underestimate the strength of the central bank response to a tax increase, which is now internalised. This second effect is desirable because it limits adverse effects on
expectations. Our main finding is therefore that co-ordination remains desirable if open-economy effects from fiscal policy are sufficiently strong.

Finally, in chapter five we use the extended ins & outs model of inflation and public expenditure developed in chapter three to analyse how monetary union in Europe is likely to affect labour market reforms. We show that the relative strength of the open-economy effects is once again pivotal for the determination of the results. Specifically, these are in line with the mainstream literature saying that reforms are higher in countries preserving their monetary policy independence only when open-economy effects are negligible. Conversely, if the latter are sufficiently strong, such incentives are in fact higher under the monetary union.
Chapter 2

Time Inconsistency:
A Survey of the Literature

Contents: 2.1 Introduction; 2.2 The Time-Inconsistency Problem: Rules versus Discretion; 2.3 Rogoff's Conservative Central Banker; 2.4 Recent Extensions of Rogoff's Conservative Central Banker; 2.5 The Principal-Agent Approach; 2.6 Controversial Issues; 2.7 Models with Endogenous Fiscal Policy; 2.8 Conclusion.

2.1 Introduction

Early theory of macroeconomic policy dealt with the economic consequences of given policy rules. The approach was that knowledge of such consequences and of the policy objectives would automatically lead to the selection of the optimal policy rule. Implicit in this approach was the assumption that policymakers are passive agents whose only task is to implement the optimal policy path once identified. Lack of success of this theory in explaining both the way in which policymaking is carried out in practice and why inflation has been higher in some countries rather than others has gradually changed the focus of the more recent theory of economic policy. Meanwhile, a new literature - identified as literature on the time or dynamic
inconsistency - has developed emphasising the analysis of the policy formation process.

This chapter aims to provide an extended - although necessarily selective (given the vast number of contributions) - coverage of this Time Inconsistency literature.

Its outline is as follows. Sections 2.2 and 2.3 introduce the problem of time inconsistency. Section 2.4 illustrates the argument of the conservative central banker as originally proposed by Rogoff, and section 2.5 presents the more recent developments based upon this theory. Section 2.6 reports on Carl Walsh’s contractual approach, while section 2.7 concentrates on more recent theoretical works where fiscal policy has been endogenously treated. Concluding thoughts are contained in section 2.8.

2.2 The Time Inconsistency Problem: Rules versus Discretion

The concept of time-inconsistency was first formalised in economic theory in 1977 to describe the temptations that policymakers face to deviate from a policy rule which has been previously announced. This field of macroeconomic policy, known also as rules versus discretion literature, has developed following two premises. The first premise is that current decisions depend not only on the current states of the world, but also upon expectations of future events. However, since these enter as a constraint in the optimisation problem, an optimal policy rule at the beginning of a planning time period may no longer remain optimal at a latter date. When this happens, the policy is said to
be time (or dynamically) inconsistent. The second premise is that macroeconomic policy is better understood as the outcome of strategic interactions between the government and the private sector of the economy. This means that the optimal decision rule for the government depends not only upon its own decision but also upon the decisions of any other player in the economy. Hence, the maintained assumption that macroeconomic policy decisions are the outcome of a game played among rational agents has made game theory the methodological tool adopted by this modern approach to macroeconomic policy.

Kydland and Prescott (1977) were the first to illustrate the time inconsistency phenomenon. Their argument may be briefly stated using a simple two period example. Assume that the policy-maker at time $t=1$ is to maximise an agreed-upon social objective function

$$U(x_1, x_2, y_1, y_2)$$

(2.1)

where $x = (x_1, x_2)$ are policies at time $t=1,2$ and $y = (y_1, y_2)$ are the corresponding sequence of economic agents decisions subject to:

$$y_1 = f_1(x_1, x_2^*)$$

(2.2)

$$y_2 = f_2(y_1, x_1, x_2)$$

(2.3)

where $x_2^*$ denotes rational expectations of $x_2$ formed at time $t=1$. Assuming differentiability, the first order conditions for the optimality of $U$ are:
The ex ante optimal (control) policy is obtained by solving the five equation (2.1)-(2.5) system in \( x_1, x_2, y_1, y_2 \).

By contrast, the solution provided by dynamic programming begins in period 2 and starts by evaluating the policy at time two \( (x_2) \), given \( x_1, y_1 \) and the constraint (2.3). This means that the first order condition for \( x_2 \) is:

\[
\frac{\partial U}{\partial x_2} + \frac{\partial f_1}{\partial x_2} \frac{\partial U}{\partial y_1} + \frac{\partial f_2}{\partial x_2} \frac{\partial U}{\partial y_2} = 0 \tag{2.6}
\]

Comparing (2.6) with (2.5) it is immediately clear that the two expressions are equivalent only if the effect of \( x_2 \) upon \( y_1 \) is zero \((\frac{\partial f_1}{\partial x_2} = 0)\) or if the direct and indirect effects of \( y_1 \) and \( y_2 \) on \( U \) are exactly offsetting. Kydland and Prescott refer to the policy sequence \( \{x_1, x_2\} \) – provided by dynamic programming – as consistent, a term that the literature has subsequently changed to time-consistent. It follows that:

**Definition**

A policy is (time) consistent if, for each period of time \( t \), it maximises (2.1), taking as given previous decisions, and that future policy decisions are similarly selected.
The implications Kydland and Prescott derived from the above two period problem were essentially two-fold. First, the dynamic programming method does not provide an optimal policy sequence, since, in general, it does not satisfy the first order condition for the maximisation of $U$. Second, optimal control theory — although powerful and useful technique for analysing dynamic systems — is an inappropriate tool for economic planning even when there is a "well-defined and agreed-upon" fixed social objective function. This derives from the fact that current decisions of economic agents depend in part also upon their expectations of future policy actions. Thus, optimal control theory would be appropriate only if these expectations were invariant to the future policy plan selected. Observe that what is required here is not necessarily that agents can forecast the future perfectly, but that they have some knowledge of how policies will be modified as a result of changing economic conditions. Secondly, the discretionary (i.e. time consistent) solution for which policymakers select the best action given the current situation will not typically result in the social objective function being maximised. Conversely, by relying on "simple and easily understood" policy rules, policymakers are able to improve their economic performance. Kydland and Prescott are very clear in this regard. The reason why policymakers should follow rules rather than discretion

".. is not that they are stupid or evil but, rather, that discretion implies selecting the decision which is best, given the current situation. Such behaviour either results in consistent but suboptimal planning or in economic instability." [K.P., JPE 1977, vol. 85, no. 3, p. 487].

16 Observe that, unlike Friedman's (1948) argument, this does not depend upon ignorance of the magnitude and timings of the effects of policy.
The problem of time inconsistency was subsequently popularised in the monetary policy game of Barro and Gordon (1983a). They postulated a supply function for aggregate output which implies that real output only increases with unanticipated inflation. In such a framework the policymaker is viewed as attempting to maximise an objective that reflects society’s preferences over inflation and output. Their findings were that, although the government in period one may adopt an anti-inflationary policy, it has a clear incentive to reverse policy in period two in order to engineer surprise inflation and increase output. Yet, a rational private sector fully understands the government’s motive to increase output by creating surprise inflation. As a result it incorporates a positive mark-up into its inflationary expectations such that they are now sufficiently high so as to give the government a disincentive to further stimulate output. The long-run result is that output remains at its natural rate while inflation becomes much higher then the socially optimal level. An inflation bias is therefore said to arise. This is computed as the difference between the lowest enforceable inflation rate and the ideal rate.

It is important to observe that the existence of an inflationary bias relies on the assumption that policymakers are not able to commit to a particular action in advance. If a precommitment technology existed, the inflation bias would disappear. At the beginning of the planning horizon the government could in fact commit to a zero-inflation rule and the inflationary expectations would adjust accordingly.
The fact that discretionary monetary policy gives rise to an inflation bias naturally raised the question of what could be done to avoid or at least mitigate this problem. A number of alternative solutions have therefore been proposed along the years.

One potential solution to the credibility problem has come from Giavazzi and Pagano (1988). They argued that a high inflation country may enhance the credibility of its own monetary policy by pegging its exchange rate to the currency of a low inflation country. The convergence of inflation rates during the 1980s in Europe through the Exchange Rate Mechanism (ERM) suggests that this particular theory may have been quite effective for some time. The main problem with this solution remains that fixing the exchange rate may not be always feasible given the difficult task of finding suitable low-inflation countries to peg the currency against. An additional problem is that such arrangements are always vulnerable to speculative attacks (especially when capital controls are being relaxed). The 1992-1993 crisis of the ERM remains a well known example.

In a completely different context, a number of authors (including Fischer and Summers (1989), Devereux (1987)) have argued that monetary time-inconsistency can be rather easily overcome by indexing labour contracts to the price level. Their argument is that with wage indexation the Phillips curve becomes steeper, and the government is less tempted to create unanticipated inflation since this now has to rise to a much higher level to achieve the same reduction in unemployment.
An alternative and more popular approach was offered by the so-called 'reputational literature'. Barro and Gordon (1983b) have extended their previous paper (B&G, 1983a) to examine whether reputational considerations can restore the credibility policy-makers need to pursue time-inconsistent policies. The basic idea is that if the game is repeated over time, a government might have incentives — namely poor reputation as reflected in an upward revision of inflationary expectations — to persist with a low inflation policy. Specifically, Barro and Gordon assumed that whenever private agents observe an inflation rate different from the one they anticipated, they will expect the policymaker to act only in accordance with his short run incentives for some time in the future. They will therefore raise their inflationary expectations. Hence a trigger strategy can be assumed to be put in place to create a trade-off for the policymaker. He gets a current benefit by driving up inflation above its expected value, but he has got to balance this against the cost of higher inflation in the future. This implies that the computation of the lowest enforceable inflation rate requires the policymaker making two calculations. On one hand he has to compute the gain from reneging on any policy announcement. This involves weighting up the cost of higher inflation and moving away from the ideal inflation rate against the gain of generating surprise inflation and moving nearer to the target level of output. This first calculation is what Barro and Gordon refer to as temptation. On the other hand, the second calculation involves comparing the cost of being able to pursue the same inflation policy rule in the next period as opposed to being forced to follow the higher discretionary inflation rate. The discounted value by which the cost of discretionary policy exceeds the policy rule is referred to as enforcement. The outcome of
such a cost and benefit calculation is that a range of announced inflation rates can be an equilibrium. Such a range crucially depends on how heavily the policymaker discounts the future and on how long the reversion of high inflationary expectations last. Yet, the important fact remains that endogenisation of future costs (deriving from reneging on promised policies) by the policymaker helps him relax his short-run incentive constraint. As a result:

"some monetary rules, but generally not the ideal one, can be enforced by the policymaker's potential loss of reputation....Specifically, the outcomes are superior to those under discretion -where no commitments are pertinent - but inferior to those under the ideal rule" [Barro and Gordon, JME 1983b, pp. 99-100]

While the framework set up by Barro and Gordon clearly illustrates the potential role of reputation in monetary policy, it does present two major weaknesses. The first is the implicit requirement that all the private agents somehow co-ordinate on a particular strategy for revising their inflationary expectations when the policymaker deviates from the expected inflation rate. The second is that the revisions of expectations are assumed to occur whenever private agents face a broken promise by the policymaker, however small and in whichever direction.

Al-Nowaihi and Levine (1996a) tried to shed some light on this last criticism. Adopting a weaker notion of renegotiation, they introduced the concept of "chisel-proof credibility" by asking, if the central bank cheats just a little, will the public be still willing to punish? They showed that the lowest inflation rate that can be supported in this case is positive but inferior to the discretionary rate.
2.3 Rogoff’s Conservative Central Banker

The discussion of rules versus discretion also encompasses the topic that deals with the viability and sustainability of independent central banks as an alternative solution to the time inconsistency problem. In this regard, the seminal contribution remains the one by Rogoff (1985a). He investigated the effects of delegating monetary policy to an independent authority concluding that:

"it can be entirely rational for a society to structure its central bank in such a way that the monetary authorities have an objective function very different from the social welfare function. Whenever a distortion causes the time consistent rate of inflation to be too high, the society can be made better off by having the central bank place 'too large' a weight on inflation rate stabilisation". [Rogoff, Q.J.E. 1985, vol. 100, p. 1184]

His argument can be illustrated by using a stripped down version of the Barro-Gordon model. Let output be given by a supply equation in which only unexpected changes in the money stock have real effects:

\[ y' = \pi - \pi^e + \varepsilon, \quad \varepsilon \sim N(0, \sigma^2_\varepsilon) \]  \hspace{1cm} (2.7)

where \( \pi \) and \( \pi^e \) are, respectively, actual and expected inflation and \( \varepsilon \) is an aggregate productivity disturbance. The principal feature of the model is the assumption that, because of tax and labour market
distortions, the equilibrium level of output is below the socially optimal level. For simplicity, we can denote with \( \dot{y} \) the target level of output and with \( b \) the positive difference between this and the natural rate. We further assume that the government preferences can be summarised as:

\[
L_{FA} = (y - \dot{y})^2 + a \pi^2
\]  

(2.8)

where \( a \) is the relative weight the government places on inflation stabilisation versus output stabilisation. The first term in (2.8) captures the idea that the government is dissatisfied with the market determined level of output while the second term represents the cost of inflation. As in Kydland and Prescott, the government is unable make binding commitments to low inflation and is motivated to generate unexpected inflation in order to expand economic activity. In order to construct the discretionary equilibrium, we need to derive the Nash non-cooperative solution by backwards induction. This gives the well known result:

\[
\pi = \frac{b}{a} - \frac{\xi}{1 + a}
\]

(2.9)

The first term is the inflationary bias, while the second represents the monetary response to unexpected disturbances. This discretionary equilibrium satisfies the following two conditions. Firstly, private sector expectations are on average correct, in the sense that \( \pi_e \) is always

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\(^{17}\) The macroeconomic model underlying our subsequent analysis is deliberately stylised because we wish to highlight the gaming aspects of monetary policy rather than the technicalities of the transmission mechanism.
the optimal forecast of actual inflation. Secondly, although it is at the
discretion of the government to fool the private sector through surprise
inflation, the latter sets its inflationary expectations sufficiently high so
that the marginal cost of inflating equals the marginal gain from
increasing output. Hence the government is not motivated to inflate
further. Observe that, if the fiscal authorities were able to commit to a
policy rule, than a simple rule of zero inflation would eliminate the
inflationary bias whilst still allowing flexible responses to shocks. In
our specific case, the optimal policy rule would have the following
form:

\[ \pi^* = -\frac{\varepsilon}{1 + \alpha} \]  \hspace{1cm} (2.10)

So far nothing new. We have quite simply formalised the issues
which have been illustrated in the previous section.

Using a framework very close to the one above derived, Rogoff
suggested to mitigate the time inconsistency featured in (2.9) by
appointing an 'independent' central banker to conduct monetary
policy. By independent it is meant that the central banker places a
greater weight on inflation stabilisation than the government does.
Formally, this is equivalent to letting the central banker's loss function
be:

\[ L_{CB} = (y - \hat{y})^2 + (\alpha + \chi)\pi^2 \]  \hspace{1cm} (2.11)
where \( \chi \) is the endogenously determined extra weight placed on inflation stabilisation. Under this modified setting, the equilibrium rate of inflation can be shown to be:

\[
\pi = \frac{b}{a + \chi} - \frac{\varepsilon}{1 + a + \chi}
\]  

(2.12)

Comparing the first two terms of (2.12) and (2.9) one can immediately see that, for any \( \chi > 0 \), the inflationary bias with a conservative central banker is lower than the bias delivered under a discretionary equilibrium. Note, however, that this comes at the price of a trade-off between commitment and flexibility. In fact, if increasing \( \chi \) reduces the time consistent average inflation, the same increase also reduces the stabilisation part of inflation that aims to mitigate the impact of the supply shock on output. In fact, as \( \chi \) approaches infinity, the counter-cyclical feedback coefficient in (2.12) approaches zero and the result is that the central bank ends up responding completely inappropriately to shocks.

The next step in the analysis was to compute the optimal degree of central bank independence. This is given by the point where the benefits of reducing the inflationary bias outweighs the costs of responding inappropriately to supply shocks. Rogoff proved that the expected value of the government's loss function is convex in \( \chi \) and that there exists a positive optimal value of it that minimises this function. To see this intuitively, suppose that \( \chi = 0 \). Then, the central bank would be stabilising the economy optimally on the one hand, but the economy would be suffering from inflationary bias on the other
hand. Hence, it would be possible for a government, by raising the
central bank's weight on inflation stabilisation, to achieve a first order
stabilisation gain at a second order stabilisation cost. At the other
extreme, if \( X \) goes to infinity, then the inflationary bias would be
eliminated but the loss due to output variability would be very high.
Thus, for a very large \( X \) the marginal cost of reducing \( X \) is small
relative to the stabilisation gain. Hence, it is optimal for the
government to choose an agent to head the central bank who places a
greater, but not infinitely greater, weight on inflation stabilisation than
the government does.

We conclude this section with an important observation. The
Barro-Gordon (1983 a,b) and Rogoff (1985a) seminal papers are usually
cited when discussing the case for central bank independence. Yet, it is
important to observe that the policy implications of these works are
rather different. Barro and Gordon argue that the inflationary bias
under discretion makes a case for a monetary rule. In their initial non
stochastic equilibrium, the optimal rule would fix the money stock or
money growth rate. Once uncertainty is introduced and the level of
output is affected by shocks, it is optimal to set up a feedback rule, in
which monetary policy responds optimally to shocks. This would be a
rule without discretion, but there would be no need for an independent
central bank. In fact it would only require a technical institute to
implement this rule. Conversely, Rogoff's solution to the need for
flexibility for monetary policy to respond to shocks is to install a
conservative central banker with the discretion to respond to shocks
and the conservatism to keep the mean rate of inflation low. Hence, the
optimal central banker is chosen by trading off the reduction in mean
inflation secured by conservatism against the less than optimal trade-off between inflation and output variability produced by the same conservatism.

2.4 Recent Extensions of Rogoff’s Conservative Central Banker

Rogoff’s model has been quite influential as it is evidenced by the number of researchers who have used it as an analytical framework for investigating further the macroeconomic effects of delegating monetary policy to an independent authority.

A first development has originated from the observation that in the rather rigid framework devised by Rogoff the government is quite simply unable to override a decision taken by a central bank enjoying such a great deal of autonomy. Lohmann (1992) relaxed this assumption using a model of delegation in which the central bank sets the inflation rate while allowing for a flexible escape clause implemented in extreme situations. The set-up is similar to that in Rogoff except for an additional term in the government’s loss function. This extra term is an endogenously determined cost that the government pays when it ex post overrides the central bank’s monetary policy decision. The timing of events is described as follows: Firstly the government appoints an inflation averse authority to run monetary policy and also sets the cost of overriding a central banker. Then the private sector sets nominal wages. Finally the shock is realised and the central bank sets the inflation rate. The government either accepts this inflation rate or it chooses the option to override the central bank and reset a new higher inflation rate. In the latter case, the government would achieve an
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chosen before the outcome of elections but who implements monetary policy right after the election date, has two benefits: it reduces the inflationary bias, but also eliminates politically induced output variability since monetary policy is not under the direct control of governments with different preferences. The elimination of policy-induced output variability may compensate for the increased economic variability caused by the fact that an independent central bank does not try enough to stabilise supply shocks. This of course strengthens the case for central bank independence, especially in countries experiencing partisan political business cycles.

Along the same lines but in a more public finance framework, van der Ploeg (1992) has made a case for delegating monetary policy to an ultra-conservative central banker, namely to someone who cares only about price stability. This is due to the fact that in an economy with nominal wage contracts and nominal public debt, a government has a temptation to create unanticipated inflation in order to erode the real value of debt service and hence to cut distortionary taxes. Under discretion, this results in an inflation bias and in a suboptimal government revenue mix that relies too much on seignorage revenue and too little on taxation. Van der Ploeg has shown that a fully independent central bank committed to price stability yields a higher welfare than a dependent central bank. He has also shown that a fully independent central bank is more likely to be preferred when the stock of outstanding nominal government debt is high, when a large proportion of wages is not indexed and when the extent of the black economy and collection costs of conventional taxes are insignificant.
2.5 The Principal-Agent Approach

One of the most promising contributions to the recent literature on central bank independence has come from Walsh (1995). His main innovation is to adopt a principal agent framework in an attempt to analyse the incentives a central banker may face in a standard monetary policy game. In a principal-agent framework, the principal (government) delegates control over inflation to an agent (central bank). The principal’s task is to offer the agent a contract providing the incentives to enact the policy desired by the principal. The positive aspect of the contract is that it does not modify the central bank’s preferences about output stabilisation. Hence, it completely eliminates the credibility vs. flexibility trade-off Rogoff’s proposal suffers from. The issue then becomes choosing a suitable contract which can be taken as credible by the private sector.

The set-up is the natural rate model examined above. But in contrast to Rogoff’s approach of viewing the central banker as more inflation averse than the rest of society, in Walsh’s model the government offers the governor of the central bank a state-contingent wage contract and his objective is to maximise the budget transfer from the government which in turn depends on inflation and unemployment. Formally, let the central bank’s objective function be:

\[ L_{cb} = (y - \hat{y})^2 + a(\pi - \hat{\pi})^2 \]  \hspace{1cm} (2.13)

where \( \hat{\pi} \) and \( \hat{y} \) are the target levels of inflation and output respectively. Aggregate supply and output is given by the Lucas supply function:
\[ y = \bar{y} + (\pi - \pi^e) + \varepsilon \] (2.14)

where \( \varepsilon \) is, as before, an aggregate supply shock with zero mean and finite variance, \( \bar{y} \) is the equilibrium level of output in the absence of supply shocks, and \( \pi, \pi^e \) are the actual and expected inflation rates, respectively. As it is often the case in monetary policy games, it is assumed that the market determined level of output \( \bar{y} \) is below the target level of output \( \hat{y} \) (\( \hat{y} = \bar{y} + k; k > 0 \)). The informational structure assumes that, firstly, expectations about inflation are formed, secondly, the monetary authority observes a signal \( \theta \) about \( \varepsilon \) and it finally sets the inflation rate based on this. The signal is private information of the central bank. Suppose now that monetary policy is delegated to an independent central banker who chooses the inflation rate in order to maximise his utility given by \( U = t - L_{CB} \), where \( t \) is a monetary transfer payment from the government conditional on the central bank performance as specified in the contract. Given the incentives and constraints faced by the government and the central bank, the interactions between the two can be regarded as a standard principal-agent problem. More specifically, the agent sets the inflation rate to maximise his expected utility, conditional on the realisation of \( \theta \) The principal’s problem is to design a transfer function \( t \) that enforces the central bank to choose \( \pi = \pi(\theta) \) so that \( E(t - L_{CB}) \geq 0 \). The transfer function \( t(\pi) \) implements the optimal policy \( \pi(\theta) \) if this maximises \( E[t(\pi) - L_{CB}] / \theta \) for all \( \theta \). Intuitively, the government’s objective is to design a contract that eliminates the inflationary bias while leaving the central bank free to respond to \( \theta \).
Walsh has shown the optimal policy can be implemented by the following transfer function:

\[ t(\pi) = t_0 - 2k(\pi - \hat{\pi}) \]  

(2.15) states that the central banker is penalised for deviations of actual inflation above target inflation \( \hat{\pi} \) and rewarded for actual inflation rates below such a target. Notice that the penalty is linear in actual inflation, which means that the marginal cost of increasing inflation is the same for all realisations of \( \theta \).

If the work of Walsh sets the stage for the contractualist research agenda, Svensson's inflation targets bridge the gap with the reality of monetary policy-making. Svensson (1995) observed that if the central banker puts a lower average inflation target than the rest of society does and its preferences over inflation and output are quadratic, this is formally equivalent to adding a linear cost to inflation, as in the Walsh model above. Moreover, he shows that the trade-off between average inflation and output variability arising in Rogoff's model only follows from the particular parameterisation of preference differences, namely that the central bank puts more weight on stabilising inflation than the rest of society does. Svensson's proposal is therefore to assume that the central banker has a lower average inflation target than the rest of society. In such a case, average inflation can be reduced without any increase in output variability.

We believe there are two alternative interpretations of this result. If the central bank may be held accountable, a target is a non-distortionary performance-based contract. Alternatively, Svensson's
proposal may be viewed as a suggestion that monetary policy be delegated to a genuinely conservative central banker, that is, a banker who implements non-distortionary responses to shocks but prefers an average rate of inflation lower than the socially optimal one.

2.6 Controversial Issues

Several issues arise at this point. The first regards the distinction between discretionary and rule-based behaviour. How does one decide whether a central bank's behaviour should be classified as discretionary or rule-based? Within a simple model one could calculate the settings implied by each type of behaviour, or simply observe whether inflation exceeds its target value on average. But such steps are not possible for an outside observer, since she does not possess knowledge of the bank's true target values -much less the response coefficients that would be implied by each type of behaviour given the implicit model of the economy. Taylor (1993) explicitly addresses this problem in practice, recognising that no actual central bank would be likely to follow literally a simple formula for its instrument settings, but contending that the distinction could be of importance nevertheless.

Clearly, being systematic is a necessary condition for the rule-like behaviour, but even those central bankers who defend discretionary behaviour do not think of it as unsystematic. Accordingly, McCallum (1993) argues that being systematic it is not sufficient and points out that even discretionary behaviour can be accurately represented by the systematic application of a simple formula. The needed additional criterion, McCallum suggests, is that
"the monetary authority must also design the systematic response pattern (so as) to take account of the private sectors expectational behaviour" [McCallum 1993, JME]

This leads us back to the main point that central banks have to avoid temptations to re-optimise over time.

A second and perhaps more controversial issue is whether it is actually feasible for an independent central bank to behave in a rule-like fashion. Many authors (including Taylor (1983), Taylor (1993), McCallum (1995) and Prescott (1977)) have in fact suggested that, since there is no tangible "commitment technology" to guarantee that future choices will be made similarly, independent central banks are inevitably destined to behave in a discretionary fashion, making a fresh optimisation calculation each period. One of the strongest explicit statements of this position has been made by Chari, Kehoe, and Prescott (1989) as follows:

"we should emphasise that in no sense can societies choose between commitment [and] time-consistent [i.e. discretionary] equilibrium. Commitment technologies are like technologies for making shoes in an Arrow-Debreu model -they are either available or not" [Chari, Kehoe, and Prescott, 1989, FRB Minneapolis, p. 303]

Moreover, Lapavitsas (1997) observed that the 'independent' central bank of the theoretical models is not a central bank at all. It is, rather, a social planner armed with a single instrument of economic policy, fiat money, in pursuit of the aim of price stability. With this in mind, 'independence' acquires a meaning: it is, above all, the
independence of the social planner from the executive branch of the
state, i.e. the periodically elected government.

The third objection regards a matter of internal consistency of the
theory of central bank independence and is rather more substantial.
McCallum (1995) claims that the literature "features inappropriate
interpretative mappings between analytical constructs and real world
institutions". Two are the fallacies which he identifies. The first regards
the assumption that if the central bank is not externally constrained to
do otherwise, it will generate the discretionary rate of inflation. He
argues that, although no technology exists for inescapably committing
future actions, this does not imply that such behaviour is actually
unfeasible. In this regard he argues:

"What is needed for avoidance of the inflationary bias is for the central bank to
recognise the futility - on average, over extended time spans - of continually
exploiting expectations that are given 'this period' but reflect responses to actions
of the central bank taken in the past, and to recognise that its objectives would be
more fully achieved on average if it were to abstain from attempts to exploit these
temporarily-given expectations".[McCallum 1995, AER]

Therefore, the actual issue remains whether the commitment
equilibrium without incentive constraints is implementable. The
second fallacy pertains to the inappropriate interpretation of the Walsh
contracts. In McCallum's own view, the unsatisfactory feature of this
result is that such a contracting device does not actually eliminate the
motivation for dynamic inconsistency. It merely relocates it to a
different place\textsuperscript{18}. Specifically, under the proposed arrangement, the

\textsuperscript{18} The same point has been made by al-Nowaihi and Levine (1996).
government would have to enforce the contract by reducing the central bank’s budget when inflation is high. However, the government has exactly the same incentive of the central bank not to do so. What this means is that, if the absence of a precommitment technology is a severe problem, then it must apply to a consolidated entity consisting of the central bank and the government together, just as it would to an entirely independent central bank. Therefore, his conclusion is that the problem cannot be overcome analytically by a suggestion that the central bank’s objective function should be specified at the constitutional stage of the political process. In fact, the constitution still needs to be enforced, and the enforcing party may be subject to the same temptations of an independent central bank. Hence, the main effect of central bank contracts

"... is not principally to constrain the central bank to act in accordance with the government objectives, but rather to constrain the government by increasing the difficulty of its bringing pressure to inflate upon the central bank". [McCallum 1995, AER]

The problem remains, however, that contracts may raise credibility relative to simple arrangements only to the extent that renegotiation costs are sufficiently high (Waller, 1995). The practical calibration of the Walsh tax, particularly when this is imposed as a non-pecuniary penalty, is of course another crucial issue.

A final objection, largely emphasised by Alesina (1988), Alesina and Summers (1993), Bade and Parkin (1984), Eijffinger and Shaling (1993), Grilli et al. (1991) and Cuckierman et al. (1992) among the many others, is grounded on the consistent empirical result of the free lunch
provided by central bank independence in industrialised countries. In fact, central bank independence appears to be empirically associated with smaller rates of inflation, while carrying no costs in terms of growth\(^\text{19}\). Furthermore, both the variance of inflation and output growth are on average lower for countries that have more independent central banks. These results do not seem at first glance consistent with the predictions of Rogoff’s model, which implies that central banks trade off between output and inflation variability. Fischer (1995) suggests three explanations of this. First, that more independent central banks are better at stabilisation than less efficient banks, and therefore come closer to the stabilisation-efficiency frontier. Secondly, that fiscal policy is more disciplined in countries whose central banks are relatively more independent. Finally, that both inflation and output performance are primarily affected by shocks that differ from country to country. Alesina and Summers (1993) and Alesina and Gatti (1995) argue that this empirical result may also be explained by the fact that independence eliminates the uncertainty created by a polarised political system. In their own view, 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.

2.7 Models with Endogenous Fiscal Policy

The main limitation of these earlier models is that they exclusively deal with monetary policy. In other words, they completely neglect the interplay between monetary and fiscal policy. More recently, however – possibly also as a response to the magnitude and duration of fiscal

\(^{19}\) These results only hold for developed economies.
deficits experienced in many developed countries – a perhaps more interesting branch of the time-inconsistency literature has tried to fill this gap.

The earliest paper on the subject to receive a great deal of attention was the Sargent and Wallace (1981) piece entitled “Some Unpleasant Monetarist Arithmetic”. The principal contention here is that an economy’s monetary authority cannot prevent inflation from rising if an uncooperative or irresponsible fiscal authority behaves so as to generate a continuing stream of primary deficits.

The workhorse paper in the monetary-fiscal interaction literature is the one by Alesina and Tabellini (1987). They developed the Barro-Gordon model by assuming that real government purchases are controlled by a fiscal authority that may have different objectives – concerning the level of these purchases as well as inflation and output – than those of the central bank. The fiscal authority’s revenues come from non-lump-sum taxes and money growth, government debt being excluded from the model. Using this setting, Alesina and Tabellini derived outcomes pertaining to both discretionary and rule-like behaviour by the central bank. Their most striking result was that, when the preferences of the central bank and the fiscal authority are sufficiently different, equilibrium outcomes with monetary policy commitment can be inferior to those obtained under discretion. This result, which was viewed as a message in favour of monetary and fiscal policy co-operation, has been subsequently confirmed by the two-country extension of Bryson et al. (1993).
There have been several attempts to improve upon the framework devised by Alesina and Tabellini. Beetsma and Bovenberg (1995), for instance, extended their framework using a more sophisticated budget constraint allowing for public debt. Within this modified setting they analysed the implications of alternative institutional arrangements - centralisation versus decentralisation, Nash versus Stackelberg - for society's welfare. Unfortunately, their results were somewhat ambiguous. In fact, different arrangements were preferable depending on society's preferences over inflation, output and public spending as well as the structural parameters of the economy.

A less ambiguous result was derived by Agell et al. (1996). Developing an analytical structure very similar to the one of Beetsma and Bovenberg, they showed how discretionary fiscal and monetary policies are bound to result in excessive inflation and deficits. With particular reference to public debt dynamics, they stressed how, in a finite game where there is no binding borrowing constraint for the government during its term of office, the equilibrium will be characterised by sustained deficits. Conversely, with binding borrowing constraints there is a bias in running debts initially.

Beetsma and Bovenberg (1998) reconsidered the original structure of Alesina and Tabellini in a multi-country model of monetary union, and modelled the fiscal authorities as Stackelberg leaders vis-à-vis the central bank. Within this framework each fiscal authority acted strategically, perceiving that the output distortions caused by a tax increase would have been partly offset by an inflation surprise. Because rational wage setters were able to anticipate this, the advantage of the
policymaker once again resulted in an inflation bias. The conclusion was that fiscal co-ordination in a monetary union is not desirable because it strengthens the bargaining position of the leader.

Yet, the work by Beetsma and Bovenberg neglected the existence of open economy-effects from fiscal policy and possibility that fiscal authorities might be tempted to use so called ‘demand side (i.e. public expenditures) policies’ to increase output. This issue was discussed at great length in the paper by Levine and Pearlman (1998). They analysed a hypothetical closed trading bloc of ins and outs to a monetary union where both fiscal and monetary authorities are subject to time-inconsistencies. If on the monetary side the source of inconsistency is represented by the temptation to deliver a rate of inflation well above the one expected by the private sector, on the fiscal side a stabilising role for the fiscal authorities is given by the pressure these can exert on the real exchange rate. The argument goes as follows. When a government fiscal stance is looser relative to that of the others, its real exchange rate appreciates. This reduces the real product wage therefore raising the domestic level of output. Yet, a domestic appreciation is equivalent to a domestic depreciation for the rest of the other countries, with opposite effects on their levels of output. Hence, fiscal policy is beggar-thy-neighbour because it increases the level of output at home at the expense of foreign countries’ welfare. One of the weaknesses of this line of analysis, however, is that it fails to account for the effects on output of both a distortionary taxation and an endogenously determined balanced budget constraint. Moreover, it is still grounded on the assumption of simultaneity in the policy decision process.
A negative externality connected to the use of fiscal policy in a monetary union is also derived in Sibert (1992). Here the negativity of the sign relates to the fact that an increase in one country’s tax lowers disposable income in the same country, therefore decreasing seignorage in the area as a whole. Thus, the lack of fiscal policy co-ordination causes income taxes to be too high. As a consequence, the provision of the public good is too high and the central bank sets inflation below the optimal level. Yet, the result that lack of international co-ordination results in too little inflation is unusual and contradicted by Miller and Salmon (1985), Cohen and Wyplosz (1989) and Levine and Brociner (1994) among the many others.

Finally, there have been several attempts to extend the contractualist approach suggested by Walsh to the case where fiscal policy is endogenously treated. It is worth mentioning here the one by Huang and Padilla (1995). They showed that, if fiscal policy is endogenous, a contract à la Walsh offered to an independent central banker remains subject to strategic manipulation by the government. As a result, a suboptimal Nash equilibrium may emerge, in which distortionary taxation is too high while inflation is too low. Hence, implementing the optimal policy mix would require that either the central banker has primacy over the fiscal authority, or the fiscal policy is delegated to an independent authority also subject to an optimal contract.

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20 It is not the aim of this survey to enter into the debate of the sign of the international transmission of fiscal policy. However, from a number of more empirical researches conducted during the past decade (an excellent survey is provided in Douven and Peeters 1997), we observe that in Europe this has often deviated from the positive effect that often assumed by the traditional Mundell-Flemming literature.
2.8 Conclusion

This chapter has provided a selected coverage of the main contributions to the literature of time-inconsistency. Several issues have been stressed. Time-inconsistency within simple policy games arises because policymakers face the temptation of increasing the level of output by delivering a rate of inflation which is above the one expected by the private sector. Although such policies may produce short-term real effects, in the long run expectations will be revised upwards so as to eliminate any monetary surprises. Therefore, such policies will eventually result into an excessively high rate of inflation without any output gain. Although there have been several attempts to solve this so called inconsistency problem, the most successful recipe today still remains the delegation of monetary policy to a central bank characterised by high aversion to inflation. This is the now popular argument of central bank independence. There is a second proposal which has received a great deal of attention in the last few years. It is the contractualist approach developed by Walsh according to which a central bank may be inclined to lower inflation if it knows that a penalty may be imposed upon it if it misses its target. The chapter also focused on the several developments that have been made to account for the important monetary and fiscal interactions which earlier works had neglected. The problem with these more recent models, however, is that they still remain rather complicated and difficult – sometimes impossible – to solve analytically. Moreover, the assumptions underlying their microfoundations are often somewhat arbitrary.
Chapter 3

Fiscal and Monetary Policy Interactions in Europe: A Case for Fiscal Policy Co-ordination

Contents: 3.1 Introduction; 3.2 General Model with Distortionary Taxes; 3.3 A Monetary Union Game with Distortionary Income Tax; 3.4 Co-ordination Through a Walsh Mechanism; 3.5 Simulations; 3.6 Conclusion

3.1 Introduction

Now that EMU has become a reality, there is a considerable debate on how fiscal policy should be managed in Europe. In the eyes of many politicians, fully discretionary national fiscal policies may be needed to counterbalance a strong and independent ECB. However, a significant number of economists (Sibert (1992), Levine and Pearlman (1998), Carlberg (1999) to name just a few) believe that the absence of precommitment devices for decentralised fiscal policies will eventually lead to excessive public expenditure – already very high in Europe, see fig. 3.1 –, deficits and inflation, as each government engages in fiscal expansions to increase domestic production, while passing some of the costs of its fiscal activism to other countries in the form of higher inflation and interest rates. The SGP has tried to guard against this by imposing strict rules on the management of national budgetary policies and imposing that each country’s fiscal deficit should not exceed 3 per
cent of GDP. It also forbids the ECB both from financing any member country's deficit and bailing out a country in financial distress. Yet, as we have seen, the SGP provisions do allow room for some flexibility. If, on one hand, this is desirable because it makes monetary union arrangements less vulnerable to the cycle disturbances, on the other hand a too flexible and *ad hoc* interpretation of the current provisions by national governments may raise an issue of credibility.

We have already emphasised how the structure upon which EMU is built – decentralised fiscal policies versus centralised monetary policy – is unprecedented and how it is far from clear if the fiscal anomaly that currently characterises economic and monetary union in Europe is indeed desirable. Our aim is to contribute to this discussion and understand if theoretical support can be found in favour of fiscal policy co-operation or other forms of co-ordination through institutional mechanisms like the SGP.

Hence our question: is the current EMU set up desirable and what is the impact of either fiscal policy co-operation or fiscal precommitment devices on inflation, public expenditure and the optimal degree of independence of the ECB?

In this chapter we provide an argument in favour of co-ordination. This is based on the fact that in an open economy governments perceive that a unilateral fiscal expansion determines a real exchange rate appreciation, which in a monetary union is entirely reflected into a change of the relative prices. Hence there is an incentive to increase public expenditure relative to foreign countries because higher domestic
prices will reduce the real product wage and boost output. For the other member countries, however, a foreign real exchange rate appreciation is equivalent to a domestic depreciation, with opposite effects on their output level. Therefore, as far as welfare is concerned, fiscal policy in our model – as in van der Ploeg (1990) and Levine and Pearlman (1998) – is *beggar-thy-neighbour* because it increases domestic output at the expense of foreign countries' welfare.

We show that, when the fiscal authorities fail to internalise the spillovers originating from their fiscal stances, both government expenditures and tax distortions are excessively high. As a result, output deviations from its natural level increase and the traditional *time-inconsistency* problem of the monetary authorities worsens.

Our main result is that co-ordination internalises these inefficiencies, therefore reducing both the fiscal bias – temptation to spend more than the socially optimal level – and its impact on the more traditional inflation bias. This also reduces the optimal degree of conservatism of the central bank. In fact, in so far as the fiscal authorities engage in expansionary fiscal policies, the central bank will have to pursue a tighter monetary policy in order to be able to deliver a particular rate of inflation.

Still, how to achieve co-ordination is not an easy matter. In the chapter we also suggest an alternative mechanism based on a *principal-agent* micro-framework that can be used to obtain the same positive results of fiscal policy co-ordination, but without an explicit commitment to it.
Our model is very close in spirit to van der Ploeg (1990 and 1993), which provides a modern version of the Mundell-Flemming open-economy model, and Levine and Pearlman (L&P, 1998), which analyses the fiscal and monetary policy interactions between the "ins and outs" to a monetary union. Here we develop a relatively more simple model based on microfoundations. We endogenise fiscal policy and concentrate on the case where the real exchange rate is the only channel of policy transmission. Our main contribution in this chapter is to introduce an explicit balanced budget rule for the fiscal authorities and analyse the important distortionary effects of a tax levied on people's income. From this perspective our (first) model is a development of that in L&P to include distortionary taxation.

We have allowed income taxes to play a crucial role in the determination of wages because increased tax rates in the major industrial economies have made both trade unions and workers more conscious of the real value of their after-tax salaries. We have not addressed, however, the issue of tax competition. Conversely, we have emphasised the fact that, in their respective employment decisions, the relevant price to the producer is the price of domestically produced goods, while the relevant price to workers is the overall price level, which is itself influenced directly by the real exchange rate. From this point of view, our analysis is also close to Salop (1974).

21 VAT taxes, however, are considered in chapter four. The different choice of taxes there derives from the need to have an open-economy model with fiscal policy which remains as close as possible to the one devised by Beetsma and Bovemberg (1998, B&B). Our aim is to show that the results derived in this chapter continue to hold in the different B&B set up.
The chapter proceeds as follows: section 3.2 develops a general model of insiders and outsiders to a monetary union with distortionary taxes and open-economy effects from fiscal policy. This model is to be retained throughout the thesis. Section 3.3 considers the issues of time inconsistency of monetary and fiscal policies within a monetary union where public expenditure programs are financed with distortionary income taxes. Section 3.4 presents a fiscal application of the Walsh contracts, and section 3.5 goes one step further and computes the optimal degree of ECB independence. Finally, section 3.6 summarises and concludes.

3.2 General Model with Distortionary Taxes

Let us consider \( n+1 \) perfectly integrated economies with identical economic structures and each specialising in the production of one good. Goods are imperfect substitutes in consumption, while capital stock is exogenously fixed. Countries run balanced budgets and are able to finance their public expenditures only by raising distortionary taxes\(^{22}\). These are either levied on peoples' income or on firms' profits.

The demand side of the model closely follows Levine and Pearlman (1998). We assume that in country \( i \) \([i = 0, ..., n]\) \( C_{ij} \) units of good \( j \) are imported from country \( j \) \([j = 0, ..., n]\).\(^{23}\) Given the total consumption expenditure \( C_i \), consumers choose the units of consumption \( \{C_{ij}\}_{j=0,n} \) to maximise an expected utility function \( E_{-1}(U_i) \) where:

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\(^{22}\) The introduction of seignorage and debt would not alter the substance of our results.

\(^{23}\) All variables are dated at time \( t \). A subscript \(-1\) indicates time \( t - 1 \).
\[ U_i = \sum_{j=0}^{n} \gamma_{ij} \log C_{ij} + \eta_i \log G_i \quad \gamma_{ij} = \frac{1}{n+1} \quad ; \quad \sum_{j=0}^{n} \gamma_{ij} = 1 \quad (3.1) \]

subject to:

\[ C_i = \sum_{j=0}^{n} E_{ij} C_{ij} \quad (3.2) \]

\( E_{ij} \) is the real exchange rate between country \( i \) and \( j \) and \( \gamma_{ij} \) is the share of good \( j \) in the consumption of the representative consumer of country \( i \). Government spending \( G_i \) falls exclusively on domestic goods. Equation (3.1) implies that the utility of individuals depends on the levels of both government and private consumption, where the latter is allocated equally between domestic and foreign goods.

Straightforward calculations show that the demand in country \( i \) is:

\[ Y_i = \frac{1}{(n+1)} \left[ C_i + \sum_{j=0; j \neq i}^{n} C_{j} E_{ij} \right] + G_i \quad (3.3) \]

where the first two terms stand, respectively, for domestic and foreign consumption and \( G_i \) is public expenditure. We can express all exchange rates relative to country zero and drop subscript \( 0 \) for notational convenience. The demand equation for country \( 0 \) is therefore:
We are now ready to move on to the supply side. Consider country 0. We assume that the representative firm maximises:

\[(1 - t^v)PY - WL\]  \hspace{1cm} (3.5)\]

where \(L\) is labour and \(t^v\) is a tax on firms' profits (VAT). Production \(Y\) is described by the Cobb-Douglas production function:

\[Y = \overline{K}^\beta L^{1-\beta} \exp(-u)\]  \hspace{1cm} (3.6)\]

where \(u\) is a supply shock\(^{24}\) and \(\overline{K}\) is an exogenous capital stock.

Workers are represented by trade unions whose sole objective is to achieve a target disposable real wage, the logarithm of which we normalise to unity. Hence, unions' welfare function can be written as (small letters denote logs):

\[U = \left(w - p^c - t^w\right)^2\]  \hspace{1cm} (3.7)\]

where \(t^w\) is a distortionary income tax\(^{25}\). \(p^c\) is the consumer price index (CPI), defined as:

\(^{24}\)Assumptions about the shocks are presented later on in the chapter.
\(^{25}\) In (3.7) \(- t^w\) is used as an approximation of \(\ln(1 - t^w)\).
\[ p^e = p + \frac{1}{(n+1)} \sum_{i=0}^{\infty} e_i \]  

(3.8)

e_i \text{ the log of the real exchange rate of country } i \text{ relative to country } 0. \text{ Observe that equation (3.7) implies that wage setters only care about a real post-tax wage target, while they regard any employment target as unimportant}.^{26}

The supply-side of the model is completed with an exogenous partial indexing arrangement \( k \in (0,1) \) linking the nominal wage to the CPI so that:

\[ w = w^* + k \left[ p^e - (p^e)^e \right] \]  

(3.9)

The expression for the real product wage is obtained by differentiating (3.7) with respect to \( w \) and combining this result with (3.9). This yields:

\[ w - p = -(1-k)\left[ p^e - (p^e)^e \right] + \frac{1}{(n+1)} \sum_{i=0}^{\infty} (e_i) + (t^w)^e \]  

(3.10)

Conversely, the firm’s maximisation problem requires:

\[ (1-\beta)k^B L^{-\beta} \exp(-u)(1-t^*)P - W = 0 \]  

(3.11)

---

26 Introduction of an employment target would complicate the algebra without affecting the substance of the results.
Taking logs and approximating $\log(1-t^*)$ with $(-t^*)$ (3.11) becomes:

$$f(\bar{K}) - t^* + p + \beta \bar{I} - u = w$$

(3.12)

where $f(\bar{K}) = \log(1 - \beta) + \beta \log \bar{K}$. The final equation for employment (\( \bar{I} \)) is derived by combining (3.9)-(3.11). This gives:

$$\bar{I} = \bar{I} + \frac{1}{\beta} \left\{(1 - k) \left[p^r - (p^e)^r\right] - \frac{1}{n+1} \sum_{t=0}^{n} \varepsilon_t \right\} - \frac{1}{\beta} \left[(t^w)^r + t^r\right] - \varepsilon$$

(3.13)

where $\bar{I} = \frac{f(\bar{K}_{-1})}{\beta}$ and $\varepsilon = \frac{u}{b}$.

The following assumptions are made about the supply shocks:

$\varepsilon_i \sim iid(0, \sigma^2)$; $i = 0, n$

$E(\varepsilon_i, \varepsilon_j) = \rho \sigma^2$; $i, j = 0, n, i \neq j$; $-\frac{1}{n} \leq \rho \leq 1$

Equation (3.13) shows that employment depends upon the familiar surprise price effect – which can only be eliminated with full indexation ($k=1$) –, tax distortions and the supply shock. Employment also depends upon the real exchange rate. This happens because a real exchange rate appreciation contracts the real wage as shown by (3.10).

The closure of the model is given by the following standard results for country 0:
\[
\left( \frac{C_i(1 + R)}{C_i(1 + \vartheta)} \right)^\varepsilon = 1 \tag{3.14}
\]

\[
\left\{ \left[ \frac{E_{i+1}}{E_i} (1 + R_{i+1}) - (1 + R_i) \right] \right\}^\varepsilon = 0 \tag{3.15}
\]

(3.14) is the Keynes-Ramsey Rule for consumption where \( R_i \) is the real interest rate over the interval \([t, t+1]\) in country 0, \( R_{i+1} \) is the real interest rate in country \( i \) and \( \vartheta \) is the representative consumer's rate of time preference. (3.15) is a UIP arbitrage condition for the real exchange rate.

Let us now define \( \pi = p - p_{-1} \) the CPI inflation of country 0 and \( \bar{\pi} = \pi - \pi^\varepsilon \) the inflation surprise. Likewise we define \( \bar{c} = c - (c^\varepsilon) \). The next step in the model is to express all variables in deviation form about a baseline steady state, where policy instruments are set at their optimal values. Lower case variables will denote either a proportional change relative to the steady state (e.g. \( y = \frac{Y - \overline{Y}}{\overline{Y}} \), with \( \overline{Y} \) the steady-state path), or an absolute change, such as inflation rates or \( g = G/Y - \overline{G}/\overline{Y} \). The country 0 model linearised about a zero-inflation steady state is therefore given by the following four equations:

\[
\left( 1 - \frac{\overline{G}}{\overline{Y}} \right) y = \frac{\overline{C}}{\overline{Y}(n + 1)} [c + \sum_{i=1}^{n} (c_i + c_{i+1})] + g \tag{3.16}
\]
\[ y = \frac{(1 - \beta)}{\beta} \left[ (1 - k) \bar{F} - \frac{1}{(n + 1)} \left[ \sum_{i=1}^{n} \tilde{e}_i + \left( \sum_{i=1}^{n} e_i \right) \varepsilon \right] - \left[ (t''')^e + t'' \right] \right] - \varepsilon \] (3.17)

\[ (c_{i+})^e = c + r/(1 + R) \] (3.18)

\[ (e_{i,1})^e = e_i + (r - r_i)/(1 + R) \] (3.19)

(3.16) and (3.17) are the linearised equations for demand and supply\(^27\), and (3.18) and (3.19) are the linearised forms of respectively (3.14) and (3.15). To compute the rational expectations solution we combine (3.18), its country \(i\) counterpart, and (3.19) to obtain:

\[ c = c_i + e_i \] (3.20)

We can now equate demand and supply in the domestic and foreign country to get expressions of the expected and surprise exchange rate effects. These are respectively:

\[ (e_i)^e = - \frac{\mu_i (\bar{g}^e - g_i^e)}{\alpha + (1 - \beta)/\beta} \] (3.21)

\[ e_i - (e_i)^e = \bar{e}_i = \frac{- \varepsilon + \varepsilon_i + (1 - \beta)(1 - k)/\beta (\bar{q} - \bar{q}_i) - \mu_i (\bar{g} - \bar{g}_i)}{\alpha + (1 - \beta)/\beta} \] (3.22)

where

\(^{27}\) The transformation: \( y = (1 - \beta)l - \beta \varepsilon \) has been applied to the supply side equation.
\[ \mu_1 = \frac{1}{1 - \frac{G}{Y}} + \frac{1 - \beta}{\beta} \]

\[ \alpha = \frac{\overline{C}/Y}{1 - \frac{G}{Y}} \]

(3.22) shows that a domestic public expenditure surprise determines a surprise appreciation of the exchange rate, whereas the opposite is true in the case of a domestic monetary surprise. The combination of (3.17) and (3.21)-(3.22) gives our reduced form of output for country 0:

\[ y = \psi \bar{x} - \psi e - \frac{1 - \psi}{n} \sum_{i=1}^{n} \varepsilon_i + \frac{(1 - \psi) \bar{x}}{n} \sum_{i=1}^{n} \bar{\pi}_i + \frac{\mu_1 (1 - \psi)}{n} \left[ n \tilde{g} - \sum_{i=1}^{n} \tilde{g}_i \right] + \mu_2 \left[ n g^e - \left( \sum_{i=1}^{n} g_i \right)^e \right] - \frac{(1 - \beta)}{\beta} \left[ \left( t^e \right)^e + t^e \right] \]

where:

\[ \bar{x} = \frac{(1 - \beta)}{\beta} (1 - k) \]

\[ \psi = \frac{[\alpha + 1/(n + 1)(1 - \beta)/\beta]}{[\alpha + (1 - \beta)/\beta]} \]

\[ \mu_2 = \frac{(1 - \beta) \mu_1}{\beta (n + 1)(\alpha + (1 - \beta)/\beta)} \]

Hence, employment depends not only upon the traditional inflation surprise but also upon a domestic public expenditure surprise relative to other countries, because of the impact this has on relative
prices and on the real product wage. Additional elements affecting output are the domestic level of (income and VAT) tax distortions and the supply shocks both at home and abroad. The impact of the latter – as well as of the public expenditure surprises – depends on the degree of openness of the economy as captured by \((1 - \nu)\). Finally, (foreign) monetary policy spillovers increase output \(via\) the appreciation of the domestic real exchange rate.

It is important to observe that (3.23) implies a negative transmission of fiscal policy. This is due to the fact that, for a given level of public expenditure in the home country, an expenditure increase in the rest of the union determines a real exchange rate appreciation abroad. As we have seen in (3.10), this reduces the real product wages and increases foreign production. For the home country, however, a foreign appreciation is equivalent to a domestic real depreciation, with opposite effects on its output level.

Observe that the underlying reason for a negative transmission of fiscal policy in our modelling framework is the same as in van der Ploeg (1990) and Levine and Pearlman (1998). Crucial to this result is the assumption of imperfect substitution between domestic and foreign goods and the fact that government consumption falls entirely on domestic goods. The sign of the transmission would of course change if we were to drop these assumptions and consider more traditional models like Mundell (1963) and Fleming (1962), or the modified versions of McKibbin and Sachs (1991) and Krugman (1995). In these models a domestic expansionary fiscal policy raises foreign GDP whereas the opposite is true for an expansionary monetary policy.
Similar results would also be obtained using frameworks where demand increases output without affecting the price level (Obstfeld and Rogoff, 1995).

The empirical evidence in this regard (see Douven and Peeters, 1997) shows that in general the sign of both monetary and fiscal policy spillovers crucially depends on the specific model assumptions and the choice of parameters used in the calibrations. The most interesting study remains the one of Whitley (1992). He compares the effects of fiscal policy shocks originating in a number of European countries with those of a fiscal policy shock originating in the US. Whitley reports significant positive spillover effects of US shocks on the EU-economies, but only very negligible effects both on the US and the other EU countries of a fiscal expansion originating in a single European economy. For European countries, in particular, the most interesting result is that the relative magnitude and the sign itself of the spillovers is subject to both the time horizon and the exchange rate considered.

Other relevant empirical studies are the ones of Helliwell and Padmore (1985) and Frankel (1988). The first applies the same kind of shock analyses on different multi-country models and compare the responses of GDP in foreign countries to a fiscal and monetary shock originating in a domestic country. Results suggest that a flexible exchange rate increases the domestic income and price effects of domestic monetary policy while reducing the foreign effects. Conversely, the study by Frankel (1988) considers the specific case of a permanent government expenditure shock of one per cent of GDP and a permanent increase in the money stock of four per cent. He shows that a fiscal expansion raises foreign GDP whereas the negative
Mundell-Fleming effect of a domestic monetary expansion on foreign GDP does not often materialise. However, these results are strongly affected by the chosen set of parameters used.

We can now transform the \( n+1 \) country model for which no particular regime has been specified into a model of ins and outs to a monetary union (EMU). Let \( n+1 \) be the countries belonging to EMU and \( m \) be the number of countries outside the monetary union. For convenience and notational consistency all exchange rates remain all relative to country 0. The general function for output for country \( i \) is given by:

\[
y_i = \psi(x_{-i} - \theta) + \frac{1 - \psi}{n + m}(x_{-i} - \theta) + \frac{\mu_i(1 - \psi)}{(n + m)}(g_{i} - \bar{g}_{i}) + \\
+ \mu_2[(n + m)(g_{i})^\varepsilon - (g_{-i})^\varepsilon] - \frac{(1 - \beta)}{\beta}(t_i^\varepsilon + t_i^\gamma)
\]  

(3.24)

where: \( x_{-i} = \sum_{j=0, j \neq i}^{n+m} x_j (\forall i) \). Observe that for outsiders monetary spillovers are defined as:

\[
\bar{x}_{-i} = (n + 1)\bar{x}_i + \sum_{j=n+1, j \neq i}^{n+m} \bar{x}_j
\]  

(3.25)

Conversely, for insiders these amount to:

\[
\bar{x}_{-i} = n\bar{x}_i + m\bar{x}^\circ = n\bar{x}_i + \sum_{j=n+1}^{n+m} \bar{x}_j
\]  

(3.26)
Hence, combining (3.26) with (3.24), the output function for the generic country \( i \) belonging to EMU can be rewritten as:

\[
y^\text{EMU}_i = \chi \nu_i \tilde{z}^\text{EMU} - \psi \varepsilon_i + \frac{1-\psi}{n+m} \left( m \chi \tilde{z}^e - \varepsilon_{-i} \right) + \frac{\mu_1 (1-\psi)}{(n+m)} \left[ (n+m) \tilde{g}_i - \tilde{g}_{-i} \right] + \\
+ \mu_2 \left[ (n+m)(g_i)^e - (g_{-i})^e \right] - \frac{(1-\beta)}{\beta} \left[ (t^*_i)^e + t^*_i \right]
\]

(3.27)

where \( \nu_i = \frac{n+m \nu}{n+m} > \psi \).

This ends our general model of ins and outs with distortionary taxation.

### 3.3 A Monetary Union Game with Distortionary Income Tax

In the remainder of the chapter we consider only the fiscal and monetary policy interactions occurring between the members of the monetary union. We therefore set \( m=0 \). We also assume that tax distortions are exclusively derived from income taxes \( (t^* = 0) \). This means that we can write output as:

\[
y^\text{EMU}_i = \chi \tilde{z}^\text{EMU} - \psi \varepsilon_i - \frac{1-\psi}{n} \sum_{j=0, j \neq i}^n \varepsilon_j + \frac{\mu_1 (1-\psi)}{n} \left[ n \tilde{g}_i - \tilde{g}_{-i} \right] + \\
+ \mu_2 \left[ n(g_i)^e - (g_{-i})^e \right] - \frac{(1-\beta)}{\beta} \left[ (t^*_i)^e \right]
\]

(3.28)
Moreover, existence of a balanced budget constraint for the governments implies that:

\[ g_i = t_i \]  

(3.29)

The game involves \( n+2 \) players: \( n+1 \) Governments (Fiscal Authorities, abbreviated with FA) and 1 Central Bank (ECB). The loss function in deviation form of the fiscal authorities is:

\[ U_{FA}^i = \pi_i^2 + b_{FA}(y_i - \hat{y} + \beta \varepsilon_i)^2 + c_{FA}g_i^2 \]  

(3.30)

(3.30) implies that the government has a bliss point at the baseline inflation and government spending/GDP ratio\(^{28}\), and a stochastically-varying output target \( \hat{y} - \beta \varepsilon \) relative to the socially sub-optimal natural rate. The parameters \( b_{FA} \) and \( c_{FA} \) denote the weights of the output and government spending objectives respectively, relative to the inflation objective, which is normalised to unity.

Similarly, the loss function of the ECB is:

\[ U_{ECB} = \sum_{i=0}^{n} \left[ \pi_i^2 + b_{ECB}(y_i - \hat{y} + \beta \varepsilon_i)^2 + c_{ECB}g_i^2 \right] \]  

(3.31)

In our modelling framework, monetary and fiscal policies are discretionary and they both have a response advantage relative to wage

\(^{28}\) Observe that both individuals and the fiscal authorities care about public expenditure. This is not assumed to be of the 'hole in the ground' variety (van der Ploeg 1993) and yields direct utility as implied by equation (3.1).
setters. Inflation and government spending are chosen in each period after nominal wage contracts and expectations of inflation for that period are formed, and current shocks have been observed.

The sequence of events is as follows:

1. Expectations of inflation and government spending are formed by wage setters for each country;
2. The supply shocks occur in each economy and are observed by both the private sector and the policymakers. All can respond except wage setters;
3. The ECB and the Fiscal Authorities independently and simultaneously set inflation and government spending in response to shocks.

The ECB minimises (3.31) with respect to average inflation, with output given by (3.28); at the same time, fiscal policy is assumed to be conducted purely in terms of government expenditure, i.e. the fiscal authorities minimise (3.30) with respect to g.

Two scenarios are examined:

i) fiscal policies in EMU countries are not co-ordinated (FPNC);

ii) fiscal policies are co-ordinated (FPC).

i) First Scenario (FPNC)

The First Order Conditions when fiscal authorities do not co-ordinate are:

\[ \sum_{i=0}^{n} \left[ \pi_i + b_{ECB} \chi (y_i + \beta e_i - \hat{y}) \right] = 0 \]  

(3.32)
We now separate the first order conditions into deterministic (expectational) \((\bar{\pi}, \bar{g}, \bar{y})\) and stochastic components \((\tilde{\pi}, \tilde{g}, \tilde{y})\) and develop the subsequent analysis concentrating on the former. Since we are dealing with a model in deviation form, we can then identify any positive deterministic components as a bias. Hence, calculating the deterministic component of output from (3.28), we get that the inflation and fiscal biases are respectively:

\[
\bar{\pi} = b_{ECB} x (\hat{y} - \bar{y}) = b_{ECB} x \left[ \hat{y} + \frac{(1 - \beta)}{\beta} \bar{g} \right] \tag{3.34}
\]

\[
\bar{g}_{FPNC} = \frac{b_{FA} \mu_{1} (1 - \psi) \hat{y}}{c_{FA} - \xi} \tag{3.35}
\]

where \(\xi = b_{FA} \mu_{1} (1 - \psi) (1 - \beta) / \beta\).

(3.34) implies the existence of an important spillover effect of the fiscal bias on the inflation bias. This derives from the fact that, when the central bank anticipates that the fiscal authorities will relax their fiscal stances, it will expect output to further deviate from its natural rate. Hence, if it cares at all about output, it will be tempted to deliver a higher rate of inflation. The public expenditure term contained in (3.34) derives from the fact that, because government consumption is tax financed, an expected increase in tax distortions is equivalent to the expected level of government consumption.
ii) Second Scenario (FPC)

When fiscal policies are co-ordinated, fiscal authorities are not tempted to engineer expenditure surprises any longer because they internalise the first order conditions of their counterparts. In other words, they internalise the fact that demand-side policies aiming to increase output through changes in the relative prices will sort no desired effect. This means that, while the first order condition for the monetary authority remains unchanged, the one of the fiscal authorities becomes:

\[
b_{FA} \sum_{i=0}^{n} (y_i + \beta \varepsilon_i - \bar{y}) \frac{\delta y_i}{\delta \varepsilon_i} + c_{FA} \sum_{i=0}^{n} g_i = 0
\]  

(3.36)

It is straightforward to show that co-ordination yields:

\[
\bar{g}_{FPC} = 0
\]  

(3.37)

Hence, fiscal policy co-ordination eliminates the time inconsistency problem of the fiscal authorities. At the same time, because the ECB expects that (distortionary) tax-financed government expenditures will no longer deviate from their optimal steady state values, it has a reduced incentive to stimulate output via monetary surprises. This means that co-ordination also mitigates the time inconsistency problem affecting monetary policy. It is important to observe that monetary time inconsistencies will fully disappear only if the central bank is able to precommit to an optimal path for inflation. Alternatively, when a full indexing \((k = I)\) arrangement eliminates any
stabilising role for monetary policy. In fact, when if $k = 1 \Rightarrow \chi = 0$
and the monetary surprise has no effect on output (see equation 3.28).

[Figure 3.2 here]

Fig. 3.2 b summarises the above results. Any shifting in the upper right of the graph represents a worsening of what we may call the economy's *structural inefficiency* because both the inflation and the spending bias increase. The ideal point to be for a country is 0, where both biases are absent. However, the perceived existence of a stabilisation role for both fiscal and monetary policies moves the equilibrium in the upper right of the graph (point B). The main result of the chapter is that, when we endogenise tax distortions, the inflation bias becomes a function of the spending bias. Graphically, the line of the inflation bias is no longer horizontal as implied in Levine and Pearlman (1998) (fig. 3.2c-3.2d), but it has a positive slope equal to $b_{ECB} \lambda (1 - \beta) / \beta$. Therefore, the higher the spending bias, the higher the inflation bias will be. As shown in (3.34), such spillover effects arise in the model via the deterministic component of output, which is itself proportional to the spending bias. Observe that, if we were to simplify the model and describe the simple case where trade unions only have a real wage target, the deterministic component of output in equilibrium would be zero. The inflation bias would then be independent of the public expenditure bias, and the former would simplify to:

$$\pi = b_{ECB} \lambda (\hat{y} - \bar{y}) = b_{ECB} \lambda \hat{y}$$  \hspace{1cm} (3.38)
This is the same result obtained by Rogoff (1985a). When fiscal policy spillovers are not accounted for, what matters is only the central bank's aversion to inflation captured by the term $b_{ECB}$ (high inflation aversion implies small $b_{ECB}$).

It is interesting to observe that, if taxes were to be lump-sum, the spending bias would turn out to be:

$$\bar{g} = \frac{b_{FA} \mu_1 (1 - \psi) \hat{y}}{c_{FA}}$$  \hspace{1cm} (3.39)

It follows that, in the case of fiscal policy non-co-ordination, distortionary taxation increases the spending bias: the bigger $\xi$, the higher the bias. This happens because taxes create distortions which have a negative impact on the level of output. Fiscal authorities, when these operate non-co-operatively, will be tempted to increase public spending in order to achieve their output target: of course, in a balanced-budget framework, this will increase distortions even more and start a vicious circle.

3.4 Co-ordination Through a Walsh Mechanism

In this section we sketch a possible institutional arrangement that could be substitute for fiscal policy co-ordination. The idea comes from Walsh (1995). He attempts to solve the time inconsistency problem of monetary policy by proposing a contract between the central bank and the government based on a principal-agent framework. Such a contract should be such that the outcome of the central bank's maximisation problem results in the socially optimal monetary rule.
Our case here is rather different because agents are not central banks but national governments. Moreover, the current EMU structure does not provide a clear view of who should control national governments (Ecofin, the Council or an ad hoc body?). However, as far as our 'theoretical' exercise is concerned, we can work on the assumption that a principal exists imposing a fine on the fiscal authorities spending more than the agreed optimal public expenditure level. In other words, what we require is that, when minimising its loss function, each fiscal authority internalises the disutility arising from its excessively relaxed domestic fiscal stance.

The treatment follows al Nowaihi and Levine (1996a). Suppose that the sovereign fiscal authorities have a loss function $L = \mathcal{U} + pg$, where $\mathcal{U}$ is the money value of the utility function and $p$ is a linear penalty in public expenditure. The factor $\mathcal{U}$ is required to convert the social loss into monetary units so that it can be added to the monetary cost given by the public expenditure penalty term. In fact, the term $\mathcal{U}$ can only be represented as an ordinal utility, whereas $pg$ represents a cardinal utility. The fiscal authorities' new loss function therefore becomes:

$$L^{FA_i} = \mathcal{U}(U_i^{FA} + p_i g_i = \pi_i^2 + b_{FA}(y_i - \dot{y} + \beta \varepsilon_i)^2 + c_{FA} g_i^2) + p_i g_i, (3.40)$$

---

29 Here we are talking about penalties on public expenditure. These are conceptually different from the SGP, which imposes a penalty on excessive deficits. However, since it has generally occurred in the past that debt was issued to finance government expenditures, we can consider the two penalties as substantially equivalent. For simplicity, in this thesis we shall sometimes refer to the penalty here derived as a SGP penalty.
Assuming that $\vartheta = 1$ for simplicity, it is straightforward to show that the optimal punishment required to eliminate the fiscal bias within this context is:

$$p_i = b_{FA} \mu (1 - \psi) \hat{y} = \lambda \hat{y}_b_{FA}$$

(3.41)

Proof: See Appendix 3A

As (3.41) shows, the punishment is directly linked, by a factor $\lambda$, to both the employment target and its weight. Provided the penalty is credibly (and we should add technically) implementable, this punishment – which of course remains still subject to the McCallum’s critique – would lead to tighter fiscal stances throughout the monetary union. We would then be able obtain the same positive results of fiscal policy co-ordination, but without an explicit commitment to it.

3.5 Simulations

So far the degree of central bank independence has been considered as exogenously fixed. What happens if this assumption changes? Unfortunately, the model in this case becomes too complicated for an analytical solution to be worked out. Therefore, we need to refer to simulation techniques. The aim of our simulation exercise is to find the optimal degree of independence of the ECB (CBI) - computed as the ratio $b_{FA}/b_{ECB}$ - and to see how such a degree depends on the correlation of the supply shocks.
We start by combining (3.28) with the first order conditions for inflation and public expenditure under scenarios i) and ii). This gives the two loss functions of the fiscal authorities to be minimised with respect to $b_{ECB}$. These are:

\[
L^{FPNC} = E[\pi^2 + b_{FA}(\gamma + \beta e - \hat{y})^2 + c_{FA}g^2] = \\
= [b_{FA} + (b_{ECB}x)^2][\hat{y} + \frac{(1 - \beta)}{\beta} \hat{g}]^2 + c_{FA} \hat{g}^2 \\
+ [b_{FA} + (b_{ECB}x)^2]\frac{(1 - \beta)^2}{(1 + b_{ECB}x^2)^2(n+1)}(1 + n\rho)\sigma^2 \\
\frac{b_{FA}(-\alpha Z + \beta)^2 + \frac{1}{c_{FA}}(\mu_1 b_{FA}(-\alpha Z + \beta)(1 - \nu))^2}{1 + b_{FA}\mu_1^2} \frac{n}{n+1}(1 - \rho)\sigma^2}
\]

(3.42)

where $Z = \frac{1}{\alpha + \frac{(1 - \beta)}{\beta}}$

in the case of fiscal policy non co-ordination, and:

\[
L^{FPC} = E[\pi^2 + b_{FA}(\gamma + \beta e - \hat{y})^2 + c_{FA}g^2] = \\
= [b_{FA} + (b_{ECB}x)^2][\hat{g}^2 + \frac{(1 - \beta)^2}{(1 + b_{ECB}x^2)^2(n+1)}(1 + n\rho)\sigma^2] + \\
\frac{b_{FA}(-\alpha Z - \beta)^2}{1 + b_{FA}\mu_1^2} \frac{n}{n+1}(1 - \rho)\sigma^2
\]

(3.43)

when fiscal authorities act co-operatively.
The calibrations used are as follows\textsuperscript{30} (see appendix 3B for the simulation program):

\begin{itemize}
  \item $n=10$
  \item $c_{FA}$ (cweight) = 5
  \item $\beta$ (beta) = 0.3
  \item Unemployment ($lhat$) = 5%
  \item Inflation ($pbar$) = 5%
  \item Variance of the Supply shocks ($sigmau$) = 3%
  \item $\bar{C}/\bar{Y}$ ($c$) = 0.6
  \item $\bar{G}/\bar{Y}$ ($gr$) = 0.2
  \item $k=0.5$
  \item $b_{FA}$ (bm) = chosen to calibrate an annual inflation of 5%
\end{itemize}

The number of EMU members ($n+1$) has been set equal to 11, which corresponds to the number of countries who are going to adopt the single currency by the year 2002. Observe, however, that our model assumes identical economies and therefore it would consider two countries like Germany and Luxembourg, for example, as carrying exactly the same weight. For the rest of the calibrations, these remain in line with the chosen set in Levine and Pearlman (1998), with the difference that here trade unions have a wage target rather than an employment target. For what concerns the indexing arrangement ($k$), an average number has been imposed given the reduced relevance of seignorage for many European economies. Alteration of this particular

\textsuperscript{30} Letters in parenthesis stand for the equivalent symbols used in the simulation programs.
assumption does not change, however, the qualitative nature of the results.

Results are summarised in figures 3.3 - 3.5. First, the optimal level of central bank independence is negatively related to the degree of correlation of the supply shocks. The closer the correlation coefficient to one (i.e. the more symmetric the shocks become), the lower the optimal level of central bank independence. The reason for this downward slope is that, when shocks are symmetric, relative prices do not adjust automatically. Hence, the central bank should put more weight on output stabilisation and less on the goal of reducing the inflationary bias. (this follows from equation (3.22)31).

A second result we obtain is that the optimal degree of central bank independence remains unaffected by the decision to co-ordinate fiscal policies in a model without distortionary taxation. This derives from the fact that, because tax distortions are absent, the central bank does not account for the fact that under fiscal policy non co-ordination (FPNC) the output level contracts below the zero steady state level. Conversely, when the output effect of tax distortions is correctly endogenised, co-ordination reduces the optimal degree of independence of the ECB because it removes the fiscal spillover effects on the inflation bias. Moreover since under FPC fiscal distortions disappear and monetary time inconsistencies are mitigated, welfare is increased. It is important to observe that, without fiscal policy co-ordination, the welfare loss of the fiscal authorities is always higher for all correlation coefficients in the case with distortionary taxes. This is due to the fact

31 The same result is obtained in Levine and Pearlman (1998).
that lack of internalisation of the output effects of individual countries' public expenditure policies induces governments to loosen their fiscal stance and therefore increase tax distortions even more.

3.6 Conclusion

In this chapter we argue in favour of fiscal policy co-ordination in a monetary union. We show that, when the fiscal authorities internalise the important spillover effects originating from their excessively expansionary fiscal policies, they reduce the structural inefficiencies - inflation and spending biases - that are likely to characterise their economies. Such a positive result can be obtained either with the explicit co-ordination of fiscal policies or with the introduction of a credible penalty in public expenditure - of the kind implied by the stability pact - in the utility function of each fiscal authority. From this point of view, the SGP represents a surrogate for discipline, that is a substitute for fiscal policy co-ordination that is able to back up the empty shell of central bank independence. We also show that, when fiscal authorities act co-operatively, the optimal degree of conservatism of the central bank declines. This happens because, to the extent that national governments engage in expansionary and inflationary fiscal policies, the monetary authorities will have to pursue a tighter monetary policy in order to get closer to their bliss point for inflation.

So, is co-ordination bringing about gain without pain? The answer our simple model seems to suggest is yes. However, it is now time to check if our positive results are still preserved under a different - and perhaps closer to reality - game theoretical structure. This is indeed what we are going to do in the next chapter.
Chapter 4

On the Desirability of Fiscal Policy Co-ordination when the Fiscal Authorities act as Stackelberg Leaders

Contents: 4.1 Introduction; 4.2 A Simple Model with Stackelberg Leadership; 4.3 An Extended Model with Open-Economy Effects from Fiscal Policy; 4.4 Results; 4.5 Conclusion

4.1 Introduction

The main conclusion of chapter three is that existence of open-economy (relative price) effects from fiscal policy in a monetary union provides a case in favour of fiscal policy co-ordination. In fact, co-ordination helps to contain excessive public expenditure within levels which are compatible with the provisions of the Stability and Growth Pact (SGP), thereby reducing the negative effects of distortionary taxation on output. As a result, the fiscal spillover effects on the inflationary bias disappear and the monetary authorities are able to respond with increased flexibility to the cycle disturbances.

Although the above results are substantially in line with those of the mainstream literature favouring co-ordination (Sibert (1992), Levine and Pearlman (1998), Aizenman (1992) and (1993)), we now want to extend our analysis in one important direction. So far we have assumed that the monetary and fiscal authorities move simultaneously, taking
the other player's move as given, i.e. we have considered a Nash game. Although such a simple game theoretical structure does provide us with several interesting results, it fails to account for the fact that the two policymakers may operate rather differently in the real world. In fact, while the monetary authorities are able to adjust their policy relatively quickly, fiscal authorities are likely to be much more constrained in this respect. Approval of the annual budget by Parliament is normally a very long process and, when this is finally reached, it is virtually impossible for the fiscal authorities to deliver policies aiming at stabilising output when unexpected disturbances occur – unless automatic stabilisers have been set up. Hence, when considering fiscal and monetary policy interactions, it may be important to account for the fact that tax rates cannot be adjusted as quickly as monetary policy. In a game theoretic perspective, this means that a perhaps more appropriate way of analysing this sort of macroeconomic policy interactions is to set up a game where fiscal authorities behave as Stackelberg leaders vis-à-vis the central bank, in the sense that a particular choice of tax rates provides the government with a first-mover advantage.

To our best knowledge, there has been only one tentative analysis conducted in this direction and which is relevant to our study. Beetsma and Bovenberg (1998, B&B) developed a model where distortionary taxes and seignorage revenues are used to finance public expenditures (as in Alesina and Tabellini, 1987), but with the fiscal authorities behaving as leaders à la Stackelberg. In this case each government acts strategically, perceiving that the output distortions caused by a tax increase will be partly offset by an inflation surprise. However, rational
wage setters anticipate this, with the advantage of the fiscal policymaker resulting once again in an inflation bias. It follows that fiscal policy co-ordination, which apparently strengthens the position of the leader, turns out to be counterproductive.

The results obtained by Beetsma and Bovenberg are strikingly in contrast with the ones we derived in chapter three, and would seem to credit the view that the current European Union approach to fiscal policy is indeed the correct one. Hence the question: are these two positions regarding the optimality of fiscal policy co-operation mutually compatible?

The aim of this chapter is, first, to improve upon our previous analysis with a closer-to-reality game theoretical structure where policymakers act sequentially. We therefore want to understand how the results set out in chapter three are affected under this modified scenario. Second, we aim to show that Beetsma and Bovenberg's argument for applying the Subsidiarity principle to fiscal policymaking within a monetary union may not necessarily be in contrast with the mainstream literature favouring fiscal policy co-ordination. The point we shall make is that B&B neglect the possibility that, in a monetary union, national fiscal authorities might have an incentive to boost domestic output through the kind of traditional demand-side policies we examined in chapter three. The endogenisation of such policies may in fact move the balance in favour of co-ordination when governments' temptation to alter the real exchange rate for stabilisation purposes is sufficiently strong.
PAGES MISSING IN ORIGINAL
On the other hand, the objective function of the ECB is given by\textsuperscript{35}:

\[ V^{ECB} = \frac{1}{2} \left( \alpha_m \pi^2 + \frac{1}{n+1} \sum_{i=0}^{n} (x_i)^2 \right) \]  \hspace{1cm} (4.4)

Such a function depends on inflation and a weighted average of output in each country. The reason why the central bank’s objective function includes a term referring to output stabilisation is that, although the ECB has a mandate to price stability, one could well imagine that in practice national governments will find ways to pressure for a more relaxed monetary stance when employment is low. However, we shall maintain the realistic assumption that the bank is weight-conservative ($\alpha_m > \alpha_M$)\textsuperscript{36}.

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

1. member states delegate monetary policy to the ECB, which has an exogenously fixed degree of independence;
2. nominal wage contracts are signed;
3. the fiscal authorities set taxes and public expenditure;
4. the ECB sets inflation\textsuperscript{37}.

\textsuperscript{35} Adding expenditure deviations from targets to equation (4.4) would not significantly alter our results.

\textsuperscript{36} Alternatively, we might have assumed that $\alpha_m = \alpha_M$, but with a target-conservative central bank as in Svensson (1997).

\textsuperscript{37} Another sequence - not examined in this thesis - might be :1,3,2,4. This would imply that fiscal policy cannot be changed during the wage contract.
We start solving the game by backward induction. Recalling the definition of output given in (4.1), the central bank reaction function is given by \( \mathcal{N}^{\text{ECB}} / \bar{\pi} = 0 \).

This yields:

\[
\pi = \frac{1}{1 + \alpha_{\text{sm}}} \left\{ \pi^e + \frac{1}{(n + 1)} \sum_{i=0}^{n} (\bar{\pi}_i) \right\}
\]  

(4.5)

Hence, higher expected inflation and high tax distortions in any of the participating countries induce the central bank to raise inflation in order to protect employment. Note, however, that the relative weight that the union central bank attaches to employment in country \( i \) is only \( 1/n \)-th of the weight that a national central bank would attach to employment if monetary policy would be determined at the national rather than the union level.

Turning now to fiscal policy, in each country the fiscal authority sets the tax rate so as to balance the marginal benefits of a tax financed increase in expenditure with the costs of higher taxes. In addition, the assumption that fiscal authorities act as Stackelberg leaders \( \text{vis-à-vis} \) the central bank implies the anticipation of the monetary responses to their own decisions (4.5). The first order condition for each fiscal authority is then obtained deriving (4.3) with respect to \( \bar{\pi}_i \). This gives:

\[
\alpha_{\text{ef}} \pi \frac{\partial \bar{\pi}}{\partial i} + x_i \frac{\partial x_i}{\partial \pi} + \alpha_{\text{gs}} (g_i - \bar{g}) = 0
\] 

(4.6)
We now observe that:

\[
\frac{\partial x_i}{\partial a} = -1 + \frac{\partial \pi}{\partial a^*} \tag{4.7}
\]

This means that fiscal authorities realise that output distortions caused by a tax financed expenditure have a negative impact on output. This is captured by the first term on the R.H.S. of (4.7). Yet, the strategic nature of the game implies that fiscal authorities anticipate that such an impact will be partly offset by a monetary surprise. This is captured by the second term on the R.H.S. of the same equation. The anticipation regarding the monetary response will in turn depend on the way fiscal policies are being managed throughout the union. We start with the first scenario of fiscal policy non-co-operation. This yields:

\[
\frac{\partial \pi}{\partial a^*} = \frac{1}{(1 + \alpha_{sm}) (n + 1)} \tag{4.8}
\]

(4.8) states quite clearly that the response of the ECB is perceived to be inversely related to its inflation aversion (as captured by the first factor), and at the same time proportional to the increased average level of tax distortions caused by a unilaterally relaxed domestic fiscal stance (second factor in 4.8). Therefore, combining equations (4.1), (4.2), (4.5)-(4.8), and noting that in equilibrium \( \pi = \pi^*; \ t_i^* = t_j^* \ (\forall i, j) \), we get that the level of distortionary taxation when fiscal authorities act non-co-operatively is:
Let us now move on to the second scenario. When fiscal policies are managed co-operatively governments' bargaining position \textit{vis-à-vis} the central bank strengthens because each fiscal authority correctly anticipates the global effect of a domestic tax increase on inflation. This induces a more aggressive use of the tax instrument. Hence in this case we shall have that:

\[
\frac{\partial \pi}{\partial_i} = -1 + \frac{\partial \pi}{\partial_i} = -1 + \frac{1}{(1 + \alpha_{sm})} (4.10)
\]

Therefore, combining (4.1), (4.2), (4.5), (4.6) and (4.10) we obtain the equilibrium solution for the domestic tax rates when fiscal policies are non co-ordinated:

\[
t^{\nu, FPC}_{i} = \frac{\alpha_{gs}(1 + \alpha_{sm})}{\left(\frac{\alpha_{ef}}{\alpha_{sm}} - 1\right) + (1 + \alpha_{sm})(1 + \alpha_{gs})} (4.11)
\]

We now want to formalise the implications of fiscal policy co-operation on the level of tax distortions. We therefore subtract (4.11) to (4.9) and concentrate only on the parameters that determine the sign of the tax difference. We get:

\[
t^{\nu, FPNC}_{i} - t^{\nu, FPC}_{i} = \frac{n}{(n + 1)} \left(\frac{\alpha_{ef}}{\alpha_{sm}} - 1\right) (4.12)
\]
Some comments are in order. When the central bank is not independent and shares the same preferences about inflation of the national fiscal authorities \( \alpha_{nm} = \alpha_{nf} \), \( t_i^{v,FPNC} - t_i^{v,FPC} = 0 \) so that incentives for a strategic use of the tax instrument are invariant to the fiscal policy scenario. This result is quite intuitive. Absence of conflict between fiscal authorities and the central bank about the inflation objectives means that fiscal authorities will not need to exert extra pressure on the ECB to loosen its monetary stance. This in a way removes governments' commitment problem. However, our maintained assumption that the central bank assigns a larger weight on inflation stabilisation than the government does implies that fiscal authorities raise taxes in order to encourage the ECB to deliver a higher rate of inflation, thereby bringing the equilibrium outcome more in line with governments' preferences. It follows that, because co-ordination strengthens the bargaining position of the fiscal authorities vis-à-vis the central bank, the strategic use of the tax instrument produces higher distortions (and inflation) when policies are managed co-operatively$^{38}$. 

Summing up, this simple model has shown that fiscal co-ordination changes the strategic interactions between policymakers. With lack of co-ordination, the effect of unilateral changes in the tax instrument on the common monetary policy is relatively small. This discourages governments from making a strategic use of the tax instrument vis-à-vis

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$^{38}$ Observe that the fiscal commitment problem worsens with the introduction of seignorage because this increases the governments' benefits of inflation. It also worsens and when the union gets larger. In fact, as \( n \) increases, the bargaining position of the fiscal authorities vis-à-vis the central bank increases as well.
the ECB. Conversely, with fiscal policy co-ordination fiscal players internalise the effects of unilateral changes in taxation of the other fiscal players. This encourages each fiscal authority to use its tax instrument more heavily so as to induce a change in the monetary stance in the direction preferred. This is exactly the result obtained by Beetsma & Bovenberg (1998).

4.3 An Extended Model with Open-Economy Effects from Fiscal Policy

We now extend our simple model to account for the existence of open-economy (relative price) effects from fiscal policy of the type described in chapter three.

Consider once again a monetary union consisting of \( n+1 \) symmetric countries, each producing a differentiated good. Output in each country is defined as follows:

\[
x_i = \bar{x} - t_i^* + \bar{c} \left[ \bar{g}_i - \sum_{j=0, j \neq i}^{n} \left( \frac{\bar{g}_j}{n} \right) \right] + \frac{\beta \mu_1}{1 - \beta} \left[ ng^e - \left( \sum_{j=0, j \neq i}^{n} \bar{g}_j \right)^e \right] \\
(4.13)
\]

where

\[
x_i = \frac{\beta \mu_1 (1 - \psi)}{(1 - \beta)n}, \quad \bar{c} = \frac{\beta \mu_1 (1 - \psi)}{(1 - \beta)n}
\]
(4.13) is derived from (3.28) assuming absence of both indexing arrangements \( k = 0 \) and supply shocks, and that \( \tau_i^n = 0 \). We re-introduce \( \tau_i^v \) as in (3.24). For convenience both members have been multiplied by \( \beta/1-\beta \). As in chapter three \( \bar{X} = \bar{\pi} - \pi^e \) is the inflation surprise of the union wide consumer price index and

\[
\left[ \bar{g}_i - \sum_{j=0}^{n} \left( \frac{\bar{g}_j}{n} \right) \right]
\]

is a relative public expenditure surprise.

As before, we assume that governments run balanced budgets \( (g_i = \tau_i^v) \) and that the loss functions are given by (4.3) and (4.4). The sequence of events is the same as in section (4.2).

### 4.4 Results

Let us concentrate exclusively on systematic policies and start solving the game by backward induction. Recalling the new definition of \( \tau_i \) given in (4.13), the central bank reaction function is:

\[
\pi = \frac{1}{1 + \alpha_{nm}} \left\{ \pi^e + \frac{1}{(n+1)} \sum_{i=0}^{n} (\tau_i^v) \right\}
\]

Hence, the central bank's reaction function is identical to the one derived in the previous section. We maintain our assumption that the bank is weight-conservative \( \alpha_{nm} > \alpha_{\pi} \).

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39 We neglect policy responses to shocks, i.e. the way fiscal policy responds to symmetric and perfectly asymmetric shocks. An analysis of this issue is however provided by Catenaro and Tirelli (1999).
Each fiscal authority sets the tax rate so as to balance the marginal benefits of a tax financed increase in expenditure with the costs of higher taxes:

\[
\alpha_i \frac{\partial \pi}{\partial \tilde{a}_i} + x_i \frac{\partial \pi}{\partial \hat{a}_i} + \alpha_{\pi}(g_i - \tilde{g}) = 0
\]  

(4.15)

Let us now concentrate on how the introduction of open-economy policies affects the perceived costs and benefits of fiscal actions. To begin with, let us assume that the tax rate in each country is set non cooperatively, so that the governments fail to internalise the responses of the other fiscal authorities. Combining equations (4.13) and (4.2) we get:

\[
\frac{\partial \pi}{\partial \tilde{a}_i} = -\left[1 - \tilde{c}\right] + \frac{\partial \pi}{\partial \hat{a}_i} = -(1 - \tilde{c}) + \frac{1}{(1 + \alpha_m)(n + 1)}
\]  

(4.16)

First of all, each fiscal authority realises that output distortions caused by a tax financed increase in expenditures will be partly offset by the impact of expenditures on output (\(\tilde{c}\)). On the other hand, the fiscal authorities correctly anticipate that public spending policies have no effect on inflation, since in aggregate these are equal to zero. Furthermore, they foresee that the ECB will increase inflation following a rise in taxes. As in the previous model, we assume that the fiscal authorities do not internalise the adverse effect of taxation on expectations. Hence, they perceive that the inflation response to \(t_i\), partly offsets output distortions. Due to the sequential nature of the game, fiscal policy is subject to time inconsistency. However, the FA
does not internalise the fact that the tax increase is implemented throughout the union. As a result, the impact of higher domestic taxes on inflation is underestimated. This, in turn, mitigates the consequences of time inconsistency.

Combining equations (4.2), (4.13) - (4.16), and noting that in equilibrium $\pi = \pi^*$; $t_i^* = t_j^*$, $\forall j$, we get that the level of distortionary taxation when fiscal authorities act non-co-operatively is:

$$t_{i,FNC} = \frac{\alpha_{st} \bar{\alpha}(1 + \alpha_m)}{1 + \frac{\alpha_q}{\alpha_m} - 1} + (1 + \alpha_m)(1 - \bar{\alpha} + \alpha_{st})$$

(4.17)

Comparing (4.17) with (4.9), it is worth observing that the introduction of open-economy effects from fiscal policy ($\bar{\alpha} > 0$) increases tax distortions. This is due to the fact that a tax financed increase in public expenditures is perceived to stimulate output via a domestic real exchange rate appreciation.

Let us move on to the second scenario of fiscal policy co-ordination. In this case each fiscal authority realises that, since governments are subject to identical incentives, any attempt to stimulate output via an increase in domestic expenditures is bound to fail. On the other hand co-ordination exacerbates the time inconsistency problem, because – as in the simple model presented in section two – each FA correctly anticipates the global effect of a domestic tax increase on inflation. Hence in this case we shall have that:
\[
\frac{\partial \hat{x}_i}{\partial t_i} = -1 + \frac{\partial \pi}{\partial \hat{x}_i} = \frac{1}{(1 + \alpha_{sm})} \tag{4.18}
\]

Therefore, combining (4.2), (4.13), (4.14), (4.15) and (4.18) we obtain the equilibrium solution for the tax rate:

\[
t_i^{v, FPC} = \frac{\alpha_{xg} \hat{\rho}(1 + \alpha_{sm})}{\left(\frac{\alpha_{sf}}{\alpha_{sm}} - 1\right) + (1 + \alpha_{sm})(1 + \alpha_{xg})} \tag{4.19}
\]

As expected, this result is identical to (4.11). This is due to the fact that the extra incentives to stimulate output via demand side or public expenditure policies disappear when fiscal policies are co-ordinated.

It is important to observe that, if each fiscal authority could precommit to a policy rule which internalises both the effects of tax policy actions on inflation expectations and on the welfare loss of the other fiscal authorities, the second best\(^{40}\) would obtain:

\[
[t_i^{v, FPC}]_p = \frac{\alpha_{xg} \hat{\rho}(1 + \alpha_{sm})}{\left(\frac{\alpha_{sf}}{\alpha_{sm}}\right) + (1 + \alpha_{sm})(1 + \alpha_{xg})} \tag{4.20}
\]

On the other hand, absence of co-ordination would give:

\(^{40}\) The first best would require non distortionary taxes. Subscript \(p\) stands for precommitment solution.
\[ \left[ t_i^*,FPNC \right]_p = \frac{\alpha_{gs} \bar{g} (1 + \alpha_{sm})}{\frac{1}{(n+1)} \left( \frac{\alpha_{sf}}{\alpha_{sm}} \right) + (1 + \alpha_{sm})(1 - \bar{c} + \alpha_{gs})} \] (4.21)

Comparing (4.20) and (4.21) with (4.17) and (4.19) it is clear that under the precommitment solution the level of distortionary tax would be lower than in a regime of discretion. It would be straightforward to show that, under this new scenario, fiscal policy co-ordination is welfare-increasing and therefore always desirable.

We now have all the information we need to evaluate the desirability of fiscal policy co-ordination within our extended modelling framework. Subtracting (4.19) from (4.17) we get:

\[ t_i^{*,FPNC} - t_i^{*,FPC} = \left( 1 + \alpha_{sm} \right) \phi \phi_0 \alpha_{gs} \bar{g} \left[ \left( \frac{n}{n+1} \right) \left( \frac{\alpha_{sf}}{\alpha_{sm}} - 1 \right) + \bar{c} (1 + \alpha_{sm}) \right] \] (4.22)

with:

\[ \phi = \frac{1}{\left\{ \left( \frac{\alpha_{sf}}{\alpha_{sm}} - 1 \right) + (1 + \alpha_{sm})(1 + \alpha_{gs}) \right\}} \]

\[ \phi_0 = \frac{1}{\left\{ \frac{1}{(n+1)} \left( \frac{\alpha_{sf}}{\alpha_{sm}} - 1 \right) + (1 + \alpha_{sm})(1 - \bar{c} + \alpha_{gs}) \right\}} \]

When \( \bar{c} = 0 \) the results coincide with those established in section 2. However, when \( \bar{c} \neq 0 \) a trade-off is established. This is due to the fact that the choice to co-ordinate fiscal policies produces two effects. On
one hand it enhances the bargaining power of the fiscal authorities creating the premises for a more aggressive use of the tax instrument. This in turn raises inflation. On the other hand, co-ordination implies that fiscal authorities internalise the effects of open-economy policies on output as well as the externalities originating from their excessively loose fiscal stances. We can therefore conclude that when the perceived output effects of an expenditure surprise are sufficiently strong, fiscal policy co-ordination remains desirable as in the case of simultaneous policy decisions described in the previous chapter. See appendix 4A for an extended version of the model accounting for seignorage.

4.6 Conclusion

Our conclusions run counter to the view recently expressed by Beetsma and Bovenberg (1998) that decentralisation of fiscal policies is necessarily conducive to both monetary and fiscal discipline. However, our results remain somewhat more ambiguous than the ones derived in chapter three. In fact, on one hand fiscal policy co-ordination strengthens the bargaining position of the fiscal authorities vis-à-vis the central bank. This first effect is not desirable because it carries adverse effects on expectations. On the other hand, co-ordination internalises the effects of individual countries' public expenditure policies on output. This second effect is, instead, desirable because it reduces incentives to loosen the fiscal stance. Hence, desirability of fiscal policy co-ordination in a monetary union crucially depends upon which of the two effects ultimately prevails.
Chapter 5

EMU and Labour Market Reform

Contents: 5.1 Introduction; 5.2 The Model; 5.3 Reforms under EMU; 5.4 Reforms outside EMU; 5.5 Results; 5.6 Conclusion

5.1 Introduction

In the previous chapters we have analysed the important monetary and fiscal policy interactions arising in a monetary union. Our findings suggest that fiscal policy co-ordination achieves second best results within a Nash framework, where policymakers operate independently and simultaneously. However, when the choice of the tax instrument provides governments with a first-mover advantage vis-à-vis the central bank, the desirability of fiscal policy co-ordination remains subject to the existence of a stabilisation role for public expenditure policies. This means that, for sufficiently strong open-economy effects from fiscal policy, co-ordination always remains beneficial.

Yet, the institutional arrangements discussed in this thesis do not solve the policymakers' commitment problems. In fact, if on one hand co-ordination helps governments realise that unilateral public expenditure surprises do not sort any real output effects, on the other hand penalties on public expenditures modify governments' welfare
functions without affecting their relative preferences. In other words, the institutional arrangements we have so far analysed, far from providing recipes on how to increase an unsatisfactory low output level, simply reduce governments' temptation to use self-defeating policies.

It is widely believed, however, that reforms aiming to mitigate labour market rigidities would be by far more effective than any artificial constraint imposed upon policymakers. In fact, equilibrium unemployment is mainly determined by the institutions in the labour market, and can only be significantly reduced by well designed labour market reforms. These could involve, for example, a reduction in the level and duration of unemployment benefits and a progressive substitution of these with employment vouchers. More generally, as suggested by Calmfors (1998a), reforms should involve a less stringent employment-protection legislation aimed at reducing firing costs, and a larger scope for individual and more flexible wage contracts.

It is difficult to ignore, however, that such potentially beneficial measures may be rather difficult to implement in the real world. In fact, the ruling coalition might raise ideological objections. They could also be blocked by both the workers, who could perceive them as reducing the welfare of the employed majority, and by those unemployed worried about losing their privileges (Saint-Paul (1993), Orzag and Snower (1999)).

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This chapter addresses the issue of labour market reforms in a context where both policymakers are subject to time inconsistencies. Specifically, it focuses on the political economy question of how incentives to reform are likely to be affected under the unique policy regime provided by the EMU. The analytical framework we use is the one of a single-period game where labour market reforms (observe that, unlike in Orzag and Snower (1999), these do not include tax reforms) are unilaterally and simultaneously decided at the beginning of the game by all the national fiscal authorities. Moreover, we assume that domestic reforms have no spillovers on foreign countries. Note that, although this is a rather ad hoc construction, it would be straightforward to show that the assumption of positive spillovers would strengthen the results presented in section 5.542.

Finally, we assume to be able to express the positive output effects of reforms with a single composite variable $s$, normalised to assume only positive values (alternatively, we should have used a series of variables $\{s_1, s_2, ..., s_n\}$, each standing for the output effects of a particular policy).

Existing literature has conducted an interesting analysis of the impact that different policy regimes have on the incentives to implement structural reforms. The possibility that macroeconomic policy might affect the implementation of reforms was first suggested by Gordon (1996), and was subsequently addressed by Sibert (1996) using a simple framework characterised by absence of time inconsistencies. More recently, a comprehensive analysis of the political incentives to conduct structural reforms was undertaken by Calmfors

42 Also the traditional literature in this regard ignores spillover effects.
(1998a,b). His argument is that there is more reform outside a monetary union to the extent that the national inflation bias can be reduced. This happens when the fiscal authorities internalise the effects of their unilateral increase in labour market reform on the level of tax distortions affecting the economy and therefore inflation. However, he finds that the existence of a precautionary motive for low average unemployment might reverse this result, when membership of a monetary union ensures more effectively against the cyclical fluctuations of output. Less ambiguous conclusions are reached by Sibert and Sutherland (1997), who argue that monetary union lowers the incentives to reform because it internalises the negative monetary spillovers associated with the independent conduct of monetary policy. Among other related works is the contribution by Ozkan et al. (1997), studying the extent to which the inflation entry condition contained in the Maastricht Treaty encourages structural reforms by potential EMU entrants.

Overall, these studies generally find that monetary union reduces the incentives to reform. Hence, the (often implicit) conclusion that, if governments were to base their decision to join a monetary union predominantly on the impact that this has on their incentives to reform, they would most probably choose to stay outside.

We are rather uncomfortable with the policy-implications of this literature. The reason is that we believe such implications do not apply to the case of the EMU. In fact, if it is clearly obvious that the decision

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4 Observe that an obvious limit of this study is that the particular sign of the spillovers is not derived from microfoundations as in this thesis, but simply assumed to be such.
to join a monetary union has potentially severe output costs, why were so many countries – particularly those with unsound fiscal policies – willing to join the European Monetary Union? There is obviously something that the literature is not able to account for.

We argue that the counterfactual policy implications of the mainstream literature – at least for the case of EMU – derive from the fact that none of the existing works has linked monetary union and the issue of reforms to the existence of some kind of penalty imposed upon either excessive government spending or debt (i.e. a SGP or surrogate). Moreover, the literature on reforms has systematically failed to consider open-economy effects of the type this thesis examines.

The model we set up in section 5.2 formalises both labour market and tax distortions in a framework where fiscal policy is endogenously treated and subject to an explicit balanced budget rule. Our aim is to analyse how incentives to reform are affected in a monetary union characterised by restricted fiscal discretionary power (EMU) as compared to countries preserving their autonomy in the management of both fiscal and monetary policies (outsiders). Crucial to our analysis is the assumption that, while all countries gain from an increased amount of labour market reforms, tax distortions uniquely affect the outsiders’ economies. We motivate this assumption with the fact that participation to EMU is conditional on the acceptance of the SGP\(^4\) (see appendix 1C). Such a condition \emph{de facto} implies the precommitment of

\(^4\) Ozkan \emph{et al.} (1997) assumes that monetary union faces no tax distortions. However, they do not motivate this assumption with the existence of the SGP and exclude from their analysis the possibility that labour market distortions might affect output.
the fiscal authorities, who have no choice other than avoiding deviations of distortionary taxes from their steady state values.

The outline of the chapter is as follows: section 5.2 introduces the model and develops the game. Section 5.3 presents the results for both EMU countries and outsiders, and section 5.4 provides some concluding thoughts.

5.2 The Model

Let us consider an economy consisting of \( n + 1 \) countries belonging to a monetary union (EMU) and \( m \) outsiders. Inside EMU fiscal policies are managed by decentralised non-co-operative fiscal authorities whereas monetary policy is conducted at a federal level by the union central bank (ECB). Conversely, outsiders maintain their autonomy in the management of both monetary and fiscal policies, which, as in the case of EMU, are assumed to be conducted in a discretionary way. Moreover, we assume that output of both outsiders and insiders increases with reform, although this carries a political cost. Finally, all national governments are subject to the balanced budget rule:

\[
g_i = \tau_i^w \quad (i = 0, n)
\]

This means that distortionary income taxation is the only instrument available to finance public consumption.

Let us now move on to the definition of the loss functions. We assume these to be standard quadratic Barro-Gordon, but with one important innovation. This is the introduction of a single composite
variable $s$ (normalised so that $s \geq 0$) standing for the cost arising from the adoption of labour market reforms. This means that, alongside the traditional inflation, public expenditure and output deviation components, the policymakers’ welfare functions are also affected by the amount of labour market reforms government are able (or willing) to deliver while in office.

Hence, the loss function of the EBC can be written as:

$$U_{i}^{ECB} = \sum_{i=0}^{n} \left( \gamma_i^2 + b_{ECB} (y_i - \hat{y})^2 + c_{ECB} g_i^2 + \gamma_{ECB} s_i^2 \right)$$  \hspace{1cm} (5.2)

where $\pi, y, g$ and $s$ stand respectively for inflation, output, public expenditure and labour market reforms. $\hat{y}$ is a deterministic output target. Note that $g$ and $y$ are expressed in deviation form about the bliss level of government expenditure and the natural rate of output before reform respectively. Observe also that reforms are taken as given by the monetary authorities.

Conversely, for the outs each central bank is run by bankers with different preferences reflected in their single-period loss function:

$$U_{i,0}^{CB} = \pi_i^2 + b_{CB} (y_i - \hat{y})^2 + c_{CB} g_i^2 + \gamma_{CB} s_i^2$$  \hspace{1cm} (5.3)

Moving on to the outsiders’ fiscal authorities, their objective function is given by:
The interpretation is the same as for (5.3), with the difference that governments assign a larger weight to the output target \( (b_{FA} > b_{CB}) \), and that \( s \) is no longer exogenously given. Reforms are in fact decided by the fiscal authorities at the end of their optimisation process.

EMU fiscal authorities have a similar loss function. However, their discretionary power when it comes to a particular choice for taxes is limited by an endogenously determined linear penalty in public expenditure. Its aim is to reduce tax distortions to an optimal steady state value\(^{49}\). This means that governments belonging to the monetary union internalise the fact that expenditure in excess of a given socially optimal level will be punished by a (credible) institutional arrangement at the union level. Such an arrangement can be assumed to be identical to the one described in section 3.4 of this thesis.

Hence for the generic country \( i \) we have:

\[
U_{i,O}^{FA} = \pi_i^2 + b_{FA} (y_i - \hat{y})^2 + c_{FA} g_i^2 + \gamma_{FA}s_i^2
\]  \hspace{1cm} (5.4)

where the last term on the R.H.S. of (5.5) stands for a linear penalty in public expenditure. Observe that for analytical simplicity and in accordance with the mainstream literature (Calmfors 1998c, Allsopp and Vines 1998) we have assumed that the cost of reform is invariant to the choice of the monetary regime \( (\gamma_{FA,i,EMU} = \gamma_{FA,j,O} = \gamma_{FA}; \forall i,j) \).
The output function is given by the general function derived in section (3.2) of this thesis. However, we add the extra term of reform to identify any positive deviations from the steady state. This means that for outsiders output is given by:

\[
y_i = \chi \psi \tilde{\pi}_i + \frac{1 - \psi}{n + m} \chi \tilde{x}_{-i} + \frac{\mu_i(1 - \psi)}{(n + m)} [(n + m)\tilde{y}_i - \tilde{g}_{-i}] + \\
+ \mu_2 \left[ (n + m)(g_i)^e - (g_{-i})^e \right] - \frac{(1 - \beta)}{\beta} \left( t_i^e \right)^e + \delta_i
\]

(5.6)

Conversely, for insiders we shall have:

\[
y_i^{EMU} = \chi \psi \tilde{\pi}_i^{EMU} + \frac{1 - \psi}{n + m} \chi m \tilde{x}_i + \frac{\mu_i(1 - \psi)}{(n + m)} [(n + m)\tilde{y}_i - \tilde{g}_{-i}] + \\
+ \mu_2 \left[ (n + m)(g_i)^e - (g_{-i})^e \right] - \frac{(1 - \beta)}{\beta} \left( t_i^e \right)^e + \delta_i
\]

(5.7)

Recall that \( \psi_i = \frac{n + m \psi}{n + m} > \psi \). This follows from the counterproductive character of monetary policy co-ordination in a discretionary regime (Rogoff, 1985b). In fact, for a given degree of conservatism of the monetary authority, absence of precommitment has the effect of increasing the inflationary bias under a monetary union. This is due to the fact that an inflation surprise is no longer constrained by an exchange rate depreciation between members of the union.

\[\text{This chapter neglects the issues of credibility raised by McCallum (1995).}\]
Both (5.6) and (5.7) neglect supply shocks. This choice is motivated by the desire to avoid unnecessary complications in the algebra. Observe also that when $s=0$ and $m=0$ (5.7) collapses to the reduced form for output (3.28).

We assume the sequence of events to be as follows:

1. labour market institutions (i.e. reforms) are determined;
2. money wages are set;
3. (*) Only for EMU countries (Ins): Optimal penalty in public expenditure is set;
4. fiscal and monetary authorities simultaneously and independently set taxes and inflation.

5.3 Reforms under EMU

Let us start with EMU countries. The first order condition of the ECB is found deriving (5.2) with respect to inflation. This yields:

$$
\frac{\partial \pi_{i, ECB}}{\partial \pi_i} = \sum_{i=0}^{n} [\pi_i + b_{ECB} \chi \psi_1 (y_i - \hat{y})] = 0
$$

(5.8)

(5.8) can be rearranged so as to get:

$$
\pi_{EMU} = \frac{1}{n+1} \sum_{i=0}^{n} \pi_i = b_{ECB} \chi \psi_1 [\hat{y} - \bar{y}_{EMU}]
$$

(5.9)

where $\bar{y}_{EMU}$ is equilibrium output, defined as:
Observe that equilibrium output depends on the difference in the fiscal biases of insiders and outsiders, when fiscal asymmetries are assumed. In a balanced budget framework, this is captured by the term \( \mu_2 m(t_i^{*\text{EMU}} - t_j^{*\text{O}}) \). To understand why this is so we must recall that fiscal policy in our model is beggar-thy-neighbour because it increases domestic output at the expenses of other countries welfare.

While the ECB sets inflation, fiscal authorities simultaneously set public expenditures. The optimal level of government spending is given by:

\[
\frac{\partial U_{i,FA}}{\partial g_i} = b_{FA} \mu_i (1 - \psi)(y_i - \bar{y}) + c_{FA} g_i + p_i = 0 \tag{5.11}
\]

from which it is straightforward to derive:

\[
g_i = t_i^{*\text{w}} = \frac{b_{FA} \mu_i (1 - \psi)(\bar{y} - \bar{y}_{EMU}) - p_i}{c_{FA}} \tag{5.12}
\]

As expected, public expenditure is negatively affected by the linear penalty \( p_i \). This should be optimally chosen so as to induce fiscal authorities to eliminate any deviations of tax distortions and public expenditures from their equilibrium steady state values. Hence, elimination of fiscal commitment problems requires that the optimal penalty in public expenditure be:
\[ p^* = b_{FA} \mu (1 - \psi')(\bar{y} - \bar{y}_{EMU}) \]  

(5.13)

This means that, if \( p = p^* \):

\[ g_{i,EMU} = t_{i,EMU} = 0 \]  

(5.14)

Substituting (5.14) and (5.10) into (5.9) we get:

\[ \pi_{i,EMU} = b_{ECB} \chi \psi_1 \left( \hat{y} + \mu_i m_t^{i,o} \Delta \epsilon_{i,EMU} \right) \]  

(5.15)

For a given level of central bank independence, the central bank will choose to lower inflation whenever labour market reforms are being implemented \((s > 0)\). Observe that the actual inflation inside EMU depends also on the overall level of distortionary taxation outside the monetary union (last term on the RHS of (5.15)). Such a level depends in turn on the number of outsiders \( m \).

We have now reached the final stage of our optimisation process. The optimal amount of reform inside the monetary union is obtained deriving the expected value of \( U_{i,EMU}^{FA} \) with respect to \( s \). This gives:

\[ \frac{\partial (U_{i,EMU}^{FA})}{\partial \epsilon_i} = -\partial_{ECB}^2 \chi^2 \psi_1 \left( \hat{y} - \bar{y}_{EMU} - \Delta \epsilon_i \right) + b_{FA} \Delta \epsilon_{EMU} + \Delta \epsilon_i - \hat{y} + \gamma_{FA} s_i = 0 \]  

(5.16)

where
\[ \tilde{y}_{EMU}^{1} = \tilde{y}_{EMU} - \tilde{\delta}_{1,EMU} = -m \mu_{2,j,o} \] (5.17)

It follows that:

\[ s_{i,EMU}^{*} = \frac{(b_{FA}^{2} + b_{ECB}^{2} \chi_{j}^{2} \psi_{1}^{2}) \sigma(y + m \mu_{2,j,o})}{\gamma_{FA} + (b_{FA}^{2} + b_{ECB}^{2} \chi_{j}^{2} \psi_{1}^{2}) \sigma^{2}} \] (5.18)

5.4 Reform Outside EMU

Consider the generic country \( j \) which is outside the monetary union. Computation of the first order condition for its monetary authority yields:

\[ \frac{\partial J_{j,0}^{CB}}{\partial \pi_{j}} = \pi_{j} + b_{CB} \chi \psi(y_{j} - \tilde{y}) = 0 \] (5.19)

As before, we can rearrange (5.19) so as to get:

\[ \pi_{j,0} = b_{CB} \chi \psi \left[ \tilde{y} - \tilde{\delta}_{j} - \tilde{y}_{o}^{1} \right] \] (5.20)

where

\[ \tilde{y}_{o}^{1} = \tilde{y}_{o} - \tilde{\delta}_{j,0} = \left[ (n + 1) \mu_{2} - \left( \frac{1 - \beta}{\beta} \right) \right] t_{j,o}^{w} \] (5.21)

Conversely, the optimal choice of the tax instrument is given by:
It is then straightforward to derive the equilibrium optimal level of public expenditure. This is:

\[
g_{j,o}^* = t_{j,o}^* = a \left( \hat{y} - \bar{y}_o - \delta_j \right)
\]  

(5.23)

where \(a = \frac{b_{FA} \mu_1 (1-\psi)}{c_{FA}}\).

Combining (5.23) with (5.21) we can re-write public expenditure (i.e. taxation) as:

\[
g_{j,o}^* = t_{j,o}^* = a \left( \hat{y} - \delta_j \right)
\]  

(5.24)

where \(a = \frac{1}{\frac{1}{\alpha} + \left[ -\left( \frac{1-\beta}{\beta} \right) + \mu_1 (n+1) \right]}\).

Therefore, substitution of (5.24) into (5.20) yields:

\[
\pi_{j,o} = \left[ 1 + a \left( \frac{1-\beta}{\beta} - \mu_1 (n+1) \right) \right] b_{CB} \chi \psi (\hat{y} - \delta_j)
\]  

(5.25)

Observe that, when deciding on the optimal inflation rate, the central bank of the generic outsider \(j\) internalises the positive spillover effects on output deriving from the existence of relative price (open
Therefore, for a given degree of central bank independence and reforms, it will increase inflation only when output tax distortions are greater that such relative price effects \( \left( \frac{1-\beta}{\beta} > \mu_2(n+1) \right) \).

In this modified scenario, the optimal amount of reforms is given by:

\[
\frac{\partial (U_{j,o}^{FA})^*}{\partial \delta_j} = -\frac{\partial \delta_{CB}^2 \lambda^2 \psi^2 z^2 (\hat{y} - \delta_{j,o})}{b_{FA} \delta_j (\hat{y} - \delta_j) - c_{FA} a^2 \sigma(\hat{y} - \delta_{j,o}) + \gamma_{FA} s_{j,o}} = 0
\]

where \( z = 1 + a \left[ \frac{1-\beta}{\beta} - \mu_2(n+1) \right] \). This yields:

\[
s_{j,o}^* = \frac{\left[ \left( b_{FA} + b_{CB}^2 \lambda^2 \psi^2 \right) z^2 + c_{FA} a^2 \right] \delta_j}{\gamma_{FA} + \left[ \left( b_{FA} + b_{CB}^2 \lambda^2 \psi^2 \right) z^2 + c_{FA} a^2 \right] \delta^2}
\]

5.5 Results

We can now compare reforms inside a monetary union with limited fiscal discretionary power with reforms outside. Subtracting (5.27) to (5.18) subject to (5.24), and assuming for simplicity that \( b_{ECB} = b_{CB} \) we get that:
The sign of (5.28) is uncertain and is given by:

\[
\left( \frac{(1 - z^2)b_{FA} - c_{FA}a^2 + b_{ECB}^2\chi^2(\psi_1^2 - \psi^2 z^2) + m\mu_2a(b_{FA} + b_{ECB}^2\chi^2\psi_1^2)}{\gamma_{FA} + (b_{FA} + b_{ECB}^2\chi^2\psi_1^2)} \right) \delta y_{FA} \\
\]  

\[ (5.28) \]

The sign of (5.29) depends on a combination of the following three factors:

1. Tax distortions outside the monetary union. The higher these are (i.e. the higher \(a\)), the higher the incentives to reform facing the outsiders;

2. Open economy effects from fiscal policy affecting the relative exchange rate between ins and outs. Since fiscal policy in our ins & outs model is beggar-thy-neighbour and transmits negative externalities via the exchange rate, the greater the externalities (i.e. the more serious the commitment problem of governments outside the monetary union), the higher the incentives to reform for the ins. Observe that this occurs when \(\mu_2 \neq 0\), i.e. when fiscal anticipated effects matter as well as the fiscal surprises.

3. For a given degree of central bank independence, monetary time inconsistencies are more severe inside monetary union (recall that \(\psi_1 > \psi\)). This contributes to higher reforms inside the union.
PAGES MISSING IN ORIGINAL
exogenous. In this chapter we used an extended Barro-Gordon model of inflation and public expenditure – in a framework where labour market reform is endogenous – to analyse how monetary union in Europe is likely to affect the amount of labour market reform. Our key assumption is that labour-market institutions continue to be determined nationally also when monetary policy is delegated to the ECB. Once again our results depend on the relative strength of the open-economy effects. When these are sufficiently strong, reforms are likely to be higher under a monetary union than in countries preserving the autonomy in the management of their macroeconomic policies. Conversely, when open-economy effects are negligible and the number of outsiders becomes sufficiently large, than the opposite is true. Hence, only under these very special circumstances, our results are in line with the mainstream literature.

We conclude by saying that we find these results particularly interesting. They in fact suggest that, once we depart from the traditional assumption of absence of open-economy effects, rather different implications about the incentives to reform under different monetary policy arrangements may have to be derived.
Chapter 6

Summary of the Main Results
and Conclusion

With eleven countries joining the EMU at the beginning of January 1999, macroeconomic policy within Europe has been radically transformed. This has gradually put aside the long debated and controversial issue of the feasibility of a monetary union among countries which do not form an optimal currency area. At the same time, more attention has been devoted to find suitable ways to make the system work smoothly in the future.

Given the fiscal anomaly that currently characterises the EMU and the central role that fiscal policy has assumed in the meantime, in this thesis we decided to investigate the desirability of fiscal policy coordination within what appears to be a suddenly modified macroeconomic policy framework. Specifically, we have concentrated on the study of the fiscal and monetary policy interactions within the stylised framework of a monetary union where the real exchange rate is the only channel of policy transmission.

Trying to overcome the limits of ad hoc IS-LM models of monetary policy in the traditional literature of time inconsistency, our analysis is characterised by the derivation of demand and supply from
microeconomic foundations as in Levine and Pearlman (1998) and the endogenisation of domestic fiscal policies subject to an explicit balanced budget constraint. Most importantly, we have introduced tax distortions. A second distinguishing feature is the adoption of a principal-agent approach to formalise the welfare implications of precommitment devices for fiscal policy, of which the stability pact is an example.

We started our analysis by setting up a relatively simple model where policymakers decide monetary and fiscal policies simultaneously and independently. The assumption that policymakers are unable to precommit their policies to optimal future paths for inflation and public expenditure implies, as we have seen, that both governments and the central bank are subject to commitment problems. This means that, in absence of fiscal policy co-ordination, equilibrium inflation and public expenditures are excessively high. Moreover, tax financed government spending in excess of the socially optimal level (i.e. the expenditure bias) determines a significant spillover effect on inflation. It follows that central bank independence by itself is not a sufficient condition to secure low inflation when fiscal authorities behave 'irresponsibly'.

The main result of the model presented in chapter three is that co-ordination of fiscal policies, by eliminating the fiscal commitment problem, also mitigates the time inconsistency problem affecting the monetary authorities. This naturally remains a second best scenario, because the first best requires precommitment of all policymakers. We

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46 There are taxes in L&P (1998) but these are assumed to be lump-sum in nature.
also showed that a precommitment device imposing a linear penalty on fiscal authorities with relatively looser fiscal stances – although vulnerable to the McCallum critique – is a substitute for fiscal policy co-ordination. Finally, our simulation results suggested that fiscal policy co-ordination decreases the optimal ECB degree of conservatism. This happens because, to the extent that national authorities engage in excessively expansionary fiscal policies, the central bank will have to pursue a tighter monetary policy in order to achieve its bliss point for inflation.

Yet, a model based on the assumption of simultaneity of policy decisions might be badly equipped to capture the real nature of the fiscal and monetary policy interactions. In practice monetary and fiscal policies seem to operate in different time frames, with monetary policy adjusting almost on a continuous basis while fiscal policy taking a longer time to adjust. This consideration induced us to think that, although the structural nature of the game presented in chapter three is substantially in line with the mainstream literature, it was worthwhile to check how the results summarised above are affected when the gaming sequence of the model is modified. In chapter four we have therefore relaxed the traditional assumption of simultaneity in the policy decision-making process and developed a modified model where a particular choice for taxes provides fiscal authorities with a first-mover advantage. From this perspective our model is similar to the one developed by Beetsma and Bovenberg (1998). However, modification of the structural nature of the game did bring about more ambiguity in the results. In fact, when fiscal policy is set before monetary policy is decided, the fiscal policymaker de facto internalises the monetary policy
response to its actions. This is perceived to be much stronger under fiscal policy co-ordination because in this case fiscal authorities are able to anticipate the full scale of the central bank response to the increased level of tax distortions throughout the union. Hence, fiscal policy co-ordination ends up strengthening the bargaining position of the fiscal authorities vis-à-vis the central bank. This – that we shall call first effect or B&B effect – stands as an issue against co-ordination. But there is a second effect that has to be considered. When open-economy effects from fiscal policy are introduced, fiscal policy non co-ordination entails an overestimation of the impact on output of public expenditures policies. Such an overestimation is bad because it creates incentives to loosen the domestic fiscal stances. We showed that when this second effect is sufficiently strong, fiscal policy co-ordination remains desirable.

Overall, the conclusions that can be derived from chapters three and four run counter to the view that decentralisation of fiscal policies is necessarily conducive to both monetary and fiscal discipline, as recently emphasised by Beetsma and Bovenberg (1998). This is certainly true for a scenario of simultaneous decisions for the reasons just summarised. However, it may also be so if fiscal authorities behave as Stackelberg leaders, when the perceived effects of public expenditure policies are sufficiently strong. From this point of view, our analysis bridges a gap between the mainstream literature favouring co-ordination (Chari and Kehoe (1998), Sibert (1992), Levine and Pearlman (1998), Beetsma and Uhlig (1997) among the many others)
and the minority against it (Beetsma and Bovenberg (1998) and more recently Dixit and Lambertini (1999))

Yet, if our derived demand side-open economy effects were to be empirically dominated by the B&B effect, the familiar credibility-versus-flexibility dilemma (Lohmann (1992)) would be resurrected in the fiscal policy domain. In fact optimal countercyclical policies call for fiscal co-ordination whereas decentralisation would generate on average lower output distortions. Note, however, that without precommitment systematic fiscal policies would still remain inefficient. To solve the conundrum, European institutions would have to find ways to induce national governments to precommit to public expenditure targets, and allow for a flexible - and co-ordinated - use of tax policies in order to stabilise the cycle. The analogy with the popular inflation targeting proposal (Svensson (1997)) is obviously suggestive. A credible expenditure target would impose more discipline than a deficit or a debt ceiling, and would directly address the issue of fiscal distortions. It is dubious whether, today, this goal can be achieved within the framework of the Stability and Growth Pact. In fact, compliance with deficit ceilings was not sufficient to induce structural reforms, whereas the cyclical stance of fiscal policies remained too conservative given the adverse international cycle.

47 They argue in favour of fiscal policy non co-ordination because this leaves the fiscal authorities free to achieve their output target without constraints being imposed upon them by external bodies. This is positive because, by increasing the output level, it also reduces monetary time inconsistencies. This model however assumes that only monetary authorities are subject to the time inconsistency problem. It would be straightforward to show that their results would radically change if fiscal time inconsistencies were to be introduced as in our model.

48 Observe that fiscal policy co-ordination when policies are not systematic is always optimal because adverse effects on expectations do not materialise.

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Finally, chapter five started with the observation that time inconsistency arises from the desire of policymakers to raise the level of output above its suboptimal equilibrium level. In this framework, fiscal policy co-ordination or various other institutional arrangements, while reducing the amount of tax distortions, are not able to remove the problem at its origin. From this perspective, institutional arrangements discussed in chapters three and four, far from providing recipes on how to increase an unsatisfactory low output level, simply mitigate the policymakers' commitment problem by reducing governments' temptation to use self-defeating policies. We have therefore decided to make a step forward in the analysis and analysed how monetary union in Europe is likely to affect incentives to reform. For this purpose we have used an extended Barro-Gordon model of inflation and public expenditure in a framework where labour market reform is endogenously treated.

The results we obtained in chapter five are in line with those of the mainstream literature only in the special case where open-economy effects are small. More generally, the results are ambiguous and depend on the interactions of a number of factors like the number of outsiders and the nature of the commitment problems affecting policymakers both inside and outside the monetary union. Our main result, however, was to show that incentives to reforms are higher under EMU when open-economy effects are sufficiently strong and the number of outsiders is small.

We conclude with some thoughts about future developments for our research. First, thorough the thesis, we have assumed that the main
channel that governments are able to use for financing public expenditure is the one of distortionary taxation. It would be interesting to see how our results are affected when debt dynamics are introduced. Another interesting development involves the analysis of tax competition, likely to assume an important role when integration between European economies becomes deeper. If this competition were to assume a dominant effect, than the problem in Europe could be exactly the opposite: the requirement to keep taxes lower than in other countries could, at least in principle, imply a negative expenditure bias. A third line of research – completely neglected in this thesis but potentially very interesting – is the analysis of dynamic coalition formation. It would be interesting to see how changing political parties seeking re-election and coalitions between countries affect current policy, particularly when the assumption of symmetry between countries is relaxed. Finally, there are two ways in which we believe it would be useful to develop the model presented in chapter five. One way would be to modify its game theoretical structure so as to provide a first-mover advantage to the fiscal authorities in a framework where monetary policies continue to suffer from time-inconsistencies (i.e. as in chapter four). It is reasonable to expect that these changes would strengthen our results because uncoordinated governments will fail to internalise the positive externalities that occur when a fall in equilibrium unemployment induces a reduction in the common rate of inflation. This analysis would be particularly useful if we believe that the recent low inflation inside the EMU is a temporary phenomenon and inflation bias problems are likely to remain in the future. A second way to extend the model would be to incorporate some of the more recent political economy research and treat the cost of reforms as
endogenously determined, linked to the political fortunes to the national parties or government coalitions. This may not prove to be an easy task, but we believe that the exercise would be useful.
Figures and Tables
Fig. 1.1

Public Deficit/GDP (1989-98)

Source: European Commission
Fig. 1.2


per cent of GDP

Fig. 1.3


per cent of GDP

FIG. 3.1
The Dynamics of Government Expenditure in Europe, US and Japan
(as a per cent of GDP) (1969-1996)

Table 3.1
Government Spending / GDP in the EU Countries

<table>
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Inflationary and Fiscal Bias under Fiscal Policy Co-ordination (FPC) and Fiscal Policy Non Co-ordination (FPNC)

Fig 3.2
FIG. 3.3

Welfare Loss and Optimal Degree of CBI under FPNC
(Case with Distortionary Tax)
FIG. 3.4

Welfare Loss and Optimal Degree of CBI under FPC
(with and without distortionary tax)
FIG. 3.5

Welfare Loss and Optimal Degree of CBI under FPNC
(Case without Distortionary Tax)
Appendices
Appendix 1A

Key Provisions of the Maastricht Treaty

The Maastricht Treaty updates and incorporates the 1957 Treaty of Rome, the founding Act of the European Community and the Single Act implemented in 1992 (free movement of goods, people and capital). The Treaty has been formally ratified by all member countries. With the Maastricht Treaty, Europe ceases to be called the European Community and becomes the European Union, which involves both political and economic union. The economic component mainly involves the adoption of a single currency, while the political one has been left rather vague, hinting at an evolution towards joint defence and foreign affairs.

The Treaty includes a detailed timetable for the adoption of a single currency. It sets in motion a gradual convergence process which is formally structured around three stages. The first begun in 1992 with the formal ratification of the Treaty. During the second stage, which started in January 1991, national central banks had to be given formal independence and cease to grant direct loans to their nation’s treasuries. The shift to the second stage also coincided with the establishment of the European Monetary Institute, with two main functions. One was to prepare the creation of the European Central Bank. The other function was to oversee the convergence criteria used to decide which countries were ready to enter the monetary union at the beginning of stage three.
This has been scheduled to start in January 1999 with the official delegation of domestic monetary policies to the ECB and will end with the introduction of the single currency - the euro - by the year 2002.

- **Convergence Criteria**

  The underlying notion of the convergence criteria is that unless countries enter the single currency with similar inflation rates and fiscal positions, the single currency will be unsustainable. Therefore, all countries willing to join EMU have to satisfy five convergence criteria.

  Three conditions deal with monetary convergence:

  - The inflation rate of any country joining the single currency must be within 1.5 percentage points of the average of the three lowest rates in Europe;
  - The long term interest rate in a country joining the single currency must not exceed more than two percentage points the average rates observed in the three countries with the lowest inflation;
  - The exchange rate must have remained within the normal bands of the existing EMS without severe tensions for at least two years;

Finally, two other criteria concern fiscal policy:

  - The ratios of debt/GDP and deficit/GDP do not have to exceed 60 and 3 per cent respectively.

  However, the Treaty does leave room for some flexible interpretation of these last two criteria: in fact, if the countries show a sufficient and rapid convergence towards the reference parameters, they can still qualify for monetary union.
CHAPTER 2: MONETARY POLICY

ARTICLE 105

1. The primary objective of the ESCB shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2. The ESCB shall act in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources, and in compliance with the principles set out in Article 3a.

2. The basic tasks to be carried out through the ESCB shall be:
   • to define and implement the monetary policy of the Community;
   • to conduct foreign exchange operations consistent with the provisions of Article 109;
   • to hold and manage the official foreign reserves of the Member States;
   • to promote the smooth operation of payment systems.
3. The third indent of paragraph 2 shall be without prejudice to the holding and management by the government of Member States of foreign exchange working balances.

4. The ECB shall be consulted:
   • on any proposed Community act in its fields of competence;
   • by national authorities regarding any draft legislative provision in its fields of competence, but within the limits and under the conditions set out by the Council in accordance with the procedure laid down in Article 106(6).

   The ECB may submit opinions to the appropriate Community institutions or bodies or to national authorities on matters in its fields of competence.

5. The ESCB shall contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system.

6. The Council may, acting unanimously on a proposal from the Commission and after consulting the ECB and after receiving the assent of the European Parliament, confer upon the ECB specific tasks concerning policies relating to the prudential supervision of credit institutions and other financial institutions with the exception of insurance undertakings.

ARTICLE 105a
1. The ECB shall have the exclusive right to authorise the issue of bank note within the Community. The ECB and the national central banks may issue such notes. The bank notes issued by the ECB and the national central banks shall be the only such notes to have the status of legal tender within the Community.

2. The Member States may issue coins subject to approval by the ECB of the volume of the issue. The Council may, acting in accordance with the procedure referred to in Article 189c and after consulting the ECB, adopt measures to harmonise the denominations and technical specifications of all coins intended for circulation to the extent necessary to permit their smooth circulation within the Community.

ARTICLE 106
1. The ESCB shall be composed of the ECB and of the national central banks.

2. The ECB shall have legal personality.

3. The ESCB shall be governed by the decision-making bodies of the ECB which shall be the Governing Council and the Executive Board.

ARTICLE 107
When exercising the powers and carrying out the tasks and duties conferred upon them by this Treaty and the Statute of the ESCB, neither the ECB, nor a national central bank, nor any member of their
decision-making bodies shall seek or take instructions from Community institutions or bodies, from any government of a Member State or from any other body. The Community institutions and bodies and the governments of the Member States undertake to respect this principle and not to seek to influence the members of the decision-making bodies of the ECB or of the national central banks in the performance of their tasks.

ARTICLE 108

Each Member State shall ensure, at the latest at the date of the establishment of the ESCB, that its national legislation including the statutes of its national central bank is compatible with this Treaty and the Statute of the ESCB.

ARTICLE 109

1. By way of derogation from Article 228, the Council may, acting unanimously on a recommendation from the ECB or from the Commission, and after consulting the ECB in an endeavour to reach a consensus consistent with the objective of price stability, after consulting the European Parliament, in accordance with the procedure in paragraph 3 for determining the arrangements, conclude formal agreements on an exchange rate system for the ECU in relation to non-Community currencies. The Council may, acting by a qualified majority on a recommendation from the ECB or from the Commission, and after consulting the ECB in an endeavour to reach a consensus consistent with the objective of price stability, adopt, adjust or abandon the central rates of the ECU within the exchange rate system. The President of the Council shall
inform the European Parliament of the adoption, adjustment or abandonment of the ECU central rates.

2. In the absence of an exchange rate system in relation to one or more non-Community currencies as referred to in paragraph 1, the Council, acting by a qualified majority either on a recommendation from the Commission and after consulting the ECB or on a recommendation from the ECB, may formulate general orientations for exchange-rate policy in relation to these currencies. These general orientations shall be without prejudice to the primary objective of the ESCB to maintain price stability.

CHAPTER 3: INSTITUTIONAL PROVISION

ARTICLE 109a

1. The Governing Council of the ECB shall comprise the members of the Executive Board of the ECB and the Governors of the national central banks.

2. (a) The Executive Board shall comprise the President, the vice-president and four other members. (b) The President, the vice-president and the other members of the Executive Board shall be appointed from among the persons of recognised standing and professional experience in monetary or banking matters by common accord of the Governments of the Member States at the level of Heads of State or of Government, on a recommendation from the Council, after it has consulted the European Parliament and the Governing Council of the ECB. Their term of office shall be eight
years and shall not be renewable. Only nationals of Member States may be members of the Executive Board.

ARTICLE 109b

1. The President of the Council and a member of the Commission may participate, without having the right to vote, in meetings of the Governing Council of the ECB. The President of the Council may submit a motion for deliberation to the Governing Council of the ECB.

2. The President of the ECB shall be invited to participate in Council meetings when the Council is discussing matters relating to the objectives and tasks of the ESCB.

3. The ECB shall address an annual report on the activities of the ESCB and on the monetary policy of both the previous and current year to the European Parliament, the Council and the Commission, and also to the European Council. The President of the ECB shall present this report to the Council and to the European Parliament, which may hold a general debate on that basis. The President of the ECB and the other members of the Executive Board may, at the request of the European Parliament or on their own initiative, be heard by the competent Committees of the European Parliament.
Key provisions of the European Council Resolution on the Stability and Growth Pact (SGP)

Member States
1. Commit themselves to respect the medium-term budgetary position of close to balance or in surplus set out in the stability or convergence programmes;

2. Will correct excessive deficits as quickly as possible after their emergence; this correction should be completed in the year following its identification, unless there are special circumstances;

3. Commit themselves not to invoke the benefit of Art. 2 par. 3 of the Council Regulation on speeding up and clarifying the excessive deficit procedure unless they are in severe recession; in evaluating whether the economic downturn is severe, the Member States will, as a rule, take as a reference point an annual fall in real GDP of at least 0.75%.

The Commission
1. Commits itself to prepare a report under Art. 104c(3) whenever there is the risk of an excessive deficit or whenever the planned or actual deficit exceeds the 3% of GDP reference value.

2. Commits itself, in the event that it considers that a deficit exceeding 3% is not excessive and this opinion differs from that of the
Economic and Financial Committee, to present in writing to the Council the reasons for its position;

3. Commits itself, following a request from the Council under Art. 109d, to make, as a rule, a recommendation for a Council decision on whether an excessive deficit exists under Art. 104c(6);

The Council

1. is invited to impose sanctions if a participating Member State fails to take the necessary steps to bring the excessive deficit situation to an end;

2. Is urged to always require a non-interest bearing deposit, whenever sanctions on a participating Member State are agreed in accordance with Art. 104c(11);

3. Is urged always to convert a deposit into a fine after two years, unless the excessive deficit has been corrected.
Appendix 3A

Punishment “‘A la Walsh”

If the fiscal authorities know that they will be punished when they spend too much, they will take account of this when calculating their first order condition. This means that endogenisation of a linear penalty in public expenditure in the welfare function of the fiscal authorities modifies their first order condition as follows:

\[ b_{FA} \mu_i (1 - \psi)(y_i + \beta e_i - \hat{y}_i) + c_{FA} g_i + p_i = 0 \]  \hspace{1cm} (3.A1)

Rewriting the above expression only in terms of deterministic components we get:

\[ b_{FA} \mu_i (1 - \psi)(\bar{y}_i - \hat{y}_i) + c_{FA} \bar{g}_i + p_i = 0 \]  \hspace{1cm} (3.A2)

from which we derive:

\[ \bar{g} = \frac{b_{FA} \mu_i (1 - \psi)\hat{y} - p}{c_{FA} - \xi} \]  \hspace{1cm} (3.A3)

Hence, when \( p = b_{FA} \mu_i (1 - \psi)\hat{y} \) the spending bias is zero. This means that an optimal punishment rule exists that eliminates the time inconsistency problem of the fiscal authorities.
Appendix 3B

Simulation Programs

(Software Used: Matlab, version 4.2c.1)

% A CASE FOR FISCAL POLICY CO-ORDINATION
% SIMULATION MAIN - PROGRAM
% CASE ONE: FISCAL POLICY NON CO-ORDINATION
% WITH DISTORTIONARY TAXES
%
%GLOBAL VARIABLES
%
global rho sigma ncount mu cweight phi bm beta epsi kappa alpgam2 yhat
%
%FUNDAMENTAL PARAMETERS
%
cweight = 5;
ncount = 10;
n = ncount;
kappa = 0.5;
beta = 0.3;
c = 0.6;
gr = 0.2;
%
% **lhat=NRU**

\%

lhat=5;
yhat=(1-beta).*lhat;
%
%
% **pibar=inflationary bias**
%

pibar=5;
sigmau=3;
%
% DERIVED PARAMETERS
%

mu=1./(1-gr)+(1-beta)./beta;
alp=c.*mu;
gam1=1/(n+1);
epsi=(1-kappa).*(1-beta)./beta;
sigma=sigmau./beta;
gam2=gam1
x=alp+gam2.*(1-beta)./beta;
y=alp+(n+1).*gam2.*(1-beta)./beta;
phi=x./y;
bm=pibar./(epsi.*phi.*yhat)
%
%
****** loop ******
%
for i=1:11
rbo=(1+1.0./n)./10.0.*(i-1)-1.0./n;
cor(i)=rbo;
options = foptions

OPTIONS(14) = 2000


%  %

bu = fmin('SUB2', 0, 5, OPTIONS)

cbi(i) = bm/bu;

bbu(i) = bu;

wlloss(i) = SUB2(bu);

end

%  

%  

%  P L O T S

subplot(2, 1, 1)

plot(cor, wlloss, '.')

xlabel('CORRELATION COEFFICIENT')

ylabel('WELFARE LOSS')

% title('FIG. 1 WELFARE LOSS')

subplot(2, 1, 2)

plot(cor, cbi, ':')

xlabel('CORRELATION COEFFICIENT')

ylabel('DEGREE OF CONSERVATISM')

% title('FIG. 2 OPTIMAL DEGREE OF CBI')

axis([-1, 1, 0, 20])

% for case without tax replace last line with

% axis([-1, 1, 0, 10])

%

%====================================

% SUB-PROGRAM 2
function y=SUB2(bu)

global rho sigma ncount mu cweight phi bm beta epsi kappa alp gam2 yhat

n = ncount;

r = rho;

p = phi;

s = sigma;

cm = cweight;

zigzag = bm.*mu.*(1-phi).*(1-beta)/beta;

numgbar = bm.*mu.*yhat.*(1-phi);

dengbar = cweight - zigzag;

gbar = numgbar./dengbar;

u = (1-beta)./(1+bu.*epsi.^2);

% now we write the deterministic component

y1 = bm + bu.^2.*epsi.^2;

y1bis = (yhat + (1-beta)./beta.*gbar).^2;

detcom = y1.*y1bis + cweight.*gbar.^2;

% %
% The stochastic component is as before
% and below calculated
%

y2 = u.*2./(1+n).*(1+n.*r).*s.^2;

stocom = y1.*y2;
\[ \text{somma} = \text{detcom} + \text{stocom} \]
\[ z = 1./(\alpha + (1-\beta)\beta); \]
\[ \text{den} = (1 + \beta m./\gamma)*((1-\alpha)*z).*(1-p)*\mu.*2)^2; \]
\[ \text{num} = \beta m. *((-\alpha)*z) + \beta)^2 + (\mu.*\beta m. *(\beta-(\alpha+z)).*(1-p))^2./\gamma; \]
\[ z2 = \text{num.}/\text{den}; \]
\[ y = \text{somma} + z2. *n./(n+1).*(1-r).s.^2; \]

\%  
\%  \% A CASE FOR FISCAL POLICY CO-ORDINATION  
\% WITH DISTORTIONARY TAXES  
\% SIMULATION MAIN PROGRAM  
\%  
\% CASE TWO: FISCAL POLICY CO-ORDINATION  
\%  
\% GLOBAL VARIABLES  
\%  
\% GLOBAL rhosigmancount mu cweightphi bm beta epsikappalam2 yhat  
\%  
\% FUNDAMENTAL PARAMETERS  
\%  
\% cweight = 5;  
\% ncount = 10;  
\% n = ncount;  
\% kappa = 0.5;  

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\text{\texttt{beta}} = 0.3;
\text{\texttt{c}}=0.6;
\text{\texttt{gr}}=0.2;
\%
\%
\text{\texttt{**lhat=NRU**}}
\%
\text{\texttt{lhat}} = 5;
\text{\texttt{yhat}} = (1 - \texttt{beta}). \texttt{lhat};
\%
\%
\text{\texttt{**pibar=inflationary bias**}}
\%
\text{\texttt{pibar}} = 5;
\text{\texttt{sigmau}} = 3;
\%
\%
\text{\texttt{DERIVED PARAMETERS}}
\%
\text{\texttt{mu}} = \frac{1}{\texttt{1-gr}} + \frac{1 - \texttt{beta}}{\texttt{beta}};
\text{\texttt{alp}} = \texttt{c}. \texttt{mu};
\text{\texttt{gam1}} = \frac{1}{\texttt{n+1}};
\text{\texttt{epsi}} = (1 - \texttt{kappa}). \frac{1 - \texttt{beta}}{\texttt{beta}};
\text{\texttt{sigma}} = \texttt{sigmau}/\texttt{beta};
\text{\texttt{gam2}} = \texttt{gam1}
\text{\texttt{x}} = \text{\texttt{alp+gam2}}. \frac{1 - \texttt{beta}}{\texttt{beta}};
\text{\texttt{y}} = \text{\texttt{alp}} + (\texttt{n+1}). \frac{\texttt{gam2} \cdot (1 - \texttt{beta})}{\texttt{beta}};
\text{\texttt{phi}} = \frac{\texttt{x}}{\texttt{y}};
\text{\texttt{bm}} = \text{\texttt{pibar}}. \frac{\texttt{epsi} \cdot \texttt{phi} \cdot \texttt{yhat}}{\texttt{epsi} \cdot \texttt{phi} \cdot \texttt{yhat}}
\%
\%
\text{\texttt{*****loop*****}}
for i = 1:11
rho = (1 + 1.0./n)./(10.0.*i-1.0./n);
cor(i) = rho;
options = foptions
OPTIONS(14) = 2000
%
%
bu = fmin('SUB1',0,5,OPTIONS)
cbi(i) = bm/bu;
bbu(i) = bu;
wloss(i) = SUB1(bu);
end
%
% PLOTS
%
subplot(2,1,1)
plot(cor,wloss,'-')
xlabel('CORRELATION COEFFICIENT')
ylabel('WELFARE LOSS')
%title('FIG. 1 WELFARE LOSS')
subplot(2,1,2)
plot(cor,cbi,':')
xlabel('CORRELATION COEFFICIENT')
ylabel('DEGREE OF CONSERVATISM')
%title('FIG. 2 OPTIMAL DEGREE OF CBI')
axis([-1,1,0,10])
% SUB-PROGRAM 1
% FISCAL POLICY CO-ORDINATION

function y = SUB1(bu)

global rho sigma ncount mu cweight phi bm beta epsi kappa alp gam2 yhat

n = ncount;

r = rho;

p = phi;

s = sigma;

cm = cweight;

u = (1 - beta)/(1 + bu.*epsi.^2);

y1 = bm + bu.^2.*epsi.^2;

y2 = yhat.^2 + u.^2/(1 + n).^2.*(1 + n.*r).*s.^2;

y = y1.*y2;

z = 1./(alp + (1-beta)./beta);

den = 1 + (bm.*mu.^2./cm).^2.*(1-alp.*z).^2;

num = bm.*(alp.*z-beta).^2;

z2 = num./den;

y = y + z2.*n./(n + 1).^2.*s.^2;
Appendix 4A

Extended Model with Seignorage

This appendix shows how results set out in section 4.3 are affected by the introduction of seignorage.

Let us assume that the $n+1$ governments run balanced budgets and finance public expenditures either by raising taxation, or via the traditional seignorage channel. We can then rewrite (4.2) as:

$$ g_i = t_i^r + k\pi $$

(Welfare functions and output remain the same as in section 4.3. Solving the game by backward induction and recalling the output definition (4.13), the central bank reaction function is:

$$ \pi = \frac{1}{1 + \alpha_m} \left\{ \pi^r + \frac{1}{n+1} \sum_{i=1}^{n} (t_i^r) \right\} $$

This is identical to (4.14). Conversely, on the fiscal side in absence of co-ordination we now have:

$$ \alpha_f \pi \frac{\partial \pi}{\partial \pi^r} + x_i \frac{\partial x_i}{\partial \pi^r} + \alpha_{gr} (g_i - \hat{g})(1 + k \frac{\partial \pi}{\partial \pi^r}) = 0 $$

(4.A3)
where:

\[
\frac{\partial \pi}{\partial i^*} = \frac{1}{(1 + \alpha_{mn}) n + 1}
\]  

(4.A4)

\[
\frac{\partial \pi}{\partial i^*} = -[1 - \bar{c}] + \frac{1}{(1 + \alpha_{mn}) n + 1}
\]  

(4.A5)

Combining (4.14)-(4.15) and (4.13), we get:

\[
t^*_i,FPNC = -\frac{\alpha_{\theta_{\theta}} [1 + \alpha_{mn} + k/(n + 1)]}{1 - \bar{c} + (1 + \alpha_{mn})(1 - \bar{c}) + \alpha_{\theta_{\theta}} \left(1 + \frac{k}{\alpha_{mn}}\right)[1 + \alpha_{mn} + \frac{k}{(n + 1)}]}
\]  

(4.A6)

Conversely, co-ordination of fiscal policies yields:

\[
\frac{\partial \pi}{\partial i^*} = \frac{1}{(1 + \alpha_{mn})}
\]  

(4.A7)

\[
\frac{\partial \pi}{\partial i^*} = -1 + \frac{1}{(1 + \alpha_{mn})}
\]  

(4.A8)

from which follows that:
\[ t_{i}^{v,FPC} = \frac{\alpha_{st} \hat{\epsilon}(1 + \alpha_{mm} + k)}{\left(\frac{\alpha_{ef}}{\alpha_{mm}} - 1\right) + \left(1 + \alpha_{mm}\right) + \alpha_{st} \left(1 + \frac{k}{\alpha_{mm}}\right) \left(1 + \alpha_{mm} + k\right)} \]  \hspace{1cm} (4. A9)

Subtracting (4. A9) from (4. A6) we get that the sign of the tax difference is given by:

\[ t_{i}^{v,FPNC} - t_{i}^{v,FPC} = \left\{ \frac{n}{\left(\frac{\alpha_{ef}}{\alpha_{mm}} - 1 - k\right) + \bar{c}\left[1 + \alpha_{mm} + k\right]} \right\} \]  \hspace{1cm} (4. A10)

When \( \bar{c} = 0 \) the results coincide with those of Beetsma and Bovenberg (1998). However, when \( \bar{c} \neq 0 \) the trade off described in section 4.3 reappears. The presence of seignorage worsens the output effects of co-ordination on one hand because it creates additional incentives for the fiscal authorities to increase distortionary taxation. This in fact relaxes the government’s budget constraint. On the other hand, it also creates additional incentives to engage in public expenditure surprises when fiscal policies are not co-ordinated. Observe also that the existence of seignorage implies that the neutrality of co-ordination - as derived in B&B - when open economy effects from fiscal policy are absent and the central bank is non-conservative will no longer apply. In fact, when \( k \neq 0 \) the tax difference is always negative.
References


--------- (1997) 'Fiscal Federalism and the European Union', Centre for European Economic Studies, University of Leicester, Discussion Paper No. 97/6


--------- (1992) 'Competitive Externalities and the Optimal Seignorage', Journal of Money, Credit and Banking 24, pp. 61-71


-------- (1996 b) 'Central Bank Independence: Gain without Pain?', *PHARE-ACE Workshop*, Torun, Poland


Bean, C., Bentolilla, S., Bertola, G. and Dolado, J. (1998) 'Social Europe, One for All?', Monitoring European Integration 8, CEPR


---------- (1995) 'Does Monetary Unification Lead to Excessive Debt Accumulation?', CEPR Discussion Paper, No. 1299


Buiter, W.H. (1999a) 'Six Months in the Life of the Euro. What Have We Learnt?' mimeo

-------- (1999 b) 'Alice in Euroland', *Journal of Common Market Studies*

-------- (1996) 'The Economic Case for Monetary Union in the European Union', mimeo

-------- (1995) 'Macroeconomic Policy During a Transition to Monetary Union', *CEPR Discussion Paper* No. 1222, August


-------- (1998b) 'Interpreting the ERM Crisis: Country-Specific and Systemic Issues', *Princeton Studies in International Finance* 84


Mondragone International Economic Seminar, Universita' di Tor Vergata, Rome, 23th-24th June


--------- (1998) 'The ESCB's Stability-Oriented Monetary Policy Strategy', Speech given at the Institute of European Affairs, Dublin (November 10)
ECB Monthly Bulletin (2000), March

ECB Monthly Bulletin (1999), May

-------- (1999), January


-------- (1990 a) 'Is Europe an OCA?' CEPR Discussion Paper, No. 478


Eichengreen, B. and Ghironi, F. (1996) 'European Monetary Unification and International Monetary Co-operation', University of California, Berkeley, December


‘Possible Effects of EMU on the EU Banking Systems in the Medium to Long Term’, Frankfurt: European Central Bank (February)


IMF, Functioning of the International Monetary System, Edited by J.A. Frenkel and M. Goldstein


——— (1999) 'Growth and Employment Policies for Europe and America, paper presented at the XI-th Mondragone Conference of the Tor Vergata University of Rome, July 5-6


OECD (1994) 'The OECD Jobs Study', OECD, Paris


Rogoff, K (1985a) 'The Optimal Degree of Commitment to an Intermediate Monetary Target', Quarterly Journal of Economics, 100 pp 1169-1190


Treaty of Amsterdam, Luxembourg: 2 October 1997


