Wetenschappelijke Raad voor het Regeringsbeleid

W 42

Macro-economic policy coordination and monetary integration: a European perspective

F. van der Ploeg

's-Gravenhage, mei 1989

Prof.dr. F. van der Ploeg is Professor of Economics, CentER for Economic Research, Tilburg University, Postbus 90153, 5000 LE Tilburg, The Netherlands.

This preliminary advice was concluded by January 1989. A non-technical version under the title "Towards Monetary Integration in Europe" is published in WRR Preliminary and Background Studies nr. V 66.

The author is grateful to Ms. P.H.M. van der Ham and Ms. J.R.M. Janssen for secretarial assistance and to Ir. P. Kop Jansen for research assistance.

This Working Document can be ordered at "Distributiecentrum Overheidspublikaties", P.O. Box 20014, 2500 EA The Hague, by paying f 10,-- on giro 751 or by letter or telephone (070-789880) in mentioning title and ISBN-number and the number of copies you want to have.

Exemplaren van deze uitgave zijn te bestellen bij het Distributiecentrum Overheidspublikaties, Postbus 20014, 2500 EA 's-Gravenhage, door overmaking van f 10,-- op giro 751 dan wel schriftelijk of telefonisch (070-789880) onder vermelding van titel en ISBN-nummer en het aantal gewenste exemplaren.

ISBN 90 346 1935 4
Publikatie van de Wetenschappelijke Raad voor het Regeringsbeleid (WRR) (Publication of the Scientific Council for Government Policy).

CONTENTS

CONTENTS ctd.

1. Introduction

The problems of macroeconomic policy coordination and monetary integration have become a major concern for the European economies in recent years and years to come. The late seventies have seen the advent of the European Monetary System, which has been reasonably successful in achieving convergence to low inflation rates throughout Europe. However, many commentators have expressed concern about the relative tight fiscal stance in Europe and the relatively loose fiscal stance in the United States during the eighties. This has been very bad for European unemployment and it is important to understand why European governments have been so reluctant to expand demand and fight unemployment. Partially, this is due to the lack of effective policy coordination between Europe and the United States, especially when one takes account of the oil-price shocks hitting Europe much harder than the United States and of the high degree of wage indexation in Europe (e.g., Branson and Rotemberg, 1980; Bruno and Sachs, 1985; van der Ploeg, 1987a). However, one could seriously ask whether the European Monetary System itself imparts a deflationary bias in the fiscal stance of European governments. Since Germany plays such an important role in the European Monetary System in the sense that it has an independent monetary policy whilst the other European governments peg their currency to the Deutschmark, one can ask whether this German hegemony in monetary policy implies that Germany is less concerned about increasing its fiscal stance in the face of unemployment than the rest of Europe. Germany may have an incentive to gain competitiveness at the expense of the rest of Europe by having a tighter fiscal stance than the rest of Europe and benefitting from the looser fiscal stances elsewhere. This seems to be, apart from the prestige and implied autonomy, the main benefit of the European Monetary System for Germany. The main benefit for the rest of Europe may be that by pegging their exchange rate to the Deutschmark, they gain the credibility of the Bundesbank and thus obtain low inflation. Dornbusch (1987) argued that attempts to fix nominal exchange rates in Europe are not a good idea; instead a "crawling peg" to allow for inflation differentials between northern Europe and southern Europe seems desirable.

Nevertheless, there is much discussion in the press and business community on the desirability and feasibility of establishing a European Central Bank and one European currency. The Delors committee is investigating these

issues and will soon report on the desirability of a European Central Bank. Such a trend towards monetary integration need not imply that national currencies would disappear altogether, because they could co-exist with the new European currency. Many countries, especially Italy, have warned that they do not want a European Central Bank to be a larger version of the Bundesbank. In other words, a European Central Bank must operate as a symmetric exchange-rate sytem with all countries having a say on how European monetary policy is set. This is quite unlike the European Monetary System, which so far has operated as an asymmetric exchange-rate system with German hegemony. Important policy questions are what monetary unification in Europe implies for fiscal policy. Do the gains arising from exchange-rate stability, from a common currency and from increased credibility outweigh any possible losses from macroeconomic inefficiencies? There is not only monetary integration but also integration of markets for goods and factors in Europe and it is important to know the implications for fiscal and monetary policies. More generally, important policy questions are:

(i) Does increased monetary integration in Europe imply more or less need for European coordination of macroeconomic policies?

(ii) What are the implications of monetary integration for the effectiveness of monetary and fiscal policies?

(iii) What institutions are needed to guarantee the coordination of monetary and fiscal policies?

(iv) What are the implications of the completion of a European Common Market ("1992") for coordination and/or convergence of fiscal and monetary policies in Europe?

(v) Is German hegemony a good or a bad thing?

(vi) Is coordination of fiscal policies within a European Monetary Union always a good thing when policies between Europe and the United States are not coordinated?

(vii) Does the liberalisation of international markets for financial assets in Europe lead to more speculative attacks and thus hinder the process of monetary integration?

(viii) Is the loss of seigniorage revenues a persuasive argument against monetary union?

This study on macroeconomic policy coordination and monetary integration in Europe adresses most of these policy issues and also investigates the

scope for international policy coordination under floating exchange rates in order to have a benchmark for comparison. Chapter 2 discusses issues and concepts relevant to macroeconomic policy, interdependence, coordination and exchange-rate regimes. Chapter 3 discusses a number of historical exchange-rate regimes, i.e., the Gold Standard, Bretton Woods, the recent era of floating and managed exchange rates and the European Monetary System, and also some proposals for the future such as a European Monetary Union, McKinnon's proposal for world monetarism and Williamson's proposal of target zones for real exchange rates. Chapter 4 discusses the international interdependence and coordination of monetary policies under fixed exchange rates, floating exchange rates (relevant for trans-Atlantic interdependence), managed exchange rates (i.e., the European Monetary Sytem) and European Monetary Union. It distinguishes between short-run and long-run views and also looks at the effects of the completion of the European Common Market. Chapter 5 discusses the international interdependence and coordination of fiscal policies under fixed exchange rates, floating exchange rates, the European Monetary Sytem and European Monetary Union. It also adresses the conflict between the United States on the one hand and the countries of a European Monetary Union on the other hand and also looks at the implications of wage indexation in Europe. Chapter 6 gives three examples why international policy coordination may be counterproductive. They relate to the fact that coordination destroys the discipline of central banks, to the fact that coordination within Europe may provoke an adverse response from the United States, and to uncertainty and disagreement on how the world economy functions.

2. Issues and Concepts

In this Chapter we briefly discuss various issues and concepts that will be useful for a proper discussion of international independence and policy coordination and of monetary integration.

2.1. Short-run, medium-run and long-run views of the economy

International policy coordination is only required when there is a problem with the economy. To be more precise, when the number of policy instruments exactly equals the number of targets, then, as Jan Tinbergen has shown, all targets can be achieved exactly and thus there is also no need for coordination. The problems that an economy might experience are too high inflation and too high unemployment. These are typical problems of the short run, because over time wages might adjust to clear the labour markets and thus remove inflationary pressures. For such short-run problems, we typically adopt a short-run Keynesian view of the economy where unemployment is caused by too high nominal wages which are fixed in the short run (see Sections 4.3-4.8 and 5.2-5.4). Alternatively, short-run employment may be caused in a more supply-oriented view of the economy where real consumers' wages are rigid and too high, thus preventing the labour markets from clearing (see Sections 5.6-5.7). It turns out that the Keynesian short-run view with nominal wage rigidity is more relevant for the US and Canada whilst the more supply-oriented short-run view with real wage rigidity is more relevant for Europe and Japan (see Section 5.4).

In the medium run real wages adjust to clear the labour market, so that unemployment is no longer a problem. In the medium run workers are on their labour supply curve and firms are on their labour demand curve, so that unemployment is at its equilibrium or natural rate. Nevertheless, unemployment can be too high and consumption can be too low relative to the Pareto-efficient outcome because of tax distortions and because of monopolistic competition. Thus, if a government needs to supply a public good and finance it with distortionary taxes on, say, labour income, then this will reduce the opportunity cost of leisure, raise leisure time and thus reduce equilibrium

employment, consumption and welfare. Alternatively, the public good is financed by printing money and this increases inflation and reduces welfare also. The medium-run problems focus mainly on these public-finance and allocative issues (see Sections 4.2, 5.1 and 6.1).

In the long run the problem of capital accumulation is important. The main policy trade-off here is that an increase in monetary growth increases inflation and thus reduces welfare, but also reduces real interest rates and increases capital accumulation (the Mundell-Tobin effect) and thus raises welfare (see Section 4.2 and van der Ploeg, 1987c; 1989). Alternatively, government investment may improve infrastructure and raise welfare but it also leads to distortions and thus reduces welfare. The long (or even medium) run for open economies with fixed exchange rates is also concerned with the conflict between low inflation and the balance of payments (see Section 4.1).

2.2. Fiscal and monetary policy and the intertemporal government budget constraint

Fiscal policy covers everything to do with government spending and with government taxation and subsidies. Fiscal policy typically affects both aggregate demand and aggregate supply. For example, government investment in infrastructure directly increases aggregate demand but also indirectly increases private sector investment, capital accumulation and aggregate supply. Another example is a cut in the marginal rates of income taxes, since this increases disposable income and thus increases consumption and aggregate demand but this also reduces the wedge between producers' and consumers' wages and thus raises aggregate supply. Indeed, the tax cuts implemented by Mr. Reagan and Mrs. Thatcher under the slogan of supply-side incentives have had mainly effects on aggregate demand as the recent overheating of the UK economy suggests. Unemployment benefits increase aggregate demand and reduce aggregate supply. Government consumption, however, has mainly effects on aggregate demand. It seems therefore sensible for analytical purposes to focus either on a fiscal demand policy, which only affects aggregate demand, or on a fiscal supply policy, which only affects aggregate supply.

The effectiveness of fiscal policy depends crucially on how it is financed. For example, an increase in government spending can be financed by

issuing bonds, by printing money, or by raising taxes and these have very different effects on inflation and unemployment (see van der Ploeg, 1989). For most short-run discussions, we consider bond-financed changes in fiscal policy. This means, as bonds need to be paid back eventually, finance by a future increase in taxes or a future cut in government spending. The more medium-run, public finance view assumes that government spending is financed by taxes.

Monetary policy affects aggregate demand in Keynesian short-run models with nominal wage rigidity, but it also affects aggregate supply in more classical long-run models via the Mundell-Tobin effect on capital accumulation. Again, the effects of monetary policy depend on how it is financed (see van der Ploeg, 1989). In the short-run discussions we implicitly assume that the central banks change the money supply by open-market operations (Sections 4.3-4.9 and 5.2-5.8). In other words, a purchase (sale) of bonds from the private sector raises (decreases) the money supply. However, in more medium-run discussions, we assume that an increase in the money supply is combined with a cut in distortionary taxes and thus boosts activity (see Sections 4.2, 5.1 and 6.1).

Changes in fiscal and monetary policies must satisfy the government budget constraint. This says that the public sector deficit, defined as the excess of interest payments on the public debt plus government spending over tax revenues, must be financed by either issuing bonds or printing money. The intertemporal government budget constraint is more insightful, because it shows that present changes in fiscal or monetary policy must imply future changes in fiscal or monetary policy. It says that the current public debt plus the present discounted value of all future government spending must equal the present discounted value of all future tax and seigniorage revenues. Hence, the question is not whether an increase in government spending is financed by bonds or by taxes, the question is whether an increase in government spending is financed by an increase in taxes today, by an increase in taxes tomorrow, or by a cut in government spending tomorrow.

2.3. Targets and common and country-specific exogeneous shocks

In short-run views of the economy, we typically assume for analytical convenience that the economy is initially in equilibrium (at full employment,

etc.) and subsequently is hit by exogeneous shocks. The exogeneous shocks can be shocks to the demand for goods, to the demand for money, to the demand for labour, to the supply of labour, to the supply of goods and to the wage. The main shock to the European economies in the seventies was the OPEC oil-price hike in 1973. This reduced the demand for materials and thus, if the output effect dominates the substitution effect, reduced the demand for labour and the supply of goods. An increase in wage "push", caused by more trade union militancy or whatever, raises the wage and reduces the demand for labour and leads to unemployment. A world-wide recession reduces the foreign demand for home goods and can cause unemployment. Such shocks can cause deviations from target variables, such as unemployment, real income and inflation, from their desired values, so that fiscal or monetary policy actions are required in order to attempt to steer the economy back to its desired state.

The shocks can be global or country-specific shocks. A global shock such as the OPEC oil-price hike is to a small degree a country-specific shock, because it affected European unemployment much more than US unemployment as the price of oil is fixed in dollars (see Canzoneri and Gray, 1985). In the following chapters most shocks are, however, of a global nature.

2.4. Uncertainty about the world economy

In order for policymakers to make a proper trade-off between their targets and objectives of economic policy they need to have a view or model of how the economy functions. However, such a model is not necessarily a good description of the economy due to various sources of uncertainty. One of the main sources of uncertainty is probably about exogeneous shocks, such as world trade, oil prices, etc., as they are notoriously difficult to forecast. However, most of these exogeneous shocks hit the economy and subsequently policy actions are undertaken to attempt to achieve the targets of economic policy. Much more important is model uncertainty. Does the economy operate according to a Keynesian, a monetarist, a supply-side or New-Classical model? Given the short data series that are available, economists are unlikely to obtain a firm rejection of all alternative models in favour of one pet model. Most macroeconomists disagree on the right model of the economy, so it is not

surprising that most policymakers disagree. For example, many German politicians believe that an increase in government spending reduces employment in the short run, whilst most other politicians (and economists) believe that this increases employment or at least leaves employment unaffected in the short run. These sources of disagreement may be the main obstacle to successful international policy coordination (see Section 6.3). Our short-run model of employment will typically be a Keynesian model of effective demand with nominal wage rigidity, although we also consider for Europe a more supply-oriented model with real wage rigidity. This is the reason that a two-handed approach to the fight against unemployment is desirable.

Other sources of uncertainty arise from the imprecise estimation of the coefficients in the model and from the possible, unpredictable behaviour of private sector agents and foreign governments.

2.5. International exchange-rate regimes

For analytical purposes, at least three international exchange-rate regimes can be distinguished: (i) floating exchange rates; (ii) fixed exchange rates; and (iii) managed exchange rates. Floating exchange rates mean that all exchange rates adjust immediately to keep all the balances of payments in equilibrium at each point of time. This is called a "clean float". It means that each country has full control of its own money supply, as foreign reserves do not affect the money supply, and can therefore insulate its (long-run) inflation rate from the rest of the world. Under fixed exchange rates each country pegs its exchange rate to the price of a reserve asset (such as the price of gold under the Gold Standard) or to the currrency of a reserve-currency country (such as the US under Bretton Woods and, perhaps, such as Germany under the European Monetary System). This means that each country looses control of its money supply, because now foreign reserves are used to peg the exchange rate and these affect the money supply of the country concerned. For example, if there is a balance-of-payments deficit and thus pressure for the currency to depreciate, the central bank must defend the currency by selling foreign reserves in exchange of own currency and this reduces its money supply. Hence, under fixed exchange rates the change in the money supply is given by domestic credit expansion plus the balance of payments. There is,

of course, an automatic tendency for the balance of payments to clear even under fixed exchange rates. This is called the classical specie-flow mechanism. When there is a deficit, the money supply of the country concerned falls so that aggregate demand and imports fall and therefore there is a tendency for the balance of payments to clear over time even in the absence of policy action. Also, the contraction in the money supply may lead to a rise in interest rates and an inflow of capital which helps to eliminate the deficit. Sometimes central banks do not like the inflationary consequences of a balance-of-payments surplus and therefore they sterilise the surplus with an open-market operation. In other words, the government sells bonds to the private sector and this exactly off-sets the increase in the money supply arising from the balance-of-payments surplus. A regime of fixed exchange rates faces the "N-1 problem"; there are only N-1 exchange rates so only N-1 out of N countries can fix their exchange rates. Under an asymmetric regime of fixed exchange rates there is a reserve-currency country, which manages the money supply, whilst the remaining countries fix the exchange rates. Under a symmetric regime of fixed exchange rates there is an outside reserve asset and each country fixes the value of its currency vis-à-vis the reserve asset. Alternatively, there is a monetary union with irrevocably fixed exchange rates and a common central bank that determines the world money supply. It is clear that a regime of fixed exchange rates leads, at least in the long run, to a common rate of inflation for all countries.

The third regime corresponds to managed exchange rates. The European Monetary System with periodic realignments of the currency is an example of such a regime. The balance of payments is not in equilibrium all the time and exchange rates are not irrevocably fixed, so that one could also sometimes refer to such a regime as a "dirty float".

2.6. International mobility of financial assets

Since the second world war, financial markets around the world have become more and more integrated. This has enhanced the mobility of financial assets across the globe, and thus has improved the possibility for international arbitrage. In the past there was more or less no mobility of financial assets across borders, which in the limit is referred to as zero capital

mobility. It implies thet there is no capital account of the balance of payments and that countries have interest rates independent of interest rates abroad. Nowadays more and more countries have free international mobility of financial assets, which is referred to as perfect capital mobility. It means that arbitrage is possible, so that for risk-neutral investors expected returns on home and foreign financial assets will be equalised in equilibrium. In particular, uncovered interest parity implies that the interest rate at home has to equal the foreign interest rate plus the expected rate of depreciation of the exchange rate. There may be a risk premium driving a wedge between expected home and foreign returns, but this will be assumed constant for most of the discussion. Another reason why (uncovered) interest parity may not hold is the presence of quantitative restrictions on international movements of financial assets, i.e., capital controls, which are particularly relevant for France and Italy. Zero capital mobility may then be a better assumption than perfect capital mobility. Another reason for deviations from interest parity is the presence of a real-interest-rate equalisation tax, that is a tax or subsidy on capital inflows and outflows. The Netherlands has free movement of financial assets across its border.

2.7. Interdependence and spill-over effects of economic policy

Most economies are interdependent with other economies in the world economy. The main channels of interdependence are:

(i) An increase in the ratio of foreign to home prices or a depreciation of the nominal exchange rate raises net exports, aggregate demand and employment as agents substitute away from foreign to home goods. It also increases the price of imported goods and thus the consumers' price index. In time this also leads to an increase in the real producers' wage and a fall in aggregate supply.

(ii) An increase in foreign income leads to more foreign expenditures and thus to more exports and employment for the home country.

(iii) International mobility of financial assets links interest rates and global capital accumulation in the various countries. The intertemporal aspects of exchange rates, arising from expectations about future changes in policy, lead to further interdependencies.

(iv) Under fixed exchange rates, the balance of payments feeds directly into the money supply and this links inflation rates in the long run.

(v) A current-account surplus leads to an increase in the wealth of the nation.

A system of interdependent economies does not take foreign prices, income and interest rates as given, as is done for a small open economy, but solves for home and foreign prices, incomes and interest rates simultaneously. Interdependence implies that changes in home (foreign) policy can in principle, affect foreign (home) as well as home (foreign) outcomes. For example, an increase in the home money supply, under a regime of floating exchange rates and perfect capital mobility, leads to a fall in the world interest rate and to an increase in capital accumulation throughout the world in the long run (channel (iii)). The associated depreciation of the exchange rates reduces net exports, aggregate demand and employment abroad (channel (i)), despite an increase in imports from the home country (channel (ii)), and also leads to lower consumers' prices and higher real income abroad (channel (i)). An increase in the home money supply, under a regime of fixed exchange rates and perfect capital mobility, leads to a deficit on the balance of payments and in the long run to an increase in prices throughout the region of fixed exchange rates. To help our discussion, we will define a beggar-thy-neighbour and a locomotive policy. The former reduces welfare abroad, whilst the latter improves welfare abroad. The main point is that the nature of the international transmission and spill-over effects of economic policy depends on the institutional framework such as the exchange-rate regime in place, the existence of capital controls, and the presence of trade barriers and also depends on the relative sizes of the various economies. A small country such as the Netherlands benefits more often from a "free ride" when, say, Germany and France coordinate their policies, but suffers as large countries like Germany do not obtain much benefit from taking into account the very large spill-over effects of German policies on the Netherlands. Hence, coordination within the European Community is in the first place a problem for the larger countries.

Sofar, we have given five channels of structural interdependence. There are also other types of interdependence (see Steinherr, 1984; Cooper, 1985). An important type is interdependence of target variables, for example, differences in national inflation rates would be inconsistent in a Europe with fixed exchange rates. Another type is policy interdependence, which arises in

a game-theoretic setting when the actions of one government depend on the actions of other governments. Finally, it is possible to have interdependence arising from common exogeneous shocks.

2.8. Non-cooperative and cooperative outcomes

Non-cooperative outcomes result when countries choose their policies in order to maximise their own welfare without taking into account the welfare of other countries, whilst cooperative outcomes result when all countries decide on their policy actions jointly and take account of the welfare of all countries concerned. Cooperative outcomes result under international policy coordination and are obtained when countries maximise global welfare. They correspond to global Pareto-efficiency. Obviously, cooperative outcomes are not unique as they depend on the relative bargaining strengths of the participating countries. The bargaining strength of countries is probably related to their relative size.

Non-cooperative outcomes pertain in Nash-Cournot equilibria, where governments assume when maximising their welfare that other governments do not react. When there are international spill-over effects, i.e., externalities, non-cooperative policies are too loose (tight) relative to the cooperative outcome when they are beggar-thy-neighbour (locomotive) policies, i.e., when they are public bads (goods), because then the adverse (beneficial) effects on other countries are not internalised. Another form of non-cooperative outcomes are Stackelberg equilibria. Here there is one large country called a Stackelberg leader, perhaps the US under Bretton Woods or Germany in the European Monetary System, who maximises its welfare subject to the reaction functions of the other smaller countries. The leader, typically, increases its welfare relative to the non-cooperative, Nash-Cournot outcomes.

It is worthwhile to point out that international policy coordination is often a second-best outcome, because a first-best outcome would imply reductions of wage rigidities and elimination of other market imperfections.

2.9. Harmonisation, convergence and coordination of economic policy

Coordination of macroeconomic policies and convergence of economic performance within Europe are stated objectives of the Treaty of Rome. The Council of Ministers made a decision in 1974 "for attainment of a high degree of convergence of economic policies of Member States", which was meant to be mainly a process of setting budgetary policy guidelines (for a discussion, see Steinherr, 1984). However, convergence of policies within the European Community does not necessarily imply international coordination of policies (and vice versa). In an interdependent system of identical economies one can converge either on a non-cooperative outcome with, say, tight fiscal policies or on a cooperative outcome with loose fiscal policies. In other words, convergence itself should not really be an objective of economic policy even though it seems to be a stated objective of the European Community. The final 1978 report on the European Monetary System states that "the European Monetary System ought to contribute to reduce divergences in economic performance" and that "the credibility of the new system depends on progressive convergence of economic performance" (see Steinherr, 1984), but again such statements say almost nothing about international policy coordination. Convergence refers to the attainment of common targets of economic policy, e.g., a reduction in inflation differentials, etc. Coordination refers to the joint and mutually consistent setting of the instruments of economic policy to maximise joint welfare of the various member states. Convergence is often used as an excuse by individual governments to implement unpopular policies, because even under coordination there is no reason for convergence when individual countries are of different size, have different social and economic structures, and are hit by different shocks. Obviously, this should be distinguished from the unrealistic case of perfect mobility of all assets, goods, capital and labour, as then the market forces convergence of tax policies and of budget deficits.

International harmonisation of economic policies attempts to achieve greater unity in economic structure, to increase the scope for rules, and to reduce the scope for discretionary policy. Harmonisation is primarily concerned with long-term objectives such as efficiency and distribution, so harmonisation is more concerned with commercial policy, anti-trust law, labour law, agricultural policy, regional policy etc. rather than with discretionary macroeconomic monetary and fiscal policies. Hence, harmonisation within Europe

is mainly concerned with promoting free competition and with efficient markets on a European level. The completion of the Common European Market and "1992" is mainly concerned with harmonisation. International cooperation occurs, firstly, through the international exchange of information, secondly, through international harmonisation of rules, and, thirdly, through international coordination of discretionary policies. Through the European Community, the OECD and summit meetings there is already a great deal of exchange of information. The plans for "1992" and beyond imply a considerable amount of harmonisation. The European Monetary System implies some degree of coordination of monetary policies and European Monetary Union would imply full coordination of monetary policies. The big issues in the coming years for Europe are the desirability and nature of convergence on the one hand and of coordination of fiscal policies at a community level on the other hand given the increasing degree of monetary unification in Europe.

3. International Exchange-Rate Regimes: Historical Experience and Proposals for the Future

There have been gradual changes and reform in the international monetary system. This has always required a consensus among the participating countries, which presumably occurs because reform changes the rules of the monetary game and affects the operation of national macroeconomic and monetary policies in a desirable fashion. The question of how economic policies affect targets in the various international exchange-rate regimes is an important one in this context and is adressed in Chapters 4 and 5. In this Chapter we briefly discuss a number of alternative exchange-rate regimes. Hamada (1985, Chapters 2 and 3) gives a good public-choice exploration of alternative exchange-rate regimes.

3.1. The Gold Standard

This exchange-rate regime was applicable before World War I. Each country pegs its currency to the price of gold, so that the classical specie-flow mechanism eventually restores equilibrium in the balance of payments. A deficit implies an outflow of gold, which leads to a contraction in the domestic money supply and thus to a fall in income and the price level. This cuts imports and restores equilibrium. Similarly, a surplus on the balance of payments leads to an inflow of gold, which increases domestic income, prices and imports. A return to the gold standard implies the removal of national currencies as international mediums of exchange. Although one would expect such a return to the gold standard to improve credibility, to remove the incentive to levy inflation taxes and thus to reduce world inflation, this may not be the case. The point is that the price of gold and thus world inflation would rise as the demand for gold increases. This also leads to capital gains for the main gold-producing countries, South Africa and the USSR, and for countries holding large stocks of gold. When discussing the benefits and costs to the United States of a return to the gold standard, one needs to compare the capital gains on holding gold with the loss in seigniorage revenues (Hamada, 1985, Chapter 2).

In theory the Gold Standard operated as a symmetric system with fixed exchange rates and monetary expansion in each country being fixed by the rate of gold mining. In practice, the Gold Standard operated from 1870-1914 as an asymmetric system with UK hegemony in the sense that the UK effectively determined world interest rates.

3.2. The Bretton Woods System

The numeraire of Bretton Woods was gold, so that in principle all currencies had a given price in terms of units of gold. This means that by changing the gold prices of the various currencies one could affect all the countries' exchange rates in an independent fashion. However, the dollar price of gold has very much been fixed throughout the Bretton Woods period (1945-1968) and indeed a fixed dollar price of gold has been regarded as the foundation of Bretton Woods. Many of the countries other than the US have changed from time to time their currency price of gold and thus their dollar exchange rate during the Bretton Woods period. For example, one can think of the revaluation of the Deutschmark and Dutch guilder in 1961 and of the devaluation of the UK pound in 1967. Bretton Woods can be regarded as an asymmetric system of fixed (but from time to time adjustable) exchange rates where the US performs the role of the reserve-currency country. In other words, Bretton Woods is characterised by a US hegemony. This means, as far as the European economies are concerned, that any devaluation of the dollar, i.e. increase in the dollar price of gold, would be matched immediately by an eqaul percentage devaluation of all European currencies, i.e. by equal percentage increases in the European currencies' prices of gold.

Bretton Woods operated both as a gold standard and as a dollar standard in the sense that the dollar was used to settle international transactions. because the United States was the only country to issue international currency, it occupied a special position under Bretton Woods. This meant that under Bretton Woods the United States benefitted from the right to print money and raise seigniorage revenues. Similarly, the United States was able to finance its deficits on the current account of the balance of payments by printing money and in this way was able to obtain a real transfer of purchasing power from abroad. However, the United States being the reserve-currency country

under Bretton Woods was obliged to hold a substantial stock of gold and to maintain the value of the dollar. This limited the scope of monetary policy. In addition, the United States probably only gained the normal return for its services of short-term borrowing and long-term lending to the rest of the world. In that sense, the United States could be considered as an international financial intermediary or world banker and probably was not able to extract that many seigniorage revenues. Of course, the United States could with an expansionary monetary policy increase world inflation and thus extract an inflation tax from the rest of the world through unanticipated losses in the real purchasing power of dollar-denominated assets held by the rest of the world.

In 1968 the gold pool was abandoned, so that Bretton Woods operated as a straightforward dollar standard.

3.3. The recent era of floating exchange rates

In the late sixties and early seventies Bretton Woods fell apart and an era of floating exchange rates commenced (see Tew (1988) for a detailed historical and institutional account of this period). The end of Bretton Woods was mainly a result of the breakdown of the Smithsonian agreement to correct the US trade deficit by a devaluation of the dollar. Under a "clean float" the balance of payments of each country is always in equilibrium and no country has an exclusive right to issue international currency. Hence, the demand for international currencies by central banks is minimal and there is no longer any conflict over the asymmetric distribution of seigniorage gains (even though each central bank can extract some seigniorage revenues from the demand for their own national currency). Each central bank can conduct a more or less independent monetary policy and eventually insulate its inflation rate from inflation in other countries, which is at the expense of more exchange-rate volatility. In practice, the recent era of floating exchange rates more closely resembles a "managed float" than a "clean float" as can be seen from the huge interventions by the national central banks. This can also be seen from the coordinated fall in the dollar subsequent to the New York Plaza Summit in September 1985. The era of coordinated exchange-rate management has been continued with the Tokyo Summit in May 1986, the Louvre Accord in February

1987 and the Venice Summit of June 1987. The Louvre Accord saw imbalances in current accounts arising from imbalances in fiscal policies, so it promised coordinated exchange-rate management, unfortunately, without monetary consensus (PPC, 1988)

3.4. The European Monetary System of Managed Exchange Rates

The dollar floated freely after Bretton Woods until the start of coordinated exchange-rate management in 1985 and rose by about 50 % in effective terms over a period of five years. This put a lot of strain on intra-European exchange rates, so the European Monetary System was founded in 1979 (Ludlow, 1982) in order to attempt to stabilise intra-European exchange rates by agreeing on central rates in terms of a composite European currency, called the ECU and on bands of fluctuation of 2¼ % (and 6 % at times for Italy). There have been about a dozen realignments since the start of the European Monetary System; the Deutschmark and the Dutch guilder have become stronger whilst the Italian lira has become weaker. In theory the European Monetary System was designed to be symmetrical with a "divergence indicator" created specifically for this purpose. However, in practice the European Monetary System has very much operated as an asymmetric exchange-rate system characterised by German hegemony. To be precise, Germany was able to set monetary policy for Europe as a whole whilst the other European countries pegged their exchange rates to the Deutschmark and the European Monetary System can (like the "snake") be seen as a greater Deutschmark zone. The incentives for Germany of such an asymmetric arrangement are (i) prestige, (ii) an independent domestic monetary policy, (iii) an ability to shift the burden of increasing its fiscal stance and of increasing employment and output throughout Europe to the other European countries (see Chapter 5), and (iv) an ability to gradually improve competitiveness (see Melitz, 1988b). The incentive for the other European economies is that, by pegging their exchange rate to the Deutschmark and giving up an independent monetary policy, they "buy" the credibility of the Bundesbank and thus obtain a lower inflation rate than they would have done otherwise (Giavazzi and Pagano, 1986; Melitz, 1987, 1988b). The point is that, if central banks face a credibility problem vis-à-vis their private sector, they may announce a tight monetary policy in order to induce workers

to settle for low wages, but once workers are locked into their contracts it pays to renege and have a loose monetary policy. When countries can credibly peg their exchange rate to the Deutschmark, they avoid such credibility problems and therefore obtain a lower inflation rate. Germany is, of course, assumed to have a larger aversion to inflation than the rest of Europe and/or have a more credible or conservative central bank. However, it should be pointed out that, unless exchange rates are irrevocably fixed, countries other than Germany still have an incentive to engage in a surprise devaluation vis-à-vis the Deutschmark (Horn and Persson, 1988).

Capital controls offered, mainly, France and Italy, the opportunity to peg their exchange rate without giving up their freedom to set domestic interest rates,but capital controls may be difficult to enforce and have also other costs. Capital controls have also been used by France and, particularly, by Italy to attempt to prevent speculative attacks on their currency when the public anticipates a devaluation. Belgium obtained a stable exchange rate as well as some financial autonomy by having dual exchange rates, that is one fixed exchange rate for international trade in goods and services and another floating exchange rate for international trade in financial assets. However, such a dual exchange rate system only works within limited bands.

The European economies have agreed to abolish all restrictions on movements of financial assets within Europe, but it is not clear that this will be feasible as long as full monetary union is not achieved. The point is that capital controls have been used to prevent balance-of-payments crises and speculative attacks on the currency, so unless Europe moves from a system of managed exchange rates to a system of irrevocably fixed exchange rates (as would be the case under a European Monetary Union) governments may be tempted to use capital controls.

Dornbusch (1987) has criticised three elements, related to the desirability and feasibility of a high degree of nominal exchange-rate rigidity in Europe, of the European Monetary System. Firstly, he sees no need why inflation rates in southern Europe should have to converge to the near-zero inflation rate reached in Germany, particularly as this would result in a problem about the sustainability of public debt. This concern is quite separate from the bad effects on unemployment. Secondly, he is concerned about the aim of full liberalisation of international movement in financial assets

without more flexibility in the (dual) exchange rate for financial transactions. Thirdly, the dollar may have to fall a further 20-30 % before global imbalances in current accounts are removed and he feels this may strain the cohesiveness of the EMS currencies. This leads Dornbusch to advocate a "crawling peg" with frequent realignments between the northern and southern currencies of Europe in order to stabilise competitiveness for the "commercial" exchange rate, whilst the exchange rate for financial transactions would float and not be restricted by intervention limits. He may be right in that this may increase the chances of widening exchange-rate management in Europe.

3.5. Towards full monetary union in Europe

One of the main policy issues for Europe during the remainder of this century is whether the process of monetary integration should lead to a single-currency area with irrevocably, fixed intra-European exchange rates or not. The process of monetary unification probably proceeds through the following steps. Firstly, the intra-European exchange rates remain within narrow and vanishing bounds and there are no common reserves and no European Central Bank. Secondly, monetary policies of the various European central banks are coordinated in order to eliminate balance-of-payments disequilibria. Thirdly, a common reserve asset (such as the dollar used by the European economies) is used in a clearing mechanism for disequilibria in the balances of payments. Fourthly, establishment of public confidence in the irrevocable nature of fixed exchange rates. Fifthly, circulation of a common European currency (called the Monet, say) issued by a European Central Bank. The European Monetary System has by and large proceeded through the first three stages. Full monetary union in Europe would also require Europe to proceed towards stages four and five. The main benefits from monetary union are: (i) elimination of uncertainty about exchange-rate fluctuations; (ii) more economic use of international reserves for Europe as a whole; (iii) benefits accruing due to the shock-absorbing nature of international reserves; (iv) elimination of the international conflict associated with competitive appreciations in order to export inflation (see Chapters 4 and 5); (v) increase in prestige for smaller countries, but loss of prestige or sovereignty of larger countries

such as the United Kingdom; and (vi) savings of the transaction costs of converting one member currency for another member currency, necessary for international trade. Hamada (1985, Chapter 3) points out that most of these benefits show non-rivalry in consumption, as for public goods, but do not show non-exclusion. However, benefits (i) and (vi) are probably most important, and, as they are related to the function of money as a unit of account, a medium of exchange and a store of value, they make monetary union a public good. Without the confidence of all member countries, a common European currency cannot develop. The costs of monetary union are mainly national, because each country gives up an independent monetary policy. Hamada (1985, Chapter 3) argues that, as the advantages of monetary union are public goods whilst the costs are more like private goods, the calculus of participation is applicable. There is a timing problem in the process towards monetary union in Europe. Increased integration of the markets for goods and factors of production ("1992" and all that) increases the costs, of adjusting output for balance-of-payments reasons, of monetary union. Hence, the completion of a European Common Market facilitates the move towards monetary union in Europe.

The calculus of participation (Hamada, 1985, Chapter 3) argues that an individual country will join a European Monetary Union when the benefits from participation (such as from the reduction in exchange-rate uncertainty, the increase in bargaining power as a group, and the use of a common currency) exceed the costs (such as giving up an independent monetary policy). However, as the benefits display a public-good character, the amount of collective action will be less than optimal because the beneficial effects on other countries are not internalised. This problem is more severe for large than for small groups of countries. Also, smaller countries can more easily be "free riders". Hence, the process towards full monetary union in Europe is easier when fewer countries in Europe participate and the impetus has to come mainly from the larger European countries. It is worthwile to point out that the use of side-payments, for example a concession in agricultural policies in favour of new members, may lead to an optimal size of the exchange-rate union. The timing of costs and benefits further changes the process of full monetary union in Europe.

Hamada (1985, Chapter 3) also gives a number of historical examples of monetary unification, which show that a monetary union is almost never achieved before political unification is achieved. In other words, unless the

European Community moves towards political integration (the United States of Europe feared by Mrs. Thatcher), there is not much chance of achieving full monetary union in Europe. The historical evidence derives mainly from the formation process of nation-states such as Germany, Italy and Japan, because there the problem arose from unification of currencies issued by local provinces. The Zollverein led by Prussia gave rise to economic unification and to a fixing of the parities of the currencies of the southern states at the Munich Convention in 1837 and of the northern states at the Dresden Convention in 1838. When the second German Reich was founded in 1871, there were 7 separate currency areas, based on silver, and thirty-three independent and unconnected banks of issue. In 1871 the mark was adopted as a currency unit, in 1873 there was a law to establish a gold standard and in 1875 the Prussian Bank became the Reichsbank, but not until 1935 did the Reichsbank obtain a monopoly in the right of issue. The most spectacular example is provided by Japan. In 1871 there were 244 provinces issuing nearly 1700 types of local notes, but after the Meiji Restoration the yen became the new currency unit and from 1872 to 1879 outstanding local notes were redeemed and in 1899 the right of issue of yen was concentrated in the Bank of Japan. Several examples of monetary unifications across national borders in the nineteenth century exist; for example, the Latin Monetary Union and the Scandinavian Monetary Union between Sweden, Denmark and Norway. Most of the historical experience suggests that political unification always preceeded monetary unification whilst it sometimes preceeded and sometimes followed economic integration. The main lesson for Europe seems nevertheless that the completion of the European Common Market and the fact that more decisions are being made by the European Community rather than by national governments facilitates and speeds up the process towards full monetary union in Europe.

The pressure from politicians and the European business community to have one European currency is building up. For example, C. van der Klugt, who is chairman of Philips and of the Society for European Monetary Union (consisting of over 150 firms), argued on 18 January 1989 that one European currency would give rise to between three and five million new jobs. Among a survey of 1000 European businessmen 860 were in favour of one European currency and a European Central Bank (not unlike the Federal Reserve in the United States). Of the European political leaders only Mrs. Thatcher seems to be against, but the British business community seems to be mostly in favour.

Italy is in favour, but only as long as the new European Central Bank is not going to be dominated by Germany (as in the European Monetary System). Many people in Europe may be against a common European currency for sentimental reasons, but there is no reason at all why a new European currency (say, the Monet) should not co-exist along the existing national currencies of Europe (after all, Scottish bank notes still circulate in the UK).

3.6. McKinnon's proposal for fixed exchange rates and control of the global money supply

Centralised money issue by an international organisation has been an important feature of many plans (witness the Keynes plan or the Triffin plan), because they increase international liquidity without worsening the credibility and confidence problems associated with the use of national currencies as international currencies and because they eliminate the asymmetry between reserve-currency countries and non-reserve-currency countries. For example, the Special Drawing Rights issued by the International Monetary Fund serve as a reserve currency and as a means of payments in international transactions. The Monetary Fund attempts to replace the dollar with Special Drawing Rights, but it will be considerable time before the substitution accounts can serve as a world currency.

In the absence of such an international currency issued by an international organisation such as the International Monetary Fund, some argue that it is a good idea to coordinate monetary policies in such a way as to achieve a desired growth in world money income. This would mean that the international monetary system would operate as a symmetric rather than as an asymmetric exchange-rate system with US hegemony. The main advocate of a return to fixed nominal exchange rates, at least between the United States, Japan and Germany, is McKinnon (1986), who suggests it must be combined with setting domestic monetary growth rates and symmetrical non-sterilised intervention in such a way as to achieve a desired growth in the aggregate nominal money stock. Given that financial markets throughout the world are highly integrated and that McKinnon's proposal implies fixed exchange rates, inflation rates and real interest rates are equalised throughout the world. This means that the global interest rate can effectively be used to control growth in the aggregate price level, which corresponds to a given aggregate money stock.

An interesting application of modern theory to the analysis of bands for nominal exchange rates in a stochastic real-exchange-rate overshooting model is provided by Miller and Weller (1988).

McKinnon's proposal reflects the view that currency substitution was the main cause of variations in velocity and of exchange-rate fluctuations, because with this proposal they would cancel out at the global level. More recently, the money supply has been replaced by the aggregate price level as a target variable or by commodity prices as forward-looking indicators.

As far as the proposals for monetary integration in Europe are concerned, it is clear that before one moves to a full monetary union in Europe one could attempt to move to implement the McKinnon proposal on a European scale. The reason is that when the McKinnon proposal is successful, it is not too different from monetary union and therefore the political feasibility of monetary integration in Europe may be enhanced.

3.7. Williamson's proposal of target zones for real exchange rates

When it is not feasible or not desirable to have a world with one common inflation rate, it does not seem sensible to have fixed nominal exchange rates as would be the case under a monetary union or under McKinnon's proposal. For example, the northern European governments extract an insignificant proportion of their total tax revenues from seigniorage (less than 1 % for the Netherlands) whilst the southern European economies extract as much as 10 % (for Greece and Portugal) of their tax revenues from seigniorage (see Giavazzi, 1988). In the world economy the Latin American countries and many other developing and high-inflation countries need to extract a much larger proportion of tax revenues from seigniorage than the US, the northern European economies and Japan. In these cases, Williamson's (1983) proposal of target zones for real exchange rates seems a very sensible idea and, indeed, this proposal has recently received a lot of attention in the press. The main reason for the popularity of Williamson's proposal is the growing dissatisfaction with the performance of floating exchange rates giving rise to exchange-rate volatility and persistent and large imbalances in current accounts. The New York Plaza Agreement of September 1985 was the first step towards coordinated intervention in exchange-rate markets to bring the value of the dollar

down and this has been relatively successful. At the Louvre Accord in February 1987 it was agreed to manage exchange rates and the Tokyo Summit of May 1986 and the Venice Summit of June 1987 advocated a common set of "indicators", such as inflation rates, unemployment rates, balance of payments, interest rates, etc., as a framework for international policy coordination.

The main advantage of Williamson's proposal is that it is supplemented with a set of simple rules and guidelines for the conduct of macroeconomic policies in the world economy. Williamson's proposal consists of a set of mutually consistent, wide and flexible target zones for real exchange rates, to be achieved by monetary policy in the form of reaction functions for interest rates, and of national targets for nominal income, to be achieved by fiscal policies. The targets are fundamental real exchange rates, which ensure medium- to longer-run equilibrium in the current accounts. An analysis of the design of such rules is provided by Edison, Miller and Williamson (1987), by Williamson and Miller (1987) and by Miller and Williamson (1988). Currie and Wren Lewis (1987) use optimal control to design a set of optimal rules based on Williamson's proposal for the Group of Three based on a large-scale, empirical, multi-country model. PPP (1988) provides a persuasive policy document for the adoption of target zones for real exchange rates.

Williamson's proposal should reduce volatility of real exchange rates and thus lead to less damaging effects on international trade and to a smaller vulnerability to speculative bubbles. It also means that countries are less likely to attempt to engage in competitive appreciations of the real value of their currency and thus to export inflation (see Chapters 4 and 5). Hence, Williamson's proposal internalises the externalities associated with exporting inflation. The main objection to Williamson's proposal is that it lacks a firm anchor for inflation rates, but this task is left to individual Treasuries who use fiscal policy to control nominal income. Williamson's proposal can be summarised by the following guidelines:

(i) The use of interest-rate differentials to ensure that real exchange rates do not move to far away (say, within bands of 10 %) from fundamental real exchange rates, which corresponds to a version of an old-fashioned "crawling peg" to off-set inflation differentials.

(ii) Adoption of targets for the growth of nominal income, which should equal the growth of productive potential plus a fraction of inherited inflation plus a positive function of the deflationary gap.

(iii) The use of the world interest rate to achieve the target for the growth of world nominal income.

(iv) The use of national fiscal policies to attain the targets for the growth of national nominal income.

It should be clear that, like McKinnon's proposal for the Group of Three, Williamson's proposal involves international policy coordination for the Group of Seven. However, there is no reason why Williamson's proposal should not be applied to Europe. Williamson's proposal means that the fiscal authorities control nominal income whilst the monetary authorities control real exchange rates.

Table 3.1 presents a useful overview of various international exchange-rate regimes discussed in this Chapter (taken from PPC (1988)). It clearly shows that one should distinguish between floating, fixed and managed exchange rates as well as between symmetric and asymmetric exchange-rate regimes. Both McKinnon's and Williamson's proposal are concerned with symmetric exchange-rate regimes without hegemony.

Table 3.1: Alternative Exchange-Rate Regimes

	Floating Exchange Rates	Fixed Exchange Rates	Managed Exchange Rates
Symmetry	National Money Supply Targets OECD 1973-85	McKinnon's Proposal for World Monetarism European Monetary Union	(i) Louvre Accord (ii) Williamson's Target Zones
Hegemony	-	(i) Gold Standard 1870-1914 (ii) Bretton Woods 1945-68 (iii) Dollard Standard 1968-73	EMS 1979-

4. International Interdependence and Coordination of Monetary Policies under Alternative Exchange-Rate Regimes

This Chapter is concerned with the international interdependence and coordination of the monetary policies of different economies under a variety of exchange-rate regimes. The focus of attention and the interpretation of the results will, as much as possible, be on the European economies. There will be three exchange-rate regimes considered:

(i) fixed exchange rates;
(ii) managed exchange rates;
(iii) floating exchange rates.

A regime of irrevocably fixed exchange rates is not that different from full monetary union with a common currency unit. It implies that each central bank has no control of its money supply, because it is very much determined by the balance of payments. In fact, under full employment (or under indexation of the nominal wage to the cost-of-living index) monetary policy is neutral and has no real effects. Hence, under such a long-run view, one can focus on the international conflicts that arise from the observation that domestic credit expansion leads to a bit more inflation for the whole region and a balance-of-payments deficit. Section 4.1 focuses on these problems and, in particular, on the coordination problems that arise when each central bank cares about inflation and foreign reserves. Maintaining a long-run view with a clearing labour market, Section 4.2 then discusses the potential for the international coordination of monetary policies under floating exchange rates. Of course, the main difference with Section 4.1 is that each central bank can conduct its own monetary policy and can thus control its own inflation rate. Section 4.1 focuses on two channels of transmission. The first one is a public-finance view, which says that any change in monetary policy must be accompanied by a change in distortionary taxes and therefore has real effects. The second one relies on the interdependent Mundell-Tobin effect, which argues that an increase in monetary growth reduces the world real interest rate and therefore increases capital accumulation in all countries.

Section 4.3 considers the international coordination of monetary policy under floating exchange rates, and concentrates on the effects on the exchange rates and on employment and output. Section 4.4 discusses the spill-over

effects under fixed exchange rates. Section 4.5 discusses the characteristics of international coordination of a regime of managed exchange rates, such as the European Moneatary System. The point is that Germany chooses its money supply to maximise German welfare whilst the other countries of Europe choose their optimal realignments of their currencies vis-à-vis the Deutschmark to maximise their welfare. Section 4.6 extends the model to allow for three countries, that is Germany, the rest of Europe and the US. Section 4.7 then considers situations where the European countries cooperate or when they do not cooperate and when there are floating or managed intra-European exchange rates. Section 4.8 considers the costs of European Monetary Union, which arise when countries can no longer manage and realign their exchange rates in order to improve their welfare as their exchange rates are, of course, irrevocably fixed under monetary union. Section 4.9 very briefly analyses the effects of the completion of the European Common Market (i.e., "1992") on the need for coordination of monetary policies and Section 4.10 presents a brief summary of the results.

4.1. Fixed exchange rates, full employment and the problem of inflation and the balance of payments

The first study to analyse issues of monetary policy coordination with the aid of the monetary approach to the balance of payments was Hamada (1976). This is a classic work and will serve as a useful example of how modern economic theory nowadays approaches the problem of international policy coordination.

Under fixed nominal exchange rates monetary policies are closely interdependent. This also occurs when exchange rates between the participating countries are fixed (as they are for periods of time in the European Monetary System), but when the central banks of the participating countries are not yet completely unified. Even when there is full monetary union or one global Central Bank (such as the proposed European Central Bank), it is of importance to know what incentives member countries have when they decide on their monetary policies in a non-cooperative fashion and when they decide in a cooperative of coordinated fashion. The monetary approach to the balance of payments assumes, unfortunately, full employment and purchasing power parity

or commodity arbitrage. The latter assumption could be replaced by imperfect substitution between home and foreign goods as long as there is a given real interest rate. It argues that a surplus (deficit) in the balance of payments occurs when the demand for money of a country exceeds (falls short of) the domestic supply of money. Within this context, it is well known that:

(i) There is a common or world rate of inflation (say, π) given by the weighted average of the excess growth rates in the supply of domestic credit expansion over the growth rates in real and national income in each of the member states (say, x_i) plus the increase in international reserves as a ratio of the total world money supply (say, G_R).

(ii) One's country's surplus on the balance of payments must be another country's deficit or, more precisely, the balance of payments of each member state expressed as a ratio of its demand for money (say, z_i) is the difference between the weighted average of excess supplies of domestic credit of all member states together and its own excess supply of domestic credit.

In algebraic terms, this can be summarised by:

$$\pi = \sum_{i=1}^{N} w_i x_i + G_R \tag{4.1}$$

$$z_i = \pi - x_i, \quad i = 1,2,\ldots,N, \tag{4.2}$$

where i denotes the i-th member state, N denotes the number of countries and w_i denotes the share of money demand for country i in world money demand. Hence, an expansion of domestic credit in one country leads to a deficit on the balance of payments in that country, which is mirrored by surpluses on the balance of payments in the other countries, and to higher inflation in all countries. It is clear that the policies of each central bank affect the outcomes in the other countries, so there are strong international spill-over effects. It should be no surprise therefore that the setting of monetary policies is a highly interdependent problem and has aspects of a game between the various central banks.

National monetary policies are guided by cost-benefit calculations of the monetary authorities. To be precise, the central bank of country i chooses its domestic monetary policy (x_i) to minimise its welfare-loss function, which

depends on inflation and the desired change in foreign reserves (i.e., the balance of payments):

$$\underset{x_i}{\text{Min}}\ W_i \equiv \tfrac{1}{2}\,(\pi-\pi^d)^2 + \tfrac{1}{2}\,\alpha_i(z_i-z_i^d)^2, \tag{4.3}$$

where π^d and z_i^d denote the desired or bliss values of inflation and the balance of payments and α_i denotes the weight given to the balance-of-payments target by country i. Non-cooperative (or Nash-Cournot) policies are obtained when each central bank takes the policies of the other central bank as given when deciding on its own optimal policy. This leads to the reaction curve,

$$w_i(\pi-\pi^d) = \alpha_i(1-w_i)(z_i-z_i^d), \tag{4.4}$$

so that the marginal rate of substitution between inflation and the balance of payments $(w_i/(1-w_i))$ is large for a large country. Also, smaller countries have a stronger effect on their balance of payments than on inflation. When a country wishes to reduce inflation, it sacrifies its balance-of-payments target and thus incurs more surplus than is desirable $(\pi>\pi^d \Leftrightarrow z_i>z_i^d)$.

Cooperative monetary policies are assumed to be the outcome of international policy coordination. They follow from choosing jointly the monetary policies of all central banks to maximise global welfare. Economists refer to such policies as Pareto-efficient outcomes. It is easy to show that the Pareto-efficient rate of inflation corresponds to the desired rates of inflation $(\pi=\pi^d)$. Summing (4.4), one obtains for the non-cooperative outcome:

$$\pi - \pi^d = \sum_{i=1}^{N} \alpha_i(1-w_i)(z_i-z_i^d). \tag{4.5}$$

When the right-hand side of (4.5) is positive (negative), international reserves and credit expansion are public goods (bads) and therefore give a deflationary (inflationary) bias to the non-cooperative outcome, because each central bank welcomes a higher (lower) growth in the world money supply whilst it attempts to expand its own money supply at a slower (faster) rate than the other central banks. It is now straightforward to establish the following propositions (Hamada, 1976):

(i) The non-cooperative outcome gives an inflation rate higher (lower) than the desired rate of inflation when the increase in international reserves, G_R, exceeds (falls short of) the weighted average of desired increases in international reserves, $\sum_{i=1}^{N} w_i z_i^d$.

(ii) When there is an excessive (a too low) expansion of world reserves, international policy coordination implies that central banks reduce (increase) their rates of expansion in domestic credit.

(iii) When the number of countries increases, the non-cooperative outcome diverges more from the cooperative outcome.

In other words, when the expansion of international reserves is excessive, countries defend themselves against reserve accumulation by expanding domestic credit and thus increasing world inflation above the desired level, so that countries defend themselves by exporting inflation to abroad. The increase in the size of the group of member states works, as is well known from the theory of public choice, against the optimal supply of public goods and thus of credit expansion.

The design of a successful system of fixed nominal exchange rates must be such that the non-cooperative or nationalistic outcome is not too different from the outcome under international policy coordination. The main lesson is that this requires one to manipulate the increase in international reserves in such a way as to match the average preference for accumulating reserves by the central banks. This requirement for success becomes more essential as the number of member states increases. If one were to speculate on what this would imply for the move towards fixed nominal exchange rates and towards monetary integration in Europe (witness the investigations of the Delors Committee into the possibility of a European Central Bank), then one could argue that the growth in the supply of European Currency Units (ECU's) should be designed in such a way as to ensure that the total growth in international reserves equals the average desire for accumulating reserves by the central banks of the European Community.

The results in this Section are most relevant for a system of irrevocably fixed exchange rates as in the McKinnon (1986) proposal for a return to fixed nominal exchange rates in the world economy or as in the proposals for a system of full monetary union in Europe and one European Central Bank. The results are less relevant for a regime of managed exchange rates, such as the

European Monetary System, because then the French, Italian, Belgium and Dutch central banks are allowed to have periodic realignments of their exchange rates (also see Section 4.4 and 4.5) and this may provoke speculative attacks on the currency. Another major characteristic of the model presented in this Section is that it assumes zero capital mobility, whereas the European Monetary System is characterised by capital movements. In order to obtain a better comparison with the unemployment models used in Chapters 4 and 5, the Appendix gives an extension to allow for perfect capital mobility. This extension makes the analysis better suited to discuss the long-run conflicts inherent under the European Monetary System and eventually under monetary union in Europe.

4.2. Floating exchange rates, full employment and the problems of distortionary taxes and of capital accumulation

In an international regime of floating exchange rates and, for the time being, full employment in each member state, exchange rates adjust to clear the balance of payments in each country ($z_i=0$) and therefore inflation in each country (say, π_i) is given by the excess rate of growth in domestic credit expansion in that country ($\pi_i=x_i$). It follows that each country can conduct an independent monetary policy and choose its own, individual inflation rate. The lack of international spill-over effects suggests that there is no big role for international policy coordination, since inflation in each country is simply set to its desired value ($\pi_i=\pi_d^d$) both under non-cooperative and under cooperation policymaking.

However, the models considered so far in this Chapter ignore three essential features of Western economies. The first feature is the public-finance aspect of monetary policy, the second feature is the effect of monetary policies on real interest rates and capital accumulation, and the third feature is the effect of monetary policy on real wages and unemployment. The first two features are discussed in the remainder of this section, whilst the third feature is discussed at some length in the next section.

Consider a system of interdependent monetary economies with floating exchange rates, full employment, exogeneous levels of government spending and distortionary taxes on production income. It will be assumed that increases

(decreases) in monetary growth must be accompanied by decreases (increases) in the tax rate in order for the government budget constraint to be satisfied. This allows the public-finance aspects of monetary policy to be discussed. For the time being, holdings of home and foreign bonds are ignored. This may be reasonable when there are controls on international capital movements. The demand for money is a decreasing function of the expected inflation rate, since when inflation is expected to be high agents will want to buy goods today rather than tomorrow. The first-best optimum for the world economy can be characterised by:

(i) zero tax rates on production income in all economies;

(ii) the marginal rates of substitution between home and foreign consumption of home, public and foreign goods must be unity;

(iii) the marginal utilities of money balances in each country must be zero or, alternatively, Friedman's optimal quantity of money must prevail in each country.

Unfortunately, this first-best outcome can not be obtained in an international and interdependent system of decentralised market economies but it serves as an appropriate benchmark.

A decrease in home monetary growth implies an increase in the home tax rate, which reduces the opportunity cost of leisure and thus cuts the supply of labour and goods. It also dampens home consumption of home and foreign goods. The resulting surplus on the current account of the balance of payments induces an appreciation of the real exchange rate, which dampens foreign consumption of home goods and therefore worsens foreign welfare. Hence, a decrease in home monetary growth or an increase in home taxes is a beggar-thy-neighbour policy as far as welfare is concerned. (The effect on home welfare is ambiguous, because home consumption falls whilst leisure increases.) Given this international externality, it is straightforward to show that (see van der Ploeg, 1988a):

(i) The non-cooperative outcomes are inefficient, because the negative effects of higher taxes on foreign welfare are not internalised and therefore tax rates and levels of government spending are too high in the non-cooperative equilibrium.

(ii) International policy coordination would lead the governments of each country to increase monetary growth rates, reduce tax rates and reduce levels of government spending, which leads to higher consumption of home

and foreign goods, to lower seigniorage revenues and to a level of real money balances below (rather than above as under the non-cooperative equilibrium) Friedman's optimal quantity of money.

(iii) Both the non-cooperative outcome and the outcome under international policy coordination are inefficient, because there are positive tax rates leading to real distortions, to deviations from Friedman's optimal quantity of money, and to a too low provision of public goods.

Note that under fixed exchange rates, the scope for raising seigniorage revenues is much less and therefore the public-finance aspects of international policy coordination become even more relevant.

This concludes our discussion of the public-finance features of international policy coordination, so let us now move on to the discussion of the second feature. This is concerned with the effects of monetary policy on the real interest rate and capital accumulation (see van der Ploeg, 1987c). Now consider an interdependent system of monetary economies with floating exchange rates, full employment, exogeneous levels of government spending, perfect capital mobility, investment and capital accumulation. Financial markets in the world economy are nowadays highly integrated, which implies that international movements in bonds are highly mobile. Hence, (risk-neutral) arbitrage between home and foreign assets ensures that the real returns on home and foreign bonds are equalised in the long run so that we can talk about a common world real interest rate. This observation leads to the interdependent Mundell-Tobin effect, that is an increase in home monetary growth leads to a less then proportionate increase in the home nominal interest rate and a fall in the world real interest rate and thus to increases in investment and capital accumulation in each country. Each central bank wishes on the one hand to cut monetary growth in order to attain the inflation objective and on the other hand to increase monetary growth in order to boost capital accumulation, employment and output. A decrease in home monetary growth is again a beggar-thy-neighbour policy, because it raises the world real interest rate and depresses activity and therefore welfare in all foreign countries whilst it does not decrease foreign inflation rates. This insight leads to the following propositions:

(i) The non-cooperative outcome leads to too low levels of monetary growth and inflation throughout the world, to too high levels of the world real

interest rate, and to too low levels of employment and output throughout the world.

(ii) International policy coordination would lead each central bank to increase its monetary growth rate.

Hence, the lack of international policy coordination leads to an international stale-mate because none of the central banks wants to carry the full burden of higher inflation associated with doing the public good of reducing the world real interest rate and increasing world activity. The point is that the cost of the charitable unilateral act of increasing monetary growth leads to inflation at home, whilst the rival countries get a "free" increase in capital, employment and output as they do not experience an increase in inflation. Note that this coordination problem is typical of an international regime of floating exchange rates, because under fixed exchange rates there is a common inflation rate throughout the world and therefore the costs as well as the benefits of reducing the world real interest rate are shared by all of the countries concerned. Hence, the aspects and problems of international policy coordination originating from the effects of monetary policy on the world real interest rate and capital accumulation are much less relevant under fixed than under floating exchange rates. This could be considered as an advantage of an international regime of fixed exchange rates.

4.3. Floating exchange rates, perfect capital mobility and the problem of unemployment

Let us now move on to the third feature of international coordination of monetary policies under floating exchange rates, that is the effects of monetary policy on wage formation and unemployment both at home and abroad. This feature is obviously much more concerned with the short and medium run and is, given the tremendous problem of unemployment facing most Western economies at the present, a very pressing issue.

There are of course many causes of unemployment such as a lack of effective aggregate demand, too high and rigid nominal wages, too high and rigid real consumers' wages, too little productive capacity, too high tax wedges, too much union power, an uncompetitive real exchange rate, etcetera. We have already discussed in the previous section the effects of monetary policy on

the real interest rate and productive capacity and the consequent need for international policy coordination. Here we focus on the effects of monetary policy on aggregate demand and the real exchange rate. We will assume that nominal wages are rigid and too high in the short run, even though they can adjust in the long run to ensure that unemployment reaches its natural rate. We could also have assumed that real wages are rigid and too high in the short run, but in the absence of wealth effects monetary policy has then no real effects as prices, wages and the nominal exchange rate change proportionally and thus leave employment and output unafffected. However, in a situation of real wage rigidity the international coordination of fiscal policies is a very important problem (see Sections 5.5-5.7).

To focus our ideas, consider a simple symmetric, two-country, monetary, short-run model with floating exchange rates, immobility of labour, perfect capital mobility and, for simplicity, static expectations:

$$y = -\bar{\sigma}r + \bar{\delta}(p^*+e-p) + \bar{f} + \gamma y^*, \quad 0 \leq \gamma < 1 \tag{4.6}$$

$$y^* = -\bar{\sigma}r^* - \bar{\delta}(p^*+e-p) + \bar{f}^* + \gamma y, \tag{4.7}$$

$$m - p = y - \lambda r, \tag{4.8}$$

$$m^* - p^* = y^* - \lambda r^*, \tag{4.9}$$

$$r = r^*, \tag{4.10}$$

$$p = w + \tau, \tag{4.11}$$

$$p^* = w^* + \tau^*, \tag{4.12}$$

where y, $\bar{f}$, r, p, e, w, m, and τ denote real output, a fiscal shock, the interest rate, the price level, the nominal exchange rate (price of foreign exchange in terms of domestic currency), the exogeneous (and rigid) nominal wage, the exogeneous money supply and the exogeneous tax wedge respectively. All variables are percentage derivations from their steady-state values, except for r and τ. Foreign variables are distinguished with an asterisk. Equations (4.6) and (4.7) denote the home and foreign IS-curves and show that

aggregate demand is a decreasing function of the interest rate and an increasing function of the real exchange rate, fiscal shocks and foreign income. Equations (4.8) and (4.9) denote the home and foreign LM-curves, which show that the real money supply must equal real money demand and that the latter depends positively on income and negatively on the interest rate. It is assumed that changes in the money supply are due to open market operations and that additional government spending and tax cuts are financed by bonds. Equation (4.10) captures perfect capital mobility, so that returns on home and foreign bonds are equalised. Finally, equations (4.11) and (4.12) show that prices are a mark-up on wages inclusive of taxes (also see Section 5.5).

Upon substitution of (4.11) into (4.8), one obtains the aggregate supply (AS-) schedule:

$$y = m - w - \tau + \lambda r \qquad (4.13)$$

and similarly for the foreign country (see Fig. 4.1). Hence, for a given nominal wage, the AS-schedule slopes upwards as a higher interest rate chokes off money demand and thus allows a higher level of income to restore equilibrium in the money market. Alternatively, a higher interest rate reduces the demand for money which exerts an upward pressure on prices, erodes the real wage and boosts aggregate supply. An increase in the nominal supply or a cut in taxes shifts the AS-schedule outwards. Combining (4.6) and (4.7) together with (4.10) yields the aggregate demand (AD-) schedule:

$$y = -\sigma r + \delta(p^*+e-p) + f + \gamma f^* \qquad (4.14)$$

where $\sigma \equiv \bar{\sigma}/(1-\gamma)$, $\delta \equiv \bar{\delta}/(1+\gamma)$ and $f \equiv \bar{f}/(1-\gamma^2)$. Equating aggregate demand, (4.14), with aggregate supply, (4.13), yields the goods market equilibrium (GME) locus (see Fig. 4.1)) and similarly for the foreign country. The GME-locus slopes upwards, because a high interest rate leads to a low level of aggregate demand and a high level of aggregate supply of home goods which induces a fall in the relative of price of home goods or a real appreciation of the home exchange rate.

Now consider a decrease in the home nominal money supply. This reduces the aggregate supply of home goods, so that the AS-schedule shifs inwards and the GME-locus shifts upwards (see Fig. 4.1). The equilibrium shifts from E to

E'. Hence, the incipient excess demand for home goods is choked off by a rise in the world interest rate. The resulting incipient excess supply of foreign goods is choked off by a depreciation of the foreign real exchange rate. The main point to notice, however, is that a monetary contraction is no longer a beggar-thy-neighbour policy as in the previous section, but has a negative effect on home employment and output and a positive effect on foreign employment and output. This is accompanied by a fall in net exports of the home country. Alternatively, one has the familiar Mundell-Fleming result that a monetary expansion is a beggar-thy-neighbour policy as far as employment and output is concerned. The algebraic solution confirms the above analysis:

$$r = r^* = \tfrac{1}{2}\,[(1+\gamma)(f+f^*) - (m-w-\tau) - (m^*-w^*-\tau^*)] \,/\, (\sigma+\lambda) \qquad (4.15)$$

$$c \equiv p^* + e - p = \tfrac{1}{2}\,[(m-w-\tau) - (m^*-w^*-\tau^*) + (1-\gamma)(f^*-f)] \,/\, \delta \qquad (4.16)$$

$$y = \tfrac{1}{2}\,[(2\sigma+\lambda)(m-w-\tau) - \lambda(m^*-w^*-\tau^*) + (1+\gamma)\lambda(f+f^*)] \,/\, (\sigma+\lambda). \qquad (4.17)$$

The central bank of each country presumably wants on the one hand to increase output whilst on the other hand it wants to increase the money supply as little as possible for this leads in the long run to higher wages and prices. This is captured by the following welfare-loss function:

$$\min_{m} W \equiv \tfrac{1}{2}\,(y-y^d)^2 + \tfrac{1}{2}\,\vartheta\, m^2, \qquad \vartheta, y^d \geq 0, \qquad (4.18)$$

where y^d denotes the full-employment value of output and ϑ denotes the weight attached to the price target. This leads to the following reaction function for the home central bank:

$$m = \hat{\sigma}\,(y^d + \hat{\sigma}\hat{\lambda} m^*)/(\hat{\sigma}^2 + \vartheta), \quad \hat{\sigma} \equiv \left(\frac{\sigma+\frac{1}{2}\lambda}{\sigma+\lambda}\right), \quad 0 < \hat{\lambda} \equiv \lambda/(2\sigma+\lambda) < 1. \qquad (4.19)$$

Hence, more initial unemployment (a higher value of y^d) leads to a high money supply. Also an increase in the foreign money supply leads to more home unemployment and thus the home central bank reacts with an increase in its money supply. Intersection of (4.19) with the foreign reaction curve leads to the non-cooperative (or Nash-Cournot) outcome, say m_N. The cooperative outcome,

say m_C, follows from choosing m and m* to minimise the global welfare loss, W+W*. It is easily established that:

$$m_N = \left(\frac{\hat{\sigma}\hat{y}^d}{\hat{\sigma}^2(1-\hat{\lambda})+\vartheta}\right) > m_C = \left(\frac{\hat{\sigma}\hat{y}^d}{\hat{\sigma}^2(1-\hat{\lambda})+\vartheta(1-\hat{\lambda})^{-1}}\right). \qquad (4.20)$$

This leads to the following propositions for an international regime of floating exchange rates and perfect capital mobility:

(i) The non-cooperative outcome leads to a too expansionary monetary policy and thus to too low interest rates and to too high levels of employment and output, because each central bank ignores the adverse consequences of a high money supply on the other country.

(ii) International policy coordination would lead all countries to pay more attention to their inflation objectives and thus to reduce their money supplies.

Hence, in contrast to the longer-run aspects of international coordination of monetary policies to do with public finance and with the global real interest rate and capital accumulation discussed in the previous section, lack of international policy coordination implies a too expansionary (rather than a too tight) monetary stance. Canzoneri and Gray (1985) use a similar welfare-loss function and also find that the non-cooperative policies are too expansionary. They also look at the case where one of the countries, say the US in the era of floating exchange rates, adopts a (Stackelberg) leadership position vis-à-vis the rest of the world. This implies that the US minimises its welfare loss subject to the reaction functions of the rest of the world and therefore the US restricts its money supply by more than the rest of the world. The interesting feature is that a non-cooperative world with US hegemony Pareto-dominates the non-cooperative (Nash-Cournot) world without US hegemony. This suggests that altering the "rules of the game" may be a partial substitute for international policy coordination. (In fact, it can be shown that the situation where the rest of the world fixes the exchange rate, i.e., where the rest of the world chooses exactly the same money supply as the US, is preferred to the US hegemony outcome by the US but not necessarily by the rest of the world).

In the seventies inflation was a very important problem for policymakers in the Western World and, not surprisingly, many Central Banks engaged in

monetary disinflation. For example, the Medium Term Financial Strategy adopted in the UK economy under Mrs. Thatcher attempted to implement gradual reductions in the UK monetary growth rate. Many studies have analysed the potential for international coordination of monetary disinflation programmes (e.g., the papers by Oudiz and Sachs and by others in Buiter and Marston, 1985). These studies have used multiple-country versions of Dornbusch's (1976) famous real-exchange-rate overshooting models (also see van der Ploeg, 1986), which extend the model discussed earlier in this section by replacing the assumption of a rigid nominal wage by an augmented Phillips curve, thereby ensuring that unemployment returns to its natural rate in the long run, and by allowing for rational expectations in the foreign-exchange and in other financial markets. In such models an anticipated reduction in home monetary growth leads to an immediate appreciation of the home real exchange rate, a fall in home employment and output and an increase in foreign employment and output (reflecting the locomotive aspect of a monetary contraction discussed earlier in this Section). The policy problem of each central bank is that they start off with full employment whilst they inherit a too high inflation rate, but that the disinflation policy of cutting monetary growth leads to transient job losses. Typically, one finds that the absence of international policy coordination leads to excessively fast disinflation in all countries. Such a finding may seem counter-intuitive, because one would think that excessive disinflation is a "public good" as far as employment and output is concerned and therefore one would think that non-cooperation would lead to an under-supply of this "public good". However, such arguments ignore the fact that a cut in home monetary growth leads to a depreciation of the foreign real exchange rate and consequently to a higher consumers' price level, so that monetary contraction is a beggar-thy-neighbour policy and thus a "public bad" as far as the inflation target is concerned.

This insight can best be explained and illustrated with the aid of our simple two-country model. Imagine that the welfare-loss function of the home central bank is, instead of (4.18), given by:

$$\underset{m}{\text{Min}} \quad W \equiv \tfrac{1}{2}(y-y^d)^2 + \tfrac{1}{2}\bar{\vartheta}(w-p_c-\bar{\omega})^2, \qquad \bar{\vartheta},\bar{\omega} > 0, \tag{4.18'}$$

where p_c denotes the (log of the) consumers' price level and $\bar{\omega}$ denotes the desired (and positive) real consumers' wage. Hence, the central bank may wish

to increase the real consumers' wage or, alternatively, decrease inflation in the consumers' price index as well as increase employment and output. The consumers' price level is a weighted average of home and foreign producers' prices:

$$p_c = (1-\alpha)p + \alpha(p^*+e) = p + \alpha c, \quad 0 \leq \alpha \leq 1, \tag{4.21}$$

where α denotes the share of imports in total expenditures. It follows that the reduced form of (4.18') can be written as:

$$\underset{m}{\text{Min}} \tfrac{1}{2}[\hat{\sigma}(m-\hat{\lambda}m^*)-y^d]^2 + \tfrac{1}{2}\vartheta(m^*-m-\omega)^2, \ \vartheta \equiv \tfrac{1}{4}\bar{\vartheta}\alpha^2/\delta^2, \ \omega \equiv (2\delta\bar{\omega}/\alpha) > 0. \tag{4.18''}$$

It is a straightforward exercise to show that

$$m_N = (\tfrac{\sigma+\lambda}{\sigma})[y^d - (\vartheta/\hat{\sigma})\omega] < m_C = (\tfrac{\sigma+\lambda}{\sigma})y^d, \tag{4.22}$$

which leads to the following propositions for these more realistic welfare-loss functions:

(i) The non-cooperative outcome leads to a too tight monetary stance and thus to too much unemployment ($y_N=y^d-(\vartheta/\hat{\sigma})\omega<y^d$), because each central bank attempts to export inflation abroad by appreciating its exchange rate.

(ii) The outcome under international policy coordination realises that such competitive appreciations are futile and therefore leads to a looser monetary policy which achieves full employment ($y_C=y_C^*=y^d$).

Note that this is exactly the reverse of the outcome when the nominal money supply rather than real income or the cost-of-living index is the target variable of each central bank. A similar result is obtained by Oudiz and Sachs (1984) and by Canzoneri and Henderson (1987) and is discussed in detail by McKibbin (1987). Roubini (1986) also gets that the Nash-Cournot policies are too contradictionary within the context of a three-country world and also discusses asymmetric supply shocks. The main lesson that follows from this discussion is that the nature of the bias in non-cooperative decisionmaking and the gains from international policy coordination depend crucially on the preferences of the various governments.

So far, this Section has always assumed that a monetary expansion is a beggar-thy-neighbour policy with respect to foreign output, which is common in all analytical Mundell-Fleming models with nominal wage rigidity, floating exchange rates and perfect capital mobility. However, some argue nevertheless that a monetary expansion is a locomotive policy with respect to foreign output (e.g., Minford, 1985). The reason is that we have been concerned with a bond-financed monetary expansion, i.e., the central banks purchase bonds from the private sector, whilst a monetary expansion could also be associated with a looser fiscal stance, i.e., lower taxes or higher government spending. Since a fiscal expansion is a locomotive policy (see equation (4.17) and Section 4), it is quite possible that in empirical work a monetary expansion accompanied by a looser fiscal stance can be a locomotive rather than a beggar-thy-neighbour policy. Incidentally, this is exactly what was found in the public-finance model discussed in Section 4.2. Hence, it should be no surprise that under such circumstances the monetary stance will, in the absence of international policy coordination and given the welfare-loss function (4.18) with its emphasis on employment and output, be too tight rather than too loose.

The discussion of Sections 4.2 and 4.3 is more relevant for transatlantic than for European coordination on international regimes of floating exchange rates and therefore of monetary policies, but Sections 4.1 and 4.4-4.8 are more relevant for European policy coordination.

4.4. Fixed exchange rates, perfect capital mobility and the problem of unemployment

We have already pointed out in Section 4.2 that in a regime of fixed exchange rates the scope for each central bank to raise seigniorage revenues is much less than in a regime of floating exchange rates (also see Chapter 7 which points out that seigniorage revenues are actually a very small proportion of total government revenues) and that therefore the public-finance aspects of international policy coordination become even more relevant. These aspects will be very briefly discussed in Chapter 5. On the other hand, we have also pointed out in Section 4.2 that the need for international coordination of monetary policies, as far as the effects on the real interest rate and

capital accumulation are concerned, are much less in a regime of fixed exchange rates than in a regime of floating exchange rates, because none of the countries can isolate its inflation rate from the other inflation rates. This Section is concerned with the short-run trade-offs and short-run international spill-over effects of monetary policy in an interdependent world with perfect capital mobility and unemployment caused by rigid nominal wages.

We will adapt the model developed in Section 4.3 to allow for fixed, rather than floating exchange rates. It is easy to show that a symmetric regime of fixed exchange rates, i.e., a European Monetary Union (see Section 5.4) automatically sustains the cooperative outcome in the face of global supply shocks (Roubini, 1986). However, we assume that the foreign central bank (say, the German Bundesbank), chooses its monetary policy (m^*) whilst the home central bank (say, the Dutch, French or Italian central bank) pegs its exchange rate to the foreign currency (e). Such an asymmetric regime is in accordance with the view that the European Monetary System operates as a greater Deutschmark-zone; for a discussion of the evidence on this proposition see Chapter 7. Obviously, this means that the home money supply (m) has become an endogeneous variable. The mechanism is as follows. If there is pressure on the home exchange rate to depreciate ($e\uparrow$) arising from a balance-of-payments deficit, then the home central bank supplies home households with foreign currency in exchange for home currency in order that home households can import the goods they want. In other words, the home central bank defends its exchange rate by buying up its own currency and selling foreign currency. It follows that a balance-of-payments deficit leads to an equal reduction in the home money supply. Similarly, if there is pressure on the home exchange rate to appreciate arising from a balance-of-payments surplus, then the home central bank exchanges foreign currency for home currency, in order to meet the need of home exporters and foreign importers, and this leads to an increase in the home money supply. Hence, the main feature of a regime of fixed exchange rates is that the central banks of Europe, other than the Bundesbank, can no longer conduct an independent monetary policy. This is the reason why the monetary policy conducted by the central bank of the Netherlands is very much determined by the monetary policy of the Bundesbank; it is almost impossible to conduct an independent monetary and exchange rate policy. However, it is possible in the short run to sterilise the effects of the balance of payments on the money supply. For example, a balance-of-payments surplus can be

sterilised by an open market sale of bonds to the private sector of equal magnitude so that the home money supply is unaffected. Similarly, a balance-of-payments deficit can be sterilised when the central bank purchases the right amount of bonds from the private sector.

An international regime of fixed exchange rates, in the absence of sterilisation policy, simply imvolves making the home money supply an endogeneous variable and the exchange rate an exogeneous variable, so that equations (4.15)-(4.17) can be rewritten in the following form (after considerable algebra):

$$r = r^* = [-\delta e - m^* + \gamma f + f^* + \delta(w+\tau) + (1-\delta)(w^*+\tau^*)] \,/\, (\sigma+\lambda) \qquad (4.23)$$

$$m = 2\delta e + m^* + (1-\gamma)(f-f^*) + (1-2\delta)(w+\tau-w^*-\tau^*) \qquad (4.24)$$

$$y = 2\hat{\sigma}\delta(e-w-\tau) + [\sigma m^* + ((1-\gamma)\sigma+\lambda)f - ((1-\gamma)\sigma-\gamma\lambda)f^* - ((1-2\delta)\sigma-\delta\lambda)(w^*+\tau^*)] \,/\, (\sigma+\lambda) \qquad (4.25)$$

$$y^* = -2\hat{\sigma}\hat{\lambda}\delta(e-w-\tau) + [\sigma m^* + \lambda(\gamma f+f^*) - (\sigma+\lambda\delta)(w^*+\tau^*)] \,/\, (\sigma+\lambda). \qquad (4.26)$$

An increase in the German money supply ($m^*\uparrow$) leads to an equal increase in the French, Italian or Dutch money supply and thus to a twice as large a fall in the European interest rate as would be the case under an international regime of floating exchange rates. The reason for the increase in the non-German money supply is that the non-German central banks are defending themselves against an appreciating currency by buying up foreign reserves and selling their own currency. Since the fixed exchange rate implies that there is no net effect on net exports arising from changes in relative prices, it is clear that employment and output in Germany and the rest of Europe increase due to the increase in consumption and investment arising from a lower interest rate in Europe. This increase in output in each country is smaller than the increase in output in Germany under floating exchange rates, because the beneficial effects on net exports of depreciating exchange rates do not occur under a regime of fixed exchange rates. The main point to remember is that a German monetary expansion is, as far as employment and output are concerned, a locomotive (rather than a beggar-thy-neighbour) policy under a regime of fixed (rather than floating) exchange rates.

Now consider the effects of a devaluation of the French, Italian or Dutch currency (e↑) vis-à-vis the Deutschmark. This leads to an improvement in net exports of the rest of Europe to Germany and thus to an increase in non-German employment and output and to a decrease in German employment and output. To choke off the resulting excess supply of German money, the European interest rate falls and as a result the non-German money demand increases in line with the non-German money supply. Hence, as far as employment and output is concerned, a devaluation of the French, Italian or Dutch currency is a beggar-thy-neighbour policy. Since the world supply of money increases, the European interest falls and thus the increase of output in the rest of Europe exceeds the fall in German output and, similarly, the non-European consumers' price level increases, by more than the German consumers's price level falls. Hence, from equation (4.20) it is clear that non-German consumers' prices increase as a result of a non-German devaluation whilst German consumers' prices decrease. Hence, as far as the real-income target is concerned, a revaluation of the French, Italian of Dutch currency is a beggar-thy-neighbour policy.

McKibbon and Sachs (1986a,b) compare the usefulness of international policy coordination under regimes with floating exchange rates to regimes with fixed exchange rates within the context of their multi-country model calibrated to the main OECD economies. They use differential game theory to derive the non-cooperative outcome and optimal control theory to derive the cooperative outcome. In the derivation of the best monetary policy for each of the central banks they assume that all bilateral exchange rates are irrevocably fixed as they would be in the McKinnon (1986) proposal of fixed exchange rates for the world economy in which the weighted sum of the national money supplies is assumed to be exogeneous or as they would be under US hegemony of Bretton Woods or under German hegemony of the European Monetary System so that N-1 of the bilateral exchange rates are irrevocably fixed and the N-th country determines the money supply. The former is a symmetric system, whereas the latter is an asymmetric system. The comparison is relevant for the proposals of full monetary union in Europe. Some argue that Bretton Woods operated as a dollar standard and thus as an asymmetric system. The reason is that, even though the numeraire of Bretton Woods was gold, the fixed dollar price of gold was considered to be the foundation of the whole system, which is reflected in the fact that only countries other than the US changed their gold parity and thus their

dollar exchange rate. In any case, if exchange rates are irrevocably fixed there is not much scope for monetary policy and therefore coordination of fiscal policy is a more relevant issue. Hence, we will postpone the discussion of the potential gains of international coordination of fiscal policies under alternative exchange rate regimes (and the work of McKibbin and Sachs (1986a; b) to Chapter 5.

4.5. Managed exchange rates, the EMS and the problem of unemployment

Let us now consider a regime of managed exchange rates (also sometimes called a reserve currency system), that is Germany chooses its money supply to maximise its welfare whilst the rest of Europe chooses its exchange rate vis-à-vis the Deutschmark to maximise their welfare. Such a regime may be more realistic than one would think at first sight, because since 1980 more than 140 countries seem to be classified by the International Monetary Fund as pegging their currencies in some way or another. Hence, a regime in which countries manage their exchange rates may be more relevant in many circumstances than a regime of rigidly fixed exchange rates or a regime of a "clean" float. It is also the case that an asymmetric exchange-rate regime is quite realistic; particularly, in the light of the "N-1 problem" which says that not all the N countries can independently control their exchange rates as only N-1 of them are independent bilateral exchange rates (see Mundell, 1968). Such an asymmetry in the management of exchange rates seems to have been relevant for Bretton Woods where the US dollar acted as the central or numeraire currency and also seems to be relevant for the European Monetary System where the Deutschmark can be viewed as the numeraire currency (also see Giovannini, 1988). Until full monetary union is achieved in Europe, the European Monetary System can be viewed as an arrrangement where exchange rates are neither floating nor irrevocably fixed and where the European monetary stance is almost wholly determined by the Bundesbank. Hence, this Section will be concerned with the European Monetary System rather than with full monetary union in Europe. It will assume that the Bundesbank has full control of the German money supply and gives up any control of the intra-European exchange rates whilst the other European central banks have full control of their exchange

rates vis-à-vis the Deutschmark and give up any control of their money supplies.

We will also assume that the financial markets of Europe are highly integrated, so that the rates of return on the bonds issued by the various European governments must be equalised. Since the European Monetary System is a system of managed exchange rates, speculative attacks on the currency and balance-of-payments crises can occur whenever the private sector expects a devaluation of the currency. Some of the European countries, e.g., Italy and France, have used capital controls as a means of avoiding such speculative attacks. This is the reason that perfect capital mobility does not yet always hold in Europe, as can be witnessed from the differential between off-shore and on-shore interest rates. It suggests that the abolition of capital controls in Europe may not be feasible unless Europe also moves to full monetary union with irrevocably fixed exchange rates (see Chapter 7). We will abstract in this chapter from such issues and thus assume that the European Monetary System is characterised by perfect capital mobility.

We will assume that each central bank is concerned about unemployment and real income (or the cost-of-living) in its own country, so that the welfare-loss function (4.18') will be used. This implies from (4.18'), (4.21) and (4.25)-(4.26) the following reduced-form welfare-loss functions:

$$\min_{e} W = \tfrac{1}{2}[2\hat{\sigma}\delta e + (\tfrac{\sigma}{\sigma+\lambda})m^* - y^d]^2 + \tfrac{1}{2}\bar{\vartheta}\alpha^2[e + (\bar{\omega}/\alpha)]^2 \qquad (4.27)$$

$$\min_{m^*} W^* = \tfrac{1}{2}[-2\hat{\sigma}\hat{\lambda}\delta e + (\tfrac{\sigma}{\sigma+\lambda})m^* - y^d]^2 + \tfrac{1}{2}\bar{\vartheta}\alpha^2[e - (\bar{\omega}/\alpha)]^2 \qquad (4.28)$$

Note that the Bundesbank has lost control over the exchange rate and has therefore lost control over its real-income target. The reaction function for the Bundesbank is upward-sloping and given by

$$m^* = (\tfrac{\sigma+\lambda}{\sigma})y^d + (\tfrac{\lambda\delta}{\sigma})e, \qquad (4.29)$$

so that it reacts with a monetary expansion when the other central banks of Europe attempt to devalue their currency and thereby cause German employment and output losses (see Fig. 4.2). The reaction function of the non-German central banks is downward sloping and given by

$$e = \left(\frac{2\hat{\sigma}\delta[y^d - (\frac{\sigma}{\sigma+\lambda})m^*] - \bar{\vartheta}\alpha\bar{\omega}}{4\hat{\sigma}^2\delta^2 + \bar{\vartheta}\alpha^2}\right), \tag{4.30}$$

so that when the Bundesbank increases its money supply and thereby increases non-German employment and output as well, the other central bank can afford to pay more attention to their real-income target and thus react with a revaluation of their exchange rate vis-à-vis the Deutschmark (see Fig. 4.2). The non-cooperative (or Nash-Cournot) outcome, say e_N and m_N^*, corresponds to the intersection of the reaction curves (4.29) and (4.30) and is given by (also see Fig. 4.2):

$$e_N = -\left(\frac{\vartheta}{2\delta(\vartheta+\hat{\sigma})}\right)\omega < 0 \tag{4.31}$$

$$m_N^* = \left(\frac{\sigma+\lambda}{\sigma}\right)y^d - \left(\frac{\lambda\vartheta}{2\sigma(\vartheta+\hat{\sigma})}\right)\omega. \tag{4.32}$$

Upon substitution into (4.23)-(4.26), one obtains:

$$m_N = 2\delta e + m^* = \left(\frac{\sigma+\lambda}{\sigma}\right)y^d - \left(\frac{(2\sigma+\lambda)\vartheta}{2\sigma(\vartheta+\hat{\sigma})}\right)\omega < m_N^* \tag{4.33}$$

$$r_N = r_N^* = -(\delta e+m^*) / (\sigma+\lambda) = -[y^d - \tfrac{1}{2}\vartheta(\vartheta+\hat{\sigma})^{-1}\omega] / \sigma \tag{4.34}$$

$$y_N = y^d - \vartheta(\vartheta+\hat{\sigma})^{-1}\omega < y^d \tag{4.35}$$

$$y_N^* = y^d > y_N. \tag{4.36}$$

It follows that the resulting welfare losses for the home and foreign country are given by:

$$W_N = \tfrac{1}{2}\vartheta\omega^2[(\vartheta+\hat{\sigma}^2)/(\vartheta+\hat{\sigma})^2] > 0 \tag{4.37}$$

$$W_N^* = \tfrac{1}{2}\vartheta\omega^2[(2\vartheta+\hat{\sigma})/(\vartheta+\hat{\sigma})]^2 > W_N > 0 \tag{4.38}$$

Before we move on to a discussion of the economic intuition behind these results, we present the outcome under international policy coordination. This outcome is obtained by simultaneously choosing the German money supply (m^*)

and the exchange rate (e) to maximise European welfare ($-W-W^*$) and leads to $e_C=0$, $y_C=y_C^*=y^d$,

$$m_C = m_C^* = (\frac{\sigma+\lambda}{\sigma})y^d > m_N^* > m_N, \tag{4.39}$$

$r_C = r_C^* = -y^d/\sigma$, $(w-p_C)_C = (w-p_C)_C^* = 0$ and

$$0 < W_N < W_C = W_C^* = \tfrac{1}{2}\vartheta\bar{\omega}^2 = \tfrac{1}{2}\vartheta\omega^2 < W_N^*, \tag{4.40}$$

where the subscript "C" denotes the cooperative outcome.

To aid the interpretation of the results, let us consider the effects of an adverse common demand shock arising from a European program of fiscal deflation or, perhaps, from a fall in US demand for European products (say, $f=f^*=d<0$). Without any adjustment in monetary policies, it is clear from equations (4.25) and (4.26) that employment and output in both countries fall by the same amount ($\partial y/\partial d=\partial y^*/\partial d=\lambda(1+\gamma)/(\sigma+\lambda)>0$) whilst real income in both countries remain unaffected. This means that, if both countries start from a position of full employment, then a positive target and a zero real-income target ($y^d>0$, $\omega=0$) are warranted. Similarly, also consider the effects of an adverse common supply shock arising from, for example, a common increase in the European tax wedge, a common detoriation in productivity or an increase in oil prices ($\tau=\tau^*=s>0$). It follows that employment and output throughout Europe fall by the same amount ($\partial y/\partial s = \partial y^*/\partial s = -\sigma/(\sigma+\lambda) < 0$) and that real incomes fall in the same proportion ($\partial(w-p_C)/\partial s = \partial(w^*-p_C^*)/\partial s = -1$), so that both a positive output target ($y^d = \sigma s/(\sigma+\lambda) > 0$) and a positive real-income (or cost-of-living) target ($\omega=s>0$) are warranted.

It is now possible to summarise the results on coordination of monetary policies within the European Monetary Sytem with the following propositions:

(i) Coordination of monetary policies within Europe leads each central bank to attain full employment exactly, both under a floating and under a managed intra-European exchange rate. In both cases, this is achieved with an equal increase in all European money supplies leading to a fall in the European interest rate, whilst real incomes and the intra-European exchange rates are unaffected. This holds for common shocks in both demand and supply.

(ii) A common demand shock to all European countries leads under a managed intra-European exchange rate and non-cooperation to exactly the same outcomes as under cooperation within Europe.

(iii) A common adverse supply shock to all European economies leads, under a managed intra-European exchange rate and non-cooperation, to an appreciation of the lira, franc and guilder vis-à-vis the Deutschmark, even though the European economies have identical structures. Hence, the non-German economies use a real appreciation to disinflate away the adverse consequences of the common supply shock. This is achieved by the Bundesbank expanding its money supply by more than the other European central banks, Germany achieves full employment but does not score at all on its real-income target, whereas the rest of Europe does not score so well on the employment-target but achieves, with the aid of an appreciation, also on the real-income target. It can be shown that the rest of Europe achieves a smaller welfare loss than Germany, so that the exchange-rate realigment allows the rest of Europe to reduce the damage to its welfare at the expense of Germany. It is even the case that the rest of Europe does better than under coordination, whilst Germany does worse than under coordination.

The beggar-thy-neighbour policy of the rest of Europe, following a common supply shock, works because it has complete control of the intra-European exchange rate. The result under (iii) should be compared with the case of floating exchange rates, discussed in Section 4.3 (see equation (4.22)) and also discussed in Canzoneri and Gray (1985), where both cuntries respond with an excessive monetary contraction after an adverse supply shock and futile attempts to impose beggar-thy-neighbour policy thereby leaving the exchange rate unaffected. In fact, when there is no cooperation within Europe, the German money supply is greater under a managed than under a floating intra-European exchange rate. Also, note that cooperation within Europe leads to fixed exchange rates and may therefore facilitate the move towards European Monetary Union. However, intra-European exchange rates need no longer remain fixed when European economies do not have identical structural coefficients, even when the European economies coordinate and are hit by identical shocks (see Section 4.7). This suggests that the completion of a common European market may be a prerequisite for full monetary union within Europe. Also, note that a regime of irrevocably fixed exchange rates (see Section 4.4) can mimic

the outcomes under international policy coordination because beggar-thy-neighbour policies are ruled out by construction.

Giavazzi and Giovannini (1986) obtain similar results to the ones discussed so far with a model that does not have the real exchange rate affecting real income and thus welfare, but that does have the real exchange rate affecting aggregate supply through the usage of imported intermediate goods. They show that, under non-cooperation, a managed intra-European exchange rate and a country-specific demand shock, it is also possible for Germany to be better, rather than worse, off than the rest of Europe. This result derives from the negative spill-over effects of exchange rate changes which in part relieve Germany from the overcontraction/overexpansion bias in monetary policy under non-cooperative decisionmaking.

The main lessons seem to be that a non-cooperatively managed exchange rate can be realigned even when the structure of the economies and the shocks are symmetric and that the potential gains from international policy coordination depend crucially on the nature of the shocks hitting the economies.

4.6. A model for Germany, the rest of Europe and the US

So far, we have looked at the coordination of monetary policies under floating exchange rates, fixed exchange rates and managed exchange rates and Sections 4.3, 4.4 and 4.5 really only considered interactions between two countries, say Germany and the rest of Europe or the US and the rest of the world. It turns out that, from a theoretical or from an empirical point of view, it is important to analyse the interactions between at least three countries, because it may well be that cooperation within Europe may be counterproductive for this might provoke an adverse response from the US monetary authorities (also see Chapter 6). In other words, cooperation within the European Monetary System may well worsen the "game" between the US and the European economies. There is also another reason why it is essential to move to an analysis of at least three countries. In Section 4.5 we showed that in an international system made up of only two countries (say Germany and the rest of Europe), whose central banks act in a cooperative fashion, it is equivalent whether they do so by using as their policy instruments their respective money supplies (as in an international regime of floating exchange

rates) or one of the two money supplies (say, the German money supply) and the exchange rate (as in a regime of managed intra-European exchange rates). However, we shall show in this section that this equivalence is no longer valid in an international system made up of three or more countries. In fact, if the third country (the US) behaves as a Stackelberg leader vis-à-vis Europe and if the European countries cooperate, then it will act differently depending on the type of European reaction function it faces and this will be different under floating and under managed exchange rates. In other words, the European reactions to US monetary policy differ under floating and managed intra-European exchange rates and, as the US leads and thus exploits the European reactions to its policy, the outcome under international policy coordination within Europe will depend on the particular exchange-rate regime prevailing in Europe.

We will discuss the study of Basevi and Giavazzi (1987). This uses a three-country model very similar to the model we have used so far. It also assumes that each country is specialised in the production of it own good, that the three goods are imperfect substitutes in the consumption of each country, that there is perfect mobility of financial assets so that interest rates are equalised throughout the three countries (cf., equation 4.10), that there is no currency susbsitution, and that factors of productions can not be transferred from one country to another country. Amending the notation we have used so far by denoting countries by the subscript i (i=1 denotes the US; i=2 denotes Germany; and i=3 denotes the rest of Europe), we can summarise the model as follows:

$$y_i = -\bar{\sigma}r + \sum_{j\neq i} \bar{\delta}_{ij}c_{ij} + \bar{f}_i + \sum_{j\neq i} \bar{\gamma}_{ij}y_j + \varepsilon_{di} \tag{4.41}$$

$$m_i - p_i = y_i - \lambda r + \varepsilon_{mi} \tag{4.42}$$

$$y_i = -\beta(w_i + \tau_i - p_i) + \varepsilon_{si} \tag{4.43}$$

$$w_i = \zeta_i p_{ci}, \quad 0 \leq \zeta_i \leq 1, \tag{4.44}$$

$$p_{ci} = \alpha_{ii}p_i + \sum_{j\neq i} \alpha_{ij}(p_j + e_{ij}) = p_i + \sum_{j\neq i} \alpha_{ij}c_{ij}, \ \sum_j \alpha_{ij} = 1 \tag{4.45}$$

$$c_{ij} \equiv p_j + e_{ij} - p_i \qquad (4.46)$$

for $i=1,2,3$, where ε_{di}, ε_{mi} and ε_{si} denote, respectively, a demand shock, a money-supply shock and a supply shock in country i. Note that the model is general enough to be extended to more than three countries. Equations (4.41) and (4.42) are the usual IS-curves (cf., equations (4.6)-(4.7)) and LM-curves (cf., equations (4.8)-(4.9)) for each of the countries. Equations (4.45) define the cost-of-living indices for each of the countries in the usual way, where α_{ij} now denotes the share of imports from country j in total expenditures of country i. Equations (4.46) define the real exchange rates, that is the relative price of country j's goods in terms of country i's goods. Arbitrage on the foreign exchange market ensures that $e_{23}=e_{13}-e_{12}$ and that $c_{23}=c_{13}-c_{12}$. The mark-up hypothesis for price formation, as encapsulated in equations (4.11)-(4.12), has been replaced by the equations for aggregate supply, (4.43)-(4.44). As the coefficient β tends to infinity, the two models for aggregate supply become the same. Equations (4.43) are the output-supply functions, which show that labour demand and the supply of goods in each country are a decreasing function of the real producers' wage. Equations (4.44) imply that labour supply is perfectly elastic with respect to the nominal wage. Instead, nominal wages are indexed to the consumers' price index. An indexation coefficient of unity ($\zeta_i=1$) implies <u>real wage rigidity</u>, so that monetary policy is completely ineffective (as already mentioned in Section 4.3). In other words, doubling the money supply leads to a doubling of the exchange rate and of all wages and prices and thus leaves employment and output unafffected. However, there may be longer run non-neutralities from changes in monetary policy arising from associated changes in distortionary tax rates or from changes in real interest rates and capital accumulation (see Section 4.2). A zero indexation coefficient ($\zeta_i=0$) implies pure <u>nominal wage rigidity</u> and implies that a percentage increase in prices leads to an equal percentage cut in real wage and thus to an increase in output of β percentage points. In general, there will be partial indexation ($0<\zeta_i<1$) and monetary policy will still be non-neutral albeit somewhat less than under nominal wage rigidity. Since this model is now rather cumbersome to solve, numerical analysis will be used. The symmetric parameter values are $\bar{\sigma}=0.5$, $\lambda=2$, $\beta=3$, $\zeta_1=\zeta_2=\zeta_3=0.5$, $\alpha_{11}=0.9$, $\alpha_{12}=\alpha_{13}=0.05$, $\alpha_{21}=\alpha_{31}=0.1$, $\alpha_{22}=\alpha_{33}=0.7$, $\alpha_{23}=\alpha_{32}=0.5$,

$\bar{\delta}_{12}=\bar{\delta}_{21}=\bar{\delta}_{13}=\bar{\delta}_{31}=0.1$, $\bar{\delta}_{23}=\bar{\delta}_{32}=0.5$, $\bar{\gamma}_{12}=\bar{\gamma}_{13}=0.3$, $\bar{\gamma}_{21}=\bar{\gamma}_{31}=1.3$ and $\bar{\gamma}_{23}=\bar{\gamma}_{32}=1.0$. Finally, the welfare loss functions are (cf., equation (4.18')) given by

$$W_i = y_i^2 + \bar{\theta}_i \, (w_i - p_{ci})^2, \tag{4.47}$$

where $\bar{\theta}_1=\bar{\theta}_2=\bar{\theta}_3=4$, and are equivalent to

$$W_i = y_i^2 + \hat{\theta}_i \, p_{ci}^2, \quad \hat{\theta}_i \equiv \bar{\theta}_i(1-\zeta_i)^2 \tag{4.47'}$$

Hence, a real-income target is equivalent to a cost-of-living target unless full indexation is present. The desired values for the target variables are assumed to be zero, but shocks in the demand for goods, the demand for money and the supply of goods can move the target variables away from zero and thus can warrant action from the monetary authorities.

The parameter values presented above give a symmetric structure to the system of interdependent economies. To allow for more realism, attention will also be given in Section 4.7 to an asymmetric set of coefficients. To be precise, the country-specific parameter values will then be $\zeta_3=0.7$, as the rest of Europe (particularly Italy) has a greater degree of wage indexation than Germany or the US, $\alpha_{31}=0.2$ and $\alpha_{32}=0.1$, as the rest of Europe imports a greater share from the US than Germany, $\bar{\delta}_{13}=\bar{\delta}_{31}=0.2$ and $\bar{\delta}_{23}=\bar{\delta}_{32}=0.5$. Hence, the countries can not only be different as a result of an asymmetric type of exchange-rate system (e.g., see Section 4.5) but they can also be different in their respective macroeconomic structural coefficients or they can be hit by asymmetric shocks. This provides an additional reason why the exchange rate may be adjusted, that is to redistribute the effects of such structural asymmetries.

Before we move on to Section 4.7, we should point out that any global or country-specific shock in the velocity of circulation and money demand can <u>exactly</u> be off-set by changes in the national money supplies and therefore such shocks never give rise to problems of international policy coordination. The reason is that such shocks are completely observable by the central banks, but in any case they can then for purposes of the present analysis without loss of generality be ignored ($\epsilon_{mi}=0$, i=1,2,3).

4.7. Interaction between Germany, the rest of Europe and the US under alternative exchange-rate regimes

This section discusses the numerical results obtained by Basevi and Giavazzi (1987) and then continues with a summary of related research. We will reproduce the result obtained in Section 4.5, that is in a non-cooperative regime of managed exchange rates there is every reason to realign the exchange rate even when the countries are hit by identical shocks and have identical structural coefficients. This means that:

> "the view that economic integration of the countries of the European economies, if understood as a process of homogenising their economic structures, would create by itself a lasting monetary union (i.e. for an area within which exchange rates remain unchanged) is wrong; yet it is correct if understood as a process leading to harmonisation, i.e. coordination of economic policies. However, this is true if also the shocks that hit the countries, and not just their structures, are identical".

(Basevi and Giavazzi, 1987, p. 139). In other words, it can be argued that coordination of monetary policies within Europe will facilitate the movement towards monetary union in Europe only as long as the European economies are hit by identical shocks and have identical structures.

The results presented in Table 4.1, 4.2 and 4.3 show the effects of a positive demand shock in the US economy and of a positive global supply shock (e.g.,due to a fall in oil prices) and confirm the above discussion. Considering the results in Table 4.1 first, we see that under floating exchange rates the European economies act in a symmetric way, as each of them controls its own money supply, and therefore there is no realignment of the intra-European exchange rate following either of the two shocks. Following the demand shock in the US, the European economies all depreciate their currencies vis-à-vis the dollar (by 12.9 or 8.9 %), so that the guilder depreciates both in nominal (by 4.1 or 2.9 %) and in real (by 3.2 or 2.5 %) effective terms. This corresponds to an increase in the relative price of US goods. A common supply shock leaves again the intra-European exchange rate unaffected, but leads to an appreciation of the European currrencies (by 3.1 or 9.8 %) and the guilder appreciates both in nominal and real effective terms. Under a regime of managed exchange rates the intra-European exchange rate is modified even

though the economic structure of the European economies are identical and they are hit by identical shocks. With a positive shock in US demand, the guilder depreciates both vis-à-vis the Deutschmark and the dollar. As a result, the effective nominal depreciation is 5.5 % and the improvement in the Dutch competitive position is 4.2 %. With a common supply improvement, the guilder appreciates vis-à-vis both the Deutschmark and the dollar. Table 4.1 also shows that a regime of managed exchange rates is qualitatively similar to a regime of floating exchange rates with Germany taking the role of Stackelberg leader. Hence, whenever countries within Europe have asymmetric roles, the intra-European exchange rate will vary even when the European economies are hit by identical shocks. It follows that German leadership in the European Monetary System is no substitute for cooperation within Europe.

Now consider the results presented in Table 4.2, which assumes identical strucures for the European economies. We note immediately that structural symmetry and cooperation within Europe never leads to changes in the intra-European exchange rate. Another interesting feature of Table 4.2 is the difference between floating and managed exchange rates given that the US adopts the role of Stackelberg leader. When the US monetary authorities adopt a leaderhip role, the US acts differently depending on the reaction function it faces, which differs under a floating or a managed intra-European exchange rate. Hence, the European central banks are, even though they cooperate with each other, forced to respond with different exchange-rate changes to the different strategy of the US. This is the reason that, with a shock to US demand (world supply), the European currencies depreciate vis-à-vis the dollar by 8.4 % (5.6 %) under a managed intra-European exchange rate. Obviously, this difference between floating and managed exchange rates does not occur when the US adopts a more passive role in the world economy. Finally, Table 4.3 repeats the results in Table 4.2 with asymmetric and thus more plausible parameter values. The main conclusion is that with structural asymmetries cooperation within Europe requires changes in the intra-European exchange rate even though the European economies cooperate and are hit by identical shocks.

The main conclusion of Sections 4.5-4.7 can be formulated as follows: The completion of the European Common Market leads to more identical structures and therefore may facilitate the movement of the European Community towards an optimal currency area.

Melitz (1986) considers the response of the European Monetary System to an exogeneous depreciation of the dollar. He assumes that Germany dislikes inflation more than the rest of Europe, so that the depreciation of the dollar suits Germany more than the rest of Europe. Given this set-up, no realignment can resolve the conflict between Germany and the rest of Europe. Hence, France has to accept exclusive responsibility for defending the jointly determined parity. However, it may not be in the interests of the French nor even, possibly, the Germans for France to do so. It follows that a depreciation of the dollar may cause the European Monetary System to fall apart and may cause, in theory at least, a return to a non-cooperative float. This scenario may have some relevance when George Bush has to cut US government spending (and/or raise US taxes) in order to get the US government's finances in order, because this would also require a depreciation of the dollar.

4.8. The costs of monetary union in Europe

As is argued in Section 3.5 and Chapter 7, monetary union in Europe is desirable from a number of points of view. For example, monetary union implies irrevocably fixed exchange rates and eventually a common European Currency Unit which saves a lot of bother and transaction costs. Also, realignments of intra-European exchange rates, even though cooperative, will be anticipated by the financial markets and thus induce a balance-of-payments crisis and a run on the reserves of the central bank whose currency is expected to be devalued. To prevent such speculative attacks, some countries (particularly Italy and France) have resorted to restrictions on the international movement of financial assets and other countries (e.g., Belgium) have resorted to a two-tier (off-shore and on-shore) exchange-rate system. Hence, one can argue that free movement of financial assets within Europe is not feasible without full monetary union in Europe. However, Sections 4.5 and 4.7 have showed that monetary union (i.e., irrevocably fixed exchange rates) are sub-optimal when countries, even when hit by identical shocks, do not have identical structures. The European Monetary System can be viewed as an intermediate stage between managed exchange rates and monetary union in Europe.

To assess these costs of monetary union, Basevi and Giavazzi also consider the situation where the US displays a passive and non-cooperative (Nash-Cournot) role in the world economy whilst the European economies either float their currencies and set their money supplies in a non-cooperative fashion or float their currencies and set their money supply in a cooperative fashion or cooperate under the constraint of a fixed intra-European exchange-rate. For both the cases of a positive demand shock to the US economy and a global supply shock, one finds that Germany and the rest of Europe obtain the highest welfare in an international regime of floating exchange rates and non-coperation within Europe. For Germany the second highest welfare is obtained under floating exchange rates and cooperation within Europe, whilst for the rest of Europe the second best is obtained under monetary union and cooperation within Europe. The first lesson from these results is that cooperation within Europe may be counterproductive for this provokes an adverse response from the US (see also Section 6.2). This possibility is well known in game theory, because a coalition among a sub-group of players does not necessarily improve their welfare. The second lesson from these results is that Germany prefers cooperation within Europe without monetary union whilst the rest of Europe prefers cooperation within Europe accompanied with monetary union. Even though these results have some realism, they depend crucially on the structural coefficients of the economic model and welfare-loss functions. It is possible, with different coefficients, for both Germany and the rest of Europe to prefer European cooperation with monetary union rather than with floating intra-European exchange-rates but the rest of Europe will always have a greater preference for monetary union than Germany.

A similar exercise can be performed to analyse the costs of the European monetary "snake" in which intra-European exchange rates must remain within pre-specified margins of fluctuations. The qualitative conclusions about the costs and preferences for a "snake" are not too different from the ones for monetary union in Europe.

4.9. Effects of the completion of the European Common Market

There have probably been more newspaper articles on "1992" and the completion of the European Common Market than on almost any other topic in

recent years. Although most of the benefits of economic integration throughout Europe are the familiar microeconomic ones to do with the efficiency of free international trade and free movement of factors of production (e.g., WRR, 1986 and the Cecchini Report), there are also some macroeconomic aspects of the completion of the European Common Market. One of the effects of removing all forms of restrictions on intra-European trade in goods is to force a convergence of prices of goods produced in the various European member states, because one of the effects of "1992" and all that is that goods produced in the various member states are more likely to become perfect substitutes. In other words, the "law of one price", also called purchasing power parity ($p=p^*+e$), is more likely to hold once the European Common Market is completed. The models we have used so far have assumed imperfect substitution between home and foreign goods, but perfect substition between home and foreign goods can easily be obtained as a special case ($\bar{\zeta}\to\infty$). The main effect is, of course, that the real exchange rate is constant and independent of policy. Hence, in Section 4.3 on floating exchange rates, consumers' prices and real income are also unaffected by monetary policies (see equations (4.16), (4.18'') and (4.21)) and thus there can be no international conflict in the form of exporting inflation and implementing beggar-thy-neighbour policy vis-à-vis the cost-of-living index and real income either. It follows that the non-cooperative and cooperative outcomes coincide ($\vartheta/\omega=0$ in (4.22)) and full employment is achieved throughout, hence international policy coordination is no longer necessary. Unfortunately, we can not move back to Section 4.4 on managed exchange rates and reconsider the European Monetary System with a European Common Market because fixed nominal wages, prices and real exchange rates already imply a fixed nominal exchange rate which can therefore not be managed. This can easily be solved by the introduction of Phillips-curve effects or aggregate-supply curves, but this exercise is left for a future occasion.

4.10. Summary of the results

We started in Section 4.1 with a regime of irrevocably fixed exchange rates, which is applicable to an analysis of the international conflict over inflation and the balance of payments under the European Monetary System with

German hegemony or, much better, under European Monetary Union. There is a common European inflation rate, which is a weighted average of the European rates of domestic credit expansion (in excess of real growth), and the balance-of-payments ratio for any country is the excess of inflation over its rate of domestic credit expansion. In such a situation the non-cooperative outcome gives a too high (low) European inflation rate when the actual increase in international reserves exceeds (is below) the weighted average of desired balance-of-payments ratios. Hence, an excessive growth in international reserves means that countries defend themselves against reserve accumulation by exporting inflation. The task of a European Central Bank is to ensure that the growth in European Currency Units is such that the total growth in international reserves matches the average desire for accumulating reserves by the central banks of the various European countries.

With floating exchange rates, each country can isolate its inflation rate and there is thus no need for international policy coordination on this front. However, if cutting monetary growth must imply raising alternative revenues from distortionary taxes, then Section 4.2 showed that levels of government spending are too high whilst monetary growth rates are too low because higher taxes are a beggar-thy-neighbour policy as they reduce imports and foreign welfare. Under a European Monetary System or European Monetary Union the scope for raising seigniorage revenues is much less, so that the international coordination of distortionary taxes becomes an even more pressing issue. Section 4.2 continued with arguing that, under floating exchange rates, an expansion of monetary growth leads to a fall in the world real interest rate and a rise in capital accumulation, employment and output throughout the world (the interdependent Mundell Tobin effect). Since inflation increases at home and nowhere else, no country has a wish to carry the burden of reducing the world interest rate and therefore absence of international policy coordination implies a stale-mate in the sense that inflation, monetary growth and activity are too low whilst real interest rates are too high. A regime of fixed exchange rates reduces these inefficiencies considerably, because all countries share the burden as well as the benefits of an increase in monetary growth and consequently there is much less need for international policy coordination.

Section 4.3 focuses on floating exchange rates and the problems of nominal wage rigidity and unemployment. A monetary expansion is now a beggar-thy-neighbour policy as far as employment and output are concerned, so that monetary policy is in the absence of coordination too loose when preferences depend on employment and the nominal money supply. However, when preferences depend on employment and real income or the cost of living, monetary policy is too tight because a monetary contraction is a beggar-thy-neighbour policy as far as real income and the cost of living are concerned. In other words, international cooperation avoids the futile attempts at competitive appreciations of the exchange rate. However, it is easy to show that a European Monetary Union sustains the cooperative outcome and avoids competitive appreciations (Roubini, 1986). Section 4.4 moves on to an asymmetric regime of fixed intra-European exchange rates in Europe with a German hegemony in monetary policy. This means that Germany fixes the money supply whilst the other countries fix the intra-European exchange rates. A German monetary expansion is a locomotive policy as far as employment and output is concerned, whilst a devaluation of the non-German currencies is a beggar-thy-neighbour policy as far as German employment and output is concerned and reduces real incomes outside Germany and increases German real income. Section 4.5 first shows that international policy coordination under the European Monetary System yields the same outcome as under floating exchange rates, that is full employment. A common adverse demand shock leads to the same outcome under cooperation as under non-cooperation within the European Monetary System, that is the European Monetary system avoids the need for international policy coordination in the face of demand shocks. A common adverse supply shock leads under a non-cooperatively managed intra-European exchange rate to a real appreciation of the lira, franc and guilder versus the Deutschmark, even when the structures of the economies are identical. Hence, the countries other than Germany use a real appreciation to disinflate the adverse consequences of a supply shock and thereby achieve a smaller welfare loss than Germany. Section 4.6 extends the model to allow for the US, Germany and the rest of Europe. Section 4.7 then argues that coordination of monetary policies within Europe facilitates the process towards European Monetary Union only when the member states have identical structures and are hit by identical shocks. It also argues that German leadership in the European Monetary System is no substitute for cooperation within Europe. The completion of the European Common Market leads to

more identical structures and thus eases the process towards an optimal currency area. Sections 4.8 and 4.9 briefly comment on the costs of monetary union in Europe and on the effects of European economic integration.

As far as related studies are concerned, Canzoneri and Gray (1985) argue that the move from Bretton Woods to a managed float can be explained by the recent tendency to have more wage indexation in Europe (see Section 5.5), the fact that oil prices are fixed in dollars, and the oil-price hike caused by OPEC in 1973. This suggests a fascinating line of research: which international regime is the best substitute for international policy coordination. Kenen (1987) also starts from the premise that international policy coordination is not perfect and asks the question which exchange-rate regimes allow individual governments to achieve their national objectives without coordination. Kenen finds that the outcome in a two-country portfolio-balance model depends on both the nature of the shock and the prevailing exchange-rate regime, but that fixed exchange rates Pareto-dominate floating exchange rates, in that they obviate the need for international policy coordination, whilst floating exchange rates never dominate a regime of fixed exchange rates (see also Section 4.8 and Chapter 5 for such comparisons for fiscal policies). Kenen (1988) extends the analysis to allow for difference in size and behaviour between the two countries.

Appendix to Section 4.1.

Section 4.1 discussed Hamada's (1976) seminal work on the international conflicts about inflation and the balance of payments in a regime of fixed exchange rates. This work assumes zero capital mobility, but this is not a very realistic assumption for a long-run analysis of the European Monetary System or of a European Monetary Union. Hence, we will allow in this Appendix for perfect mobility of financial assets within Europe. We will also use the notation that is used in Sections 4.3-4.8 and in Chapter 5, so there is a better comparison possible.

The model assumes that there is one reserve-currency country, whose variables will be denoted with an asterisk. Under Bretton Woods this would be the US, under the European Monetary Sytem and German hegemony this would be Germany, whilst under a European Monetary Union this would not be a country but, say, the European Central Bank which issues European Currency Units (ECU's or Monets). In addition, there are i=1,2,...N countries who peg their currencies to the reserve-currency. Note that under the European Monetary System Germany is not included, but under a more symmetric European Monetary Union Germany is included. For simplicity, all countries are assumed to be of the same size. As far as aggregate supply is concerned, we will assume that it cannot be affected by monetary policy. This may be reasonable <u>either</u> under full employment <u>or</u> under real wage rigidity, but in any case output (y^*, y_i, i=1,...,N) is exogeneous. The model can be summarised by the following equations:

$$m_i - p_i = y_i - \lambda r_i, \quad i=1,2,\ldots,N \tag{4.48a}$$

$$m^* - p^* = y^* - \lambda r^* \tag{4.48b}$$

$$r_1 = r_2 = \ldots r_N = r^* \equiv r \tag{4.49}$$

$$p_1 = p_2 = \ldots p_N = p^* \equiv p \tag{4.50}$$

$$\dot{m}_i \equiv \frac{\dot{M}_i}{M_i} = \frac{\dot{M}_i^D + \dot{M}_i^F}{M_i} = (x_i + \dot{y}_i) + z_i, \quad i=1,2,\ldots,N \tag{4.51a}$$

$$\dot{m}^* \equiv \frac{\dot{M}^*}{M^*} = \frac{\dot{M}^{D*} + \dot{M}^{F*}}{M^*} = (x^* + \dot{y}^*) + z^* \qquad (4.51b)$$

$$y_1 + y_2 + \ldots y_N + y^* = -\sigma(r-\pi) + f_1 + f_2 + \ldots f_N + f^* \qquad (4.52)$$

where r_i denotes a nominal interest rate, (M^*, M_i) denotes the money demand, M_i^D denotes domestic credit, M_i^F denotes foreign reserves, $\pi \equiv \dot{p}$ denotes world inflation, $x_i \equiv (\dot{M}_i^D/M_i)$ denotes the balance-of-payments ratio. Equation (4.48) denotes the usual LM-curves, which indicates that money and bonds are close substitutes. Equations (4.49) imply perfect mobility of financial assets, so that interest rates are equalised throughout the region of fixed exchange rates. Equations (4.50) come from the assumption of given real exchange rates and fixed nominal exchange rates and they imply a common inflation rate throughout the region. Real exchange rates are fixed under purchasing power parity (the "law of one price"), which may happen when the European Common Market is finally completed. However, they would also be fixed when home and foreign goods are imperfect substitutes and when the fiscal stance is constant as there is full employment. Equations (4.51) decompose the growth in domestic credit and the endogeneous rate of growth in foreign reserves. The latter component is, in the absence of sterilisation, the balance of payments, because when there is a surplus the central bank sells home currency in exchange for foreign currency and thereby increases its foreign reserves. Finally, equation (4.52) gives the global IS-curve which equates aggregate demand, a negative function of the real interest rate and the various fiscal shocks, to aggregate supply at a world level.

One can solve the above model for global inflation (π) and the various balance-of-payments ratios by adding the LM-curves,

$$(N+1)\pi = \left(\sum_{i=1}^{N} (x_i + z_i)\right) + x^* + z^* + (N+1)\lambda\dot{r},$$

and noting that $z_1 + z_2 + \ldots z_N + z^* = 0$;

$$\pi = \left[\left(\sum_{i=1}^{N} (x_i)\right) + x^*\right]/(N+1) \qquad (4.53)$$

$$z_i = \pi - x_i, \qquad i = 1,2,\ldots,N \tag{4.54a}$$

$$z^* = \pi - x^* \tag{4.54b}$$

where the term $\lambda\dot{r}$ has been dropped in each of these equations as r is stationary when the various fiscal stances are stationary. This is of course almost equivalent to equations (4.1)-(4.2) with the difference being the extension to perfect capital mobility and the allowance for a reserve-currency country (such as the US under Bretton Woods or Germany under the European Monetary System) rather than for a supranational institution issuing international reserves (such as a European Central Bank).

Table 4.1: Non-Cooperative Decisionmaking when Germany and the Rest of Europe have Identical Structural Coefficients*

	Floating exchange rates			Managed exchange rates in Europe
	overall Nash	US leads; Europe follows	US leads; Germany leads in Europe	overall Nash
10 % demand shock in the US ($\varepsilon_{d\ US}$)				
Dfl/$-rate	12.9	8.9	9.1	12.5
Dfl/DM-rate	0.0	0.0	0.4	2.2
Nominal effective rate	4.1	2.9	3.2	5.5
Real effective rate	3.2	2.5	2.7	4.2
10 % global supply shock				
Dfl/$-rate	-3.1	-9.8	-9.4	-2.1
Dfl/DM-rate	0.0	0.0	-1.9	-6.2
Nominal effective rate	-1.0	-3.4	-4.5	-4.8
Real effective rate	-1.5	-3.0	-3.7	-4.0

* The non-European currency is referred to as the Guilder. It could also have been called the lira or the French franc. A depreciation (appreciation) of the guilder is positive (negative). The nominal effective guilder rate is derived from the α_{ij} whilst the real effective rate is derived from the δ_{ij}.

Table 4.2: Cooperation within Europe when Germany and the Rest of Europe have Identical Structural Coefficients*

	Floating exchange rates		Managed exchange rates in Europe	
	US Nash	US leads	US Nash	US leads
10 % demand shock in the US ($\varepsilon_{d\ US}$)				
Dfl/$-rate	9.0	8.2	9.0	8.4
Dfl/DM-rate	0.0	0.0	0.0	0.0
Nominal effective rate	2.9	2.7	2.9	2.7
Real effective rate	2.7	2.6	2.7	2.6
10 % global supply shock				
Dfl/$-rate	7.4	5.2	7.4	5.6
Dfl/DM-rate	0.0	0.0	0.0	0.0
Nominal effective rate	2.4	1.7	2.4	1.8
Real effective rate	-0.1	-0.6	-0.1	-0.5

* The non-European currency is referred to as the Guilder. It could also have been called the lira or the French franc. A depreciation (appreciation) of the guilder is positive (negative). The nominal effective guilder rate is derived from the α_{ij} whilst the real effective rate is derived from the δ_{ij}.

Table 4.3: Cooperation within Europe when Germany and the Rest of Europe have More Realistic Structural Coefficients*

	Floating exchange rates		Managed exchange rates in Europe	
	US Nash	US leads	US Nash	US leads
10 % demand shock in the US ($\epsilon_{d\ US}$)				
Dfl/$-rate	7.2	6.3	7.2	6.8
Dfl/DM-rate	-2.2	-2.0	-2.2	-2.1
Nominal effective rate	4.0	3.5	4.0	3.7
Real effective rate	1.2	1.1	1.2	1.1
10 % global supply shock				
Dfl/$-rate	2.7	0.2	2.7	1.6
Dfl/DM-rate	1.8	2.4	1.8	2.1
Nominal effective rate	2.4	0.9	2.4	1.7
Real effective rate	0.0	-0.3	0.0	-0.1

* The non-European currency is referred to as the Guilder. It could also have been called the lira or the French franc. A depreciation (appreciation) of the guilder is positive (negative). The nominal effective guilder rate is derived from the α_{ij} whilst the real effective rate is derived from the $\bar{\delta}_{ij}$.

Fig. 4.1: Effects of a cut in the home nominal money supply in a two-country model with floating exchange rates and nominal wage rigidity

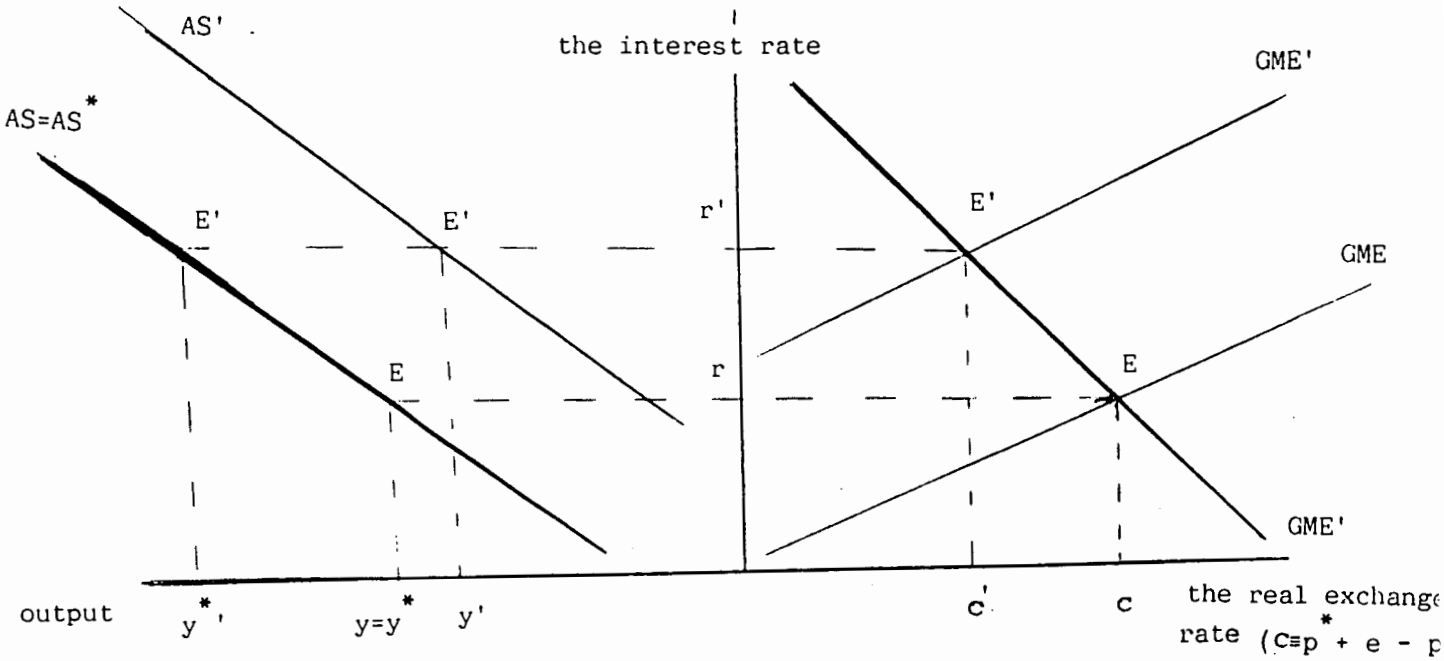
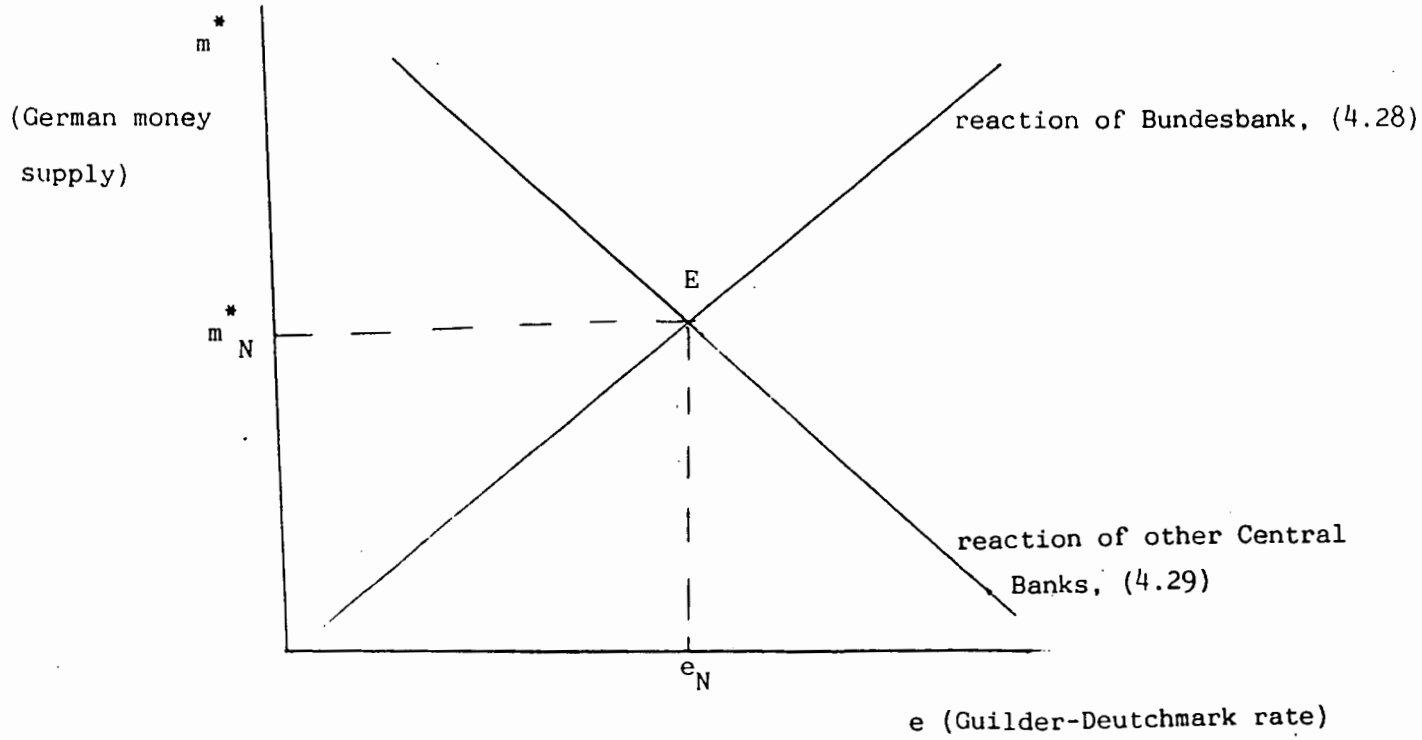


Fig. 4.2: Reaction functions in a world of managed exchange rates



5. International Interdependence and Coordination of Fiscal Policies under Alternative Exchange-Rate Regimes

This Chapter is concerned with the international interdependence and coordination of the fiscal policies of different economies under a variety of alternative exchange-rate regimes. The focus of attention will, as usual, be as much as possible on the European economies. The main questions are, firstly, what is the nature of the bias in fiscal policies caused by the absence of international policy coordination for the various types of exchange-rate regimes and, secondly, which exchange-rate regime acts as a good substitute for international policy coordination. Section 5.1 discusses the short-run and long-run effects of fiscal policies on the real exchange rate and welfare in an interdependent world with floating exchange rates and full employment. Section 5.2 discusses international coordination of fiscal policies in an interdependent world with floating exchange rates and unemployment caused by nominal wage rigidity. It carefully contrasts the results for left-wing and for right-wing governments. Section 5.3 considers the same questions within the context of the European Monetary System, on the assumption that all capital controls have been abolished, and Section 5.4 does the same for a European Monetary Union. Sections 5.2-5.4 give a detailed discussion and comparison of the effects of the three non-cooperative and cooperative exchange-rate regimes on fiscal policies, unemployment, real income, cost of living and welfare.

Section 5.5 gives an empirical overview of the importance of wage indexation in the main OECD economies. It turns out that real wage rigidity is relatively important for Europe and Japan whilst nominal wage rigidity is important for the US. Section 5.6 then discusses the effects of real wage rigidity for coordination of fiscal policies in Europe whilst Section 5.7 discusses the effects of nominal wage rigidity in the US and real wage rigidity in Europe on trans-Atlantic coordination of fiscal policies. Section 5.8 considers a three-country model, say for Germany, France (the rest of Europe) and the US, which allows for a European Monetary Union and a floating trans-Atlantic exchange rate. This allows one to consider the US response to cooperation within Europe on fiscal policies. Finally, Section 5.9 summarises the results.

5.1. Floating exchange rates, zero capital mobility and full employment

In a world characterised by floating exchange rates, zero capital mobility and distortionary taxes on labour income, the main form of externality is that an increase in the tax rate or level of public spending leads to a fall in the home demand for foreign goods. The incipient trade surplus is choked off by an appreciation of the real exchange rate, which reduces foreign consumption of home goods and thus worsens foreign welfare (Kehoe, 1986; van der Ploeg, 1987b; 1988). Hence, as far as welfare is concerned, an increase in taxes or in public spending is a beggar-thy-neighbour policy (also see Sections 4.2 and 6.1). This is the main reason why absence of international policy coordination leads to too high tax rates and levels of public spending. When the adverse effects on foreign welfare are internalised via international policy coordination, then governements reduce taxes and public spending thus increasing output, consumption and leisure.

In a dynamic economy with government debt and foreign debt and international mobility of financial assets the intertemporal aspects of the governments' finances and the current account play an important role. In that case, an increase in the tax rate or the level of public spending leads in the short run to an appreciation of the real exchange rate, but in the long run to a depreciation of the real exchange rate (see van de Klundert and van der Ploeg, 1988). The reason is that the fall in supply and increase in demand lead to trade deficits and over time to an accumulation of foreign debt, which has to be serviced by a trade surplus induced by a depreciation of the real exchange rate in the long run. Hence, in the long run such a policy is a locomotive rather than a beggar-thy-neighbour policy and consequently tax rates and levels of public spending will be too low, rather than too high, in the absence of international policy coordination. Hence, the intertemporal aspects of international policy coordination can be quite important.

5.2. Floating exchange rates, perfect capital mobility and the problem of unemployment

Let us now return to a more short-run perspective and consider the problem of fighting unemployment in an interdependent world. We will consider

first the case of floating exchange rates, which can perhaps best be thought of as a game between the US and Europe (however, see Section 5.7). We will use the two-country model developed in Section 4.3, which is characterised by rigid nominal wages ($w=w^*=0$), imperfect substitution between home and foreign goods and perfect mobility and substitution between home and foreign financial assets. We will think of the Treasury of each government deciding on the fisal stance (f), given the monetary stance adopted by the Central Bank (m). In other words, we will assume that the monetary authorities move in advance of the fiscal authorities. This implies that any change in fiscal policy is financed by issues of bonds, because the money supply in each country is assumed to be constant ($m=m^*=0$). We should be quite clear about what is meant by fiscal policy. A fiscal expansion can be considered as an increase in government consumption or in government investment, which will increase aggregate demand ($f\uparrow$). However, government investment will presumably also improve the infrastructure of the country concerned and therefore will increase productivity and improve aggregate supply ($\tau\downarrow$). Similarly, a cut in taxes increases disposable income and therefore increases aggregate demand ($f\uparrow$) but also reduces the wedge between the producers' and consumers' wage and thus boosts aggregate supply ($\tau\uparrow$). Much of the alleged beneficial impact of tax cuts on the supply side actually operate much more strongly on the demand side in the short run as the predicament in which Mr. Lawson and the UK economy find themselves in demonstrates. Hence, most fiscal policy instruments can be used for a two-handed approach to the fight against unemployment and some argue that such an approach is essential for solving the European uenmployment problem (e.g., Layard and Jackman, 1985; Drèze et al., 1987; Buiter, 1988). The lesson seems to be that the <u>effects of a fiscal expansion depend crucially on what fiscal instruments are used</u>. To focus our ideas, we will adopt the convention that a <u>fiscal demand shock</u> only affects aggregate demand (i.e., f) whereas a <u>fiscal supply shock</u> only affects aggregate supply (i.e., τ). In practice, most changes in fiscal policy instruments can be characterised by combinations of a fiscal demand shock and a fiscal supply shock.

To aid our understanding, we will present the results on the two-country model with floating exchange rates developed in Section 4.3 again:

$$r = r^* = \tfrac{1}{2}[(1+\gamma)(f+f^*) + \tau + \tau^*] \,/\, (\sigma+\lambda) \qquad (5.1)$$

$$c = \tfrac{1}{2}[(1-\gamma)(f^*-f) - \tau + \tau^*] \,/\, \delta \tag{5.2}$$

$$y = \tfrac{1}{2}[(1+\gamma)\lambda(f+f^*) - (2\sigma+\lambda)\tau + \lambda\tau^*] \,/\, (\sigma+\lambda) \tag{5.3}$$

$$w - p_C = \tfrac{\alpha}{2}[(1-\gamma)(f-f^*) + \{1-(\tfrac{2\delta}{\alpha})\}\tau - \tau^*] \,/\, \delta. \tag{5.4}$$

Hence, a fiscal demand expansion in the home country leads, as it is assumed to be financed by bonds, to a rise in the world interest rate and an appreciation of the home real exchange rate. This means that part of the fiscal demand expansion is choked of by a fall in consumption, investment and net exports in the home country, so that home output expands by less than the full amount of the demand expansion. In fact, it is well known that in a small open economy, i.e., an economy that takes world income, world prices, and the world interest rates as given, a fiscal demand expansion is for 100 % crowded out by the fall in net exports thereby rendering a fiscal demand expansion totally useless as far as increasing employment and output is concerned. The process is that a fiscal demand expansion leads to incipient capital inflows, which must be choked off by an appreciation of the exchange rate. The main point to note for interdependent economies is the familiar Mundell-Fleming result that a fiscal demand expansion is a locomotive policy as far as foreign employment and output are concerned. The reason is that the shift in demand away from home to foreign goods boosts net exports and output of the foreign country by more than foreign consumption and investment fall as a result of the increase in the world interest rate. In fact, the multipliers for home and foreign output are exactly the same. This should be contrasted with a monetary expansion, which is a beggar-thy-neighbour policy as we have seen in Section 4.3. The appreciation of the real exchange rate reduces consumers' prices at home and increases them abroad, so that real income increases at home and falls abroad. Hence, fiscal demand expansion is a beggar-thy-neighbour policy as far as real income is concerned. A common or global fiscal demand expansion leaves the real exchange rate and therefore real income in both countries unaffected. It raises the world interest rate, so that consumption and investment throughout the world fall and therefore world output does not increase by the full amount of the fiscal demand expansion.

Now consider a fiscal supply expansion, e.g., a cut in the employers' tax rate, in the home country ($\tau\downarrow$). Since this reduces home prices and boosts

the home real money supply, this has exactly the same effects as a home monetary expansion (see Section 4.3). Hence, a fiscal supply expansion reduces the world interest rate, causes a depreciation of the home real exchange rate, so as to choke off part of the incipient capital outflows, boosts home output and reduces foreign output. Hence, a fiscal supply expansion acts as a monetary expansion and is a beggar-thy-neighbour policy as far as foreign employment and output are concerned. The positive effect on home output outweights the negative effect on foreign output, so that world employment and output increase. The appreciation of the foreign real exchange rate cuts foreign consumers' prices and thus boosts foreign real income. Similarly, real income at home falls as a result of the depreciation of the home real exchange rate yet it increases as a result of the improvement in the wedge between producers' and consumers' prices. The net effect on home real income is ambiguous, but it is likely to increase as a result of the fiscal supply expansion (as $\alpha<2\delta$ is likely to be satisfied). A global improvement in aggregate supply ($\tau=\tau^*\downarrow$) leaves the real exchange rate uneffected in this symmetric world and thus leads to a one-for-one improvement in real income in each country, but reduces world prices, increases the real money supply and thus decreases world interest rates and increases demand, employment and output thoughout the world.

Let us now focus our attention on the problems of international coordination of fiscal policies. To be more precise, we will focus our attention at optimal fiscal demand policies as fiscal supply policies are taken care off by more longer run policies. A fiscal demand expansion at home benefits activity at home and abroad. The adverse effects of a fiscal expansion are higher budget deficits, which to the extent that they eventually may be financed by increases in monetary growth have an adverse effect on inflation and the government does not like this effect. Alternatively, governments simply dislike high budget deficits for reasons of political economy. This seems to be the case for most governments throughout the OECD region as most seem to want to balance their books. In any case, the policy dilemmma of each country is that they want a high level of government spending for high activity and real income, but that they want a low level of government spending for budgetary balance and/or low inflation. The policy dilemma of the Treasury of the home country can therefore be captured by the following problem (c.f., (4.18'):

$$\min_{f} W \equiv \tfrac{1}{2}(y-y^{d})^2 + \tfrac{1}{2}\bar{\vartheta}_1(w-p_c-\bar{\omega})^2 + \tfrac{1}{2}\bar{\vartheta}_2 f^2 \qquad (5.5)$$

subject to (5.3), (5.4) and the actions of the Treasury of the foreign country. Exogeneous demand shocks can, as long as they are observable, be immediately off-set by fiscal demand policy, hence we will concentrate on the effects of a supply shock. A common adverse supply shock ($\tau=\tau^{*}=s>0$) leads, as before, to a positive employment target and a positive real income target ($y^{d}=\sigma s/(\sigma+\lambda)$, $\bar{\omega}=s$) and we are concerned in the remainder of this section with how the Treasuries at home and abroad react to such an adverse supply shock both under uncoordinated and under coordinated decisionmaking.

Under decentralised decisionmaking, the reaction function of the home Treasury is downward-sloping when the real-income or cost-of-living target has a low priority relative to the target of full employment. The reason is that, when the foreign Treasury engages in a fiscal demand expansion, then home output and employment increase so that the home Treasury can afford to pay more attention to the objective of maintaining budgetary balance. When the real-income or price-stability target has a very high priority relative to the full-employment target ($\bar{\vartheta}_1$ high), the reaction function of the home Treasury is upward-sloping. The reason for this is that, when the foreign Treasury expands demand, the home real exchange rate depreciates, the home cost-of-living index increases and home real income falls so that the home Treasury feels an urge to engage in a fiscal demand expansion. This insight can alternatively be formulated as follows: under floating exchange rates a right-wing Treasury responds to a fiscal demand contraction abroad with a fiscal demand contraction whilst a left-wing Treasury responds with a fiscal demand expansion. Mathematically, the requirement for a right-wing Treasury can be shown to be given by

$$\bar{\vartheta}_1[\alpha(1-\gamma)/\delta]^2 > [(1+\gamma)\lambda/(\sigma+\lambda)]^2 \qquad (5.6)$$

and the opposite for a left-wing Treasury, which is in accordance with the above discussion. Intersection of the reaction curves for the home and foreign Treasuries yield the non-cooperative (or Nash-Cournot) outcome (denoted by the subscript N as before):

$$f_N = f_N^* = \left(\frac{\hat{\gamma} y^d + \bar{\vartheta}_1[\alpha(1-\gamma)/\delta]\bar{\omega}}{\hat{\gamma}^2 + 2\bar{\vartheta}_2}\right) > 0 \tag{5.7}$$

$$(w-p_C)_N = (w^*-p_C^*)_N = 0 < \bar{\omega} \tag{5.8}$$

$$y_N = y_N^* = \hat{\gamma} f_N, \qquad \hat{\gamma} \equiv (1+\gamma)\lambda/(\sigma+\lambda). \tag{5.9}$$

We note that, in a non-cooperative symmetric world with floating exchange rates, each of the two countries is able to increase employment and output, but none of the countries is able to score on the real-income target. Before a full discussion of the non-cooperative outcome can take place, it is useful to present the cooperative outcome (obtained by choosing f and f* to minimise the global welfare loss, W+W*) as a benchmark (denoted by the subscript C as before):

$$f_C = f_C^* = \left(\frac{\hat{\gamma} y^d}{\hat{\gamma}^2+\bar{\vartheta}_2}\right) > 0 \tag{5.10}$$

$$(w-p_C)_C = (w^* - p_C^*)_C = 0 < \bar{\omega} \tag{5.11}$$

$$y_C = y_C^* = \hat{\gamma} f_C = \left(\frac{\hat{\gamma}^2}{\hat{\gamma}^2+\bar{\vartheta}_2}\right) y^d < y^d. \tag{5.12}$$

Note that, when the national governments cooperate and do not care about budgetary balance ($\bar{\vartheta}_2$=0) they achieve full employment. In general, they will not attain full employment as they do not want to have too large deficits.

It may be worthwhile to formulate a few propositions that compare the cooperative and non-cooperative outcomes:

(i) Right-wing governments, i.e. governments who attach relatively high priority to the real-income or the cost-of-living target rather than to the targets of budgetary balance and full employment (high $\bar{\vartheta}_1$, low $\bar{\vartheta}_2$), under a non-cooperative regime of floating exchange rates tend to have a too loose fiscal stance (relative to the cooperative outcome) and therefore end up with excessively large levels of employment and output and with too high levels of interest rates.

(ii) International coordination of fiscal policies among right-wing governments leads them to tighten their fiscal stance.

(iii) Left-wing governments pay more attention to the targets of full employment and budgetary balance rather than to real income, so that in a non-cooperative regime they tend to have a too tight fiscal stance and this leads to unemployment.

(iv) International coordination of fiscal policies among left-wing governments leads them to loosen their fiscal stance.

The reason that left-wing governments have a too tight fiscal stance and right-wing governments have a too loose fiscal stance relative to the cooperative outcome is that, in the absence of international policy coordination, left-wing governments do not internalise the beneficial effects on foreign employment and output of a fiscal demand expansion whilst right-wing governments do not take account of the adverse effects on foreign real incomes. Hence, in a regime of floating exchange rates international coordination of fiscal policies leads right-wing governments to tighten and left-wing governments to loosen their fiscal stance.

5.3. Managed exchange rates, the EMS and the problem of unemployment

Let us now move on to the problem of coordination of fiscal policies in an asymmetric regime of managed exchange rates such as the European Monetary System. Sections 4.4-4.7 gave a detailed discussion of the interdependence and coordination of monetary policies under such an arrangement of exchange rates. We will assume that the Bundesbank sticks to a stable money supply ($m^*=0$) and that the other central banks of the European Monetary System give up control of their own money supply and, instead, peg their exchange rates to the Deutschmark ($e=0$). Hence, we are considering the interaction of fiscal policies in Europe under a regime of a stable German money supply and fixed intra-European exchange rates. Such a situation is really a bit more advanced than the European Monetary System, because free movement of financial assets within Europe and the absence of speculative attacks are assumed. Nevertheless, this analysis will give us some useful insight into the interdependence of fiscal policies in the European economies and will be very relevant once all controls on international movements of financial assets within Europe are abolished.

To help our discussion, we will present the results on the two-country model with managed exchange rates developed in Section 4.4 again:

$$r = r^* = [\gamma f + f^* + \delta\tau + (1-\delta)\tau^*] / (\sigma+\lambda) \tag{5.13}$$

$$c = \tau^* - \tau \tag{5.14}$$

$$y = [\{(1-\gamma)\sigma+\lambda\}f-\{(1-\gamma)\sigma-\gamma\lambda\}f^*-(2\sigma+\lambda)\delta\tau-\{(1-2\delta)\sigma-\delta\lambda\}\tau^*] / (\sigma+\lambda) \tag{5.15}$$

$$y^* = [\lambda(\gamma f+f^*) + \delta\lambda\tau - (\sigma+\delta\lambda)\tau^*] / (\sigma+\lambda) \tag{5.16}$$

$$w - p_C = -(1-\alpha)\tau - \alpha\tau^* \tag{5.17}$$

$$w^* - p_C^* = -(1-\alpha)\tau^* - \alpha\tau. \tag{5.18}$$

The first point to notice is that a fiscal demand expansion in Germany or in the rest of Europe can, in a regime of managed rather than floating exchange rates, not affect the intra-European real exchange rate and therefore not affect consumers' prices and real income, either at home or abroad. This means that there is no need to take account of real-income or cost-of-living targets when coordinating fiscal demand policies. It is also one of the main reasons why an international regime of managed exchange rates may be superior to a regime of floating exchange rates (see also Kenen, 1987, 1988). However, a fiscal supply expansion at home such as a cut in the employers', employees' or indirect tax rates leads to a proportional depreciation in the real exchange rate and thus to a smaller than proportional decrease in the consumers' price level and thus to an increase in real income. The spill-over effects of a fiscal supply expansion at home lead to an appreciation of the foreign real exchange rate and thus to a fall in foreign consumers' prices and to an increase in foreign real income, so that under managed exchange rates a fiscal supply expansion is a locomotive policy as far as real income is concerned. (Note that, under floating exchange rates (see equation (5.4)), a fiscal supply expansion has a smaller negative spill-over effect on real income as long as $\alpha<2\delta$ is satisfied.) The effects of a German tax cut and a tax cut in the rest of Europe are symmetric as far as consumers' price and real income,

at home and abroad, are concerned. In fact, competitiveness and real exchange rates simply depend on international differences between tax rates.

A common adverse fiscal supply shock (e.g., a European rise in taxes) or, alternatively, a European adverse shock to supply (e.g., arising from higher prices of raw material imports, $\tau=\tau^*=s>0$) leaves the relative price of German goods in terms of other European goods unaffected, reduces real incomes one-for-one throughout Europe, and the resulting rise in European interest rates leads to falls in aggregate demand until equilibrium in the goods markets is restored. There is no effect on the money supply of the rest of Europe. This means that positive output targets and positive real-income targets are called for ($y^d=\sigma s/(\sigma+\lambda)>0$ and $\bar{\omega}=s>0$). A fiscal supply expansion in Germany ($\tau^*\downarrow$) increases German employment and output by more than an equal fiscal supply expansion in the rest of Europe ($\tau\downarrow$) decreases German output and unemployment and, as long as $\delta<[\sigma/(2\sigma+\lambda)]$, increases employment and output in the rest of Europe. However, the main point to note is that a fiscal supply expansion in the rest of Europe is a beggar-thy-neighbour policy as far as employment and output is concerned whilst a German fiscal supply expansion has ambiguous effects on employment and output in the rest of Europe. The reason that, say, a French tax cut reduces German output and employment is that the incipient excess supply of French goods is choked off by a real appreciation of the Deutschmark, which reduces net exports of Germany to the rest of Europe and thus German effective demand. To restore equilibrium on the German money market, the German and thus the French interest rate must fall. The implied French balance-of-payments surpluses lead to an expansion of the French money supply, which in turn boosts aggregate demand and employment in France. In other words, the expansion in the European money supply leads to a fall in European interest rates so that, for a given German money supply, German employment and output must fall in order for the German money market to clear. This is qualitatively analogous to the negative spill-over effects on output in a regime of floating exchange rates (see equation (5.3)). However, a German tax cut has an ambiguous effect on French employment and output under a regime of managed exchange rates such as the European Monetary System. The reason is that a German tax cut leads to a real depreciation of the Deutschmark, in order to boost German demand in line with supply, and a boost in net exports to the rest of Europe. The German price level falls and this boosts, as long as $\delta>1$, the real German money supply by less than the increase in German money

demand, so that to restore equilibrium in the German money market the German and thus French interest rates must increase and the French money supply falls. In this case, it follows that French employment and output must fall. However, if $\delta<1$, then European interest rates fall and, if $\delta<\frac{1}{2}$, the French money supply increases and, if $\delta<[\sigma/(2\sigma+\lambda)]$, French employment and output increase.

Now consider a joint European fiscal demand expansion ($f=f^*=d>0$). This leaves the intra-European real exchange rate and real incomes unaffected and leads to the same increase in European interest rates as under floating exchange rates (compare equations (5.1) and (5.13)), which leads to crowding out. The net effect of a joint European fiscal demand expansion is, of course, the same expansion of employment and output throughout Europe as under floating exchange rates. A fiscal demand expansion in the rest of Europe is under managed exchange rates a locomotive policy as far as German employment and output is concerned. The reason is that the greater increase in French income than in German income increases net exports from Germany to France. The resulting excess demand for money in Germany is choked off by a rise in the German and thus the French interest rate, which leads to some crowding out of private consumption and investment throughout Europe. The excess demand for French goods is accomodated by an increase in the French money supply (whilst the German money supply remains fixed), rather than by an appreciation of the French real exchange rate as under floating exchange rates. However, a German fiscal demand expansion has under managed exchange rates ambiguous effects on employment and output in the rest of Europe. The reason is that a German fiscal demand expansion leads on the one hand to an appreciation of the Deutschmark and thus to a fall in, say, the French money supply, because France has to prevent its currency from depreciating. This raises the French and German interest rates and thus depresses French employment and output. On the other hand, the increase in net exports from France to Germany boosts French employment and output. The net effect is ambiguous, but when $(1-\gamma)\sigma>\gamma\lambda$ holds then a German fiscal demand expansion is a beggar-thy-neighbour policy and when $(1-\gamma)\sigma<\gamma\lambda$ then it is a locomotive policy as far as employment and output throughout the rest of Europe are concerned. It is also clear that a German fiscal demand expansion has a smaller effect on German employment and output than a French fiscal demand expansion has on French employment and output. McKibbin and Sachs (1986b) make the point that, when the French use

their fiscal demand policy instruments to keep their currency pegged to the Deutschmark, then a German fiscal demand expansion is always a locomotive policy. (They also discuss the optimal international coordination of both fiscal and monetary policies within the context of a multi-country simulation model.)

Let us now discuss the problems related to international coordination of fiscal policies. As before, we will focus our attention at optimal fiscal demand policies as fiscal supply policies are taken care off by longer run considerations. As before, we will assume that the welfare-loss function of each Treasury is given by (5.5) so that each Treasury trades off a loose fiscal stance in order to achieve full employment against a tight fiscal stance in order to maintain budgetary balance. As noted before, in an international regime of managed exchange rates the Treasury cannot affect the real exchange rates and thus cannot affect consumers' prices and real incomes so that obviously such considerations do not affect the problem of international policy coordination ($\bar{\Theta}_1$ does not matter). Neither does the distinction between left-wing and right-wing governments, as discussed in Section 5.2 for the international regime of floating exchange rates play a role, because cost-of-living and real-income targets cannot be affected by the Treasuries in an international regime of managed exchange rates anyway. Exogeneous demand shocks can, as long as they are observable, be off-set by fiscal demand policy hence we will again concentrate on the effects of a common adverse supply shock ($\tau=\tau^*=s>0$). This implies, as usual, a positive employment and a positive real-income target ($y^d=\sigma s/(\sigma+\lambda)$, $\bar{\omega}=s$).

Under decentralised decisionmaking, the reaction function of the German Treasury is always downward-sloping. Hence, Germany responds with a fiscal contraction to a French fiscal expansion. This can be seen from the reaction function of the German Treasury:

$$f^* = \frac{(\frac{\lambda}{\sigma+\lambda})[y^d-\gamma(\frac{\lambda}{\sigma+\lambda})f]}{(\frac{\lambda}{\sigma+\lambda})^2+\bar{\vartheta}_2}. \qquad (5.19)$$

The reason is, of course, that with managed exchange rates a French fiscal expansion has a positive spill-over effect on German employment and output and therefore the German Treasury can afford to pay more attention to the target

of maintaining budgetary balance. The reaction functions of the Treasuries of the rest of Europe are downward-sloping or upward-sloping depending on whether a German fiscal demand expansion has a locomotive effect ($(1-\gamma)\sigma<\gamma\lambda$) or a beggar-thy-neighbour effect ($(1-\gamma)\sigma>\gamma\lambda$) on employment and output in the rest of Europe. In the latter case, a fiscal demand expansion in the rest of Europe worsens German employment and thus the German Treasury finds it worthwhile to pay less attention to the target of budgetary balance and pay more attention to the full-employment target. Intersection of the reaction functions for Germany and the rest of Europe yields the non-cooperative (or Nash-Cournot) outcome. For the case of a German fiscal demand expansion being a locomotive policy, it is easily established that absence of European coordination leads to a too tight fiscal stance throughout Europe. On the other hand, if a German fiscal expansion is a beggar-thy-neighbour policy, then usually the German fiscal stance will be too loose whilst the fiscal stance of the rest of Europe will be too tight relative to the cooperative outcome. The reason is that in a non-cooperative regime of managed exchange rates such as the European Monetary System Germany ignores the adverse effects of a loose fiscal stance on the rest of Europe whilst the rest of Europe ignores the beneficial effects of a loose fiscal stance on Germany.

It should be pointed out that, in contrast to the optimal coordination of monetary policies in a regime of managed exchange rates (see Section 4.5), the optimally coordinated fiscal demand policies for Germany and the rest of Europe are not identical. The reason is that full employment is not obtained exactly in each country. To obtain a better idea of this proposition, it seems best to consider a numerical example rather than to present a lot of cumbersome algebra. Choose $\bar{\sigma}=0.5$, $\bar{\delta}=0.5$, $\gamma=0.5$, $\alpha=0.8$ and $\lambda=2$ as the parameter values defining our two-country model, so that $\sigma=1$ and $\delta=\frac{1}{3}$. Note that with these values $(1-\gamma)\sigma<\gamma\lambda$, so that a German fiscal expansion is a locomotive policy. It follows that under floating exchange rates

$$y_N = y_N^* = f_N = f_N^* = \frac{(1+3.6\bar{\vartheta}_1)s}{3(1+2\bar{\vartheta}_2)} \tag{5.20}$$

and

$$y_C = y_C^* = f_C = f_C^* = \frac{S}{3(1+\bar{\vartheta}_2)} \tag{5.21}$$

(c.f., equations (5.7) and (5.10)), whilst under managed exchange rates in Europe

$$f_N = (30 + 90\,\bar{\vartheta}_2)s \,/\, \Delta_N \tag{5.22}$$

$$y_N = (30 + 87\,\bar{\vartheta}_2)s \,/\, \Delta_N \tag{5.23}$$

$$f_N^* = (30 + 72\,\bar{\vartheta}_2)s \,/\, \Delta_N < f_N \tag{5.24}$$

$$y_N^* = (30 + 78\,\bar{\vartheta}_2)s \,/\, \Delta_N < y_N \tag{5.25}$$

$$f_C = (108 + 504\,\bar{\vartheta}_2)s \,/\, \Delta_C \tag{5.26}$$

$$y_C = (108 + 480\,\bar{\vartheta}_2)s \,/\, \Delta_C \tag{5.27}$$

$$f_C^* = (108 + 360\,\bar{\vartheta}_2)s \,/\, \Delta_C < f_C \tag{5.28}$$

and

$$y_C^* = (108 + 408\,\bar{\vartheta}_2)s \,/\, \Delta_C < y_C, \tag{5.29}$$

where $\Delta_N \equiv (25 + 36\bar{\vartheta}_2)(4 + 9\bar{\vartheta}_2) - 10$ and $\Delta_C \equiv (29 + 36\bar{\vartheta}_2)(36\bar{\vartheta}_2 + 17) - 169$. Hence, both under a non-cooperative and a cooperative regime of managed exchange rates Germany has a tighter fiscal stance than the rest of Europe. The reason is, of course, that a German fiscal expansion is less of a locomotive (or is even a beggar-thy-neighbour) policy than a fiscal expansion in the rest of Europe under managed exchange rates. Hence, if German hegemony in monetary policy is maintained then this automatically leads to a German hegemony in fiscal policy. Not only will, in the absence of coordination, the fiscal stance be too tight throughout Europe, but Germany will not carry its full burden in Europe as far as a loose enough fiscal stance is concerned. To see this, note that for $\bar{\vartheta}_1=\bar{\vartheta}_2=1$ one has $f_N=0.153s$, $y_N=0.149s$, $f_N^*=0.130s$, $y_N^*=0.138s$, $f_C=0.187s$, $y_C=0.179s$, $f_C^*=0.143$ and $y_C^*=0.158s$ under a regime of managed exchange rates, such as the European Monetary System (see equations (5.22)-(5.25)). This asymmetry in the European Monetary System, i.e., the fact that the EMS seems to operate as a greater Deutschmark zone, is the main

reason why Germany cannot be relied upon to be a "locomotive engine of growth" that pulls the European economies out of a recession.

However, a system of managed exchange rates may nevertheless be preferable to a system of floating exchange rates from a welfare point of view, as it makes international conflict and beggar-thy-neighbour policies with respect to real-income targets impossible. To see this, note that for $\bar{\vartheta}_1=\bar{\vartheta}_2=1$ one has $f_N=f_N^*=0.511s$ and $f_C=f_C^*=0.167s$ under floating exchange rates (see equations (5.20)-(5.21)). A non-cooperative regime of managed exchange rates leads to lower deficits than a non-cooperative regime of floating exchange rates, because the negative spill-over effects of a fiscal demand expansion on foreign real income are eliminated. Hence, the European Monetary System leads in the absence of cooperation to too tight fiscal policies whilst a regime of floating exchange rates can lead (right-wing) governments to have too loose fiscal policies. To be more precise, the European Monetary System has a built-in deflationary bias as far as fiscal demand policies are concerned.

Finally, it is useful to give, at least for the case $\bar{\vartheta}_1=\bar{\vartheta}_2=1$, a welfare comparison for a regime of floating and for a regime of managed exchange rates. It is easily shown that under floating exchange rates $y_N-y^d=y_N^*-y^d=0.178s>0$, $W_N=W_N^*=0.6464s^2$, $y_C-y^d=y_C^*-y^d=-0.167s<0$ and $W_C=W_C^*=0.5278s^2$, whilst under the European Monetary System of managed exchange rates $y_N-y^d=-0.184s$, $W_N=0.5287s^2$, $y_N^*-y^d=-0.195s$, $W_N^*=0.5276s^2$, $y_C-y^d=-0.154s$, $W_C=0.5293s^2$, $y_C^*-y^d=-0.176s$, and $W_C^*=0.5258s^2$. We note the excessively loose fiscal stances under a non-cooperative regime of floating exchange rates and the excessively tight fiscal stances under the EMS. We also note that, both in a non-cooperative and in a cooperative EMS, Germany ends up with tighter deficits and lower employment and output than the rest of Europe. The welfare ranking in decreasing order is EMS with cooperation, floating exchange rates with cooperation, EMS without cooperation, and floating exchange rates without cooperation. Hence, the EMS seems, as far as common supply shocks are concerned, a better alternative than floating exchange rates. However, this example also illustrates that Germany has an incentive to cooperate in the EMS whilst the rest of Europe need not have an incentive to cooperate in the EMS (see Table 5.1), at least when cooperation implies equal weights to welfare in the other countries. In other words, the maximisation of joint European welfare ($-W-W^*$) is not Pareto-efficient so the rest of Europe is only likely to cooperate when their welfare receives a greater weight than German welfare. This

explains why Germany has a greater incentive to cooperate in the European Monetary System than the rest of Europe.

5.4. European Monetary Union and the problem of unemployment

So far, we have discussed the international coordination of fiscal policies under a symmetric regime of floating exchange rates (see Section 5.2) and under an asymmetric regime of managed exchange rates (see Section 5.3). It seems worthwhile to also discuss the international coordination of fiscal policies under a symmetric regime of fixed exchange rates. There are two interpretations of such a symmetric regime of fixed exchange rates. The first is a monetary union and a European Central Bank as envisaged by the Delors Committee for the future evaluation of the European Monetary System. Such a monetary union would imply irrevocably fixed intra-European exchange rates, so that the problems of speculative attacks and balance-of-payments crises which occur from time to time under a regime of managed intra-European exchange rates, disappear. Since there are a lot of sentiments about national currencies, one would envisage the issue of European Currency Units as a parallel currency to the national currencies of Europe. One of the stated principles of such a European monetary union is that there should be no German or any other hegemony in the formulation of monetary policies. In other words, the task of maintaining fixed intra-European exchange rates should be carried out by all European central banks including the Bundesbank. This means that the European money supply, defined as

$$m^E \equiv \tfrac{1}{2}(m + m^*), \tag{5.30}$$

should be controlled by all European central banks together or, alternatively, by the European Central Bank, but not be controlled by the Bundesbank alone. Hence, the idea is that the European Central Bank should not be dominated by the Germans and thus that a European Monetary Union should be a symmetric system. The other interpretation of such a symmetric regime of a fixed exchange rates is the way the world economy would operate under McKinnon's (1986) proposal. McKinnon's approach involves a return to fixed nomminal exchange rates throughout the world and cooperation among the national central banks to

set their money supplies in such a way as to achieve a target growth in nominal gross domestic product of the world economy. The difference between McKinnon's proposal and Bretton Woods is that the former is meant to operate as a cooperative and symmetric regime of irrevocably fixed nominal exchange rates whilst Bretton Woods operated de facto as a dollar standard rather than a gold standard and thus Bretton Woods operated most of the time as a non-cooperative and asymmetric regime of fixed, but adjustable nominal exchange rates.

The reduced form of the model under European Monetary Union can easily be derived from equations (4.13)-(4.17) and is given by:

$$r = r^* = \tfrac{1}{2}[-2m_E + (1+\gamma)(f+f^*) + w + \tau + w^* + \tau^*] \,/\, (\sigma+\lambda) \tag{5.31}$$

$$c = w^* + \tau^* + e - w - \tau \tag{5.32}$$

$$y = \left(\frac{\sigma}{\sigma+\lambda}\right)[m^E - \tfrac{1}{2}(w+\tau+w^*+\tau^*)] + \delta(w^*+\tau^*+e-w-\tau)$$
$$+ \left(\frac{(1-\gamma)\sigma+2\lambda}{2(\sigma+\lambda)}\right)f + \left(\frac{-(1-\gamma)\sigma+2\lambda\gamma}{2(\sigma+\lambda)}\right)f^*, \tag{5.33}$$

where m^E and e are the policy instruments of the various central banks and the European Central Banks whilst f, f^*, τ and τ^* are the policy instruments of the Treasuries of the sovereign member states. An expansion of the European money supply under a regime of monetary union has exactly the same effects on European interest rates and European levels of employment and output as a common and equal expansion of the money supplies of the various European central banks under a regime of floating exchange rates (compare equations (4.15)-(4.17) with equations (5.31)-(5.33)) and as an equal expansion of the German money supply under a regime of managed intra-European exchange rates (see equations (4.23)-(4.26)). The same is true for a common fiscal demand shock or a common fiscal supply shock under these three alternative exchange-rate regimes. A fiscal supply expansion, such as a tax cut, in one of the member states of the European Monetary Union reduces European interest rates and leads to a depreciation of the real exchange rate of the country concerned. Hence, the increase in net exports of the home country implies that the beneficial effects on home output are always greater than on foreign output and employment. In fact, if the contractionary effect of the real exchange

rate outweighs the expansionary effect of the interest rate on foreign output and employment (if $2\delta(\sigma+\lambda)>0$), then a fiscal supply expansion is a beggar-thy-neighbour policy as far as foreign employment is concerned. A fiscal demand expansion in one of the member states of the European Monetary Union leads, as it is financed by selling bonds, to a rise in European interest rates and thus to a fall in private consumption and investment throughout Europe. The net effect on home employment and output is, of course, positive, but foreign employment and output can increase or decrease depending on whether the beneficial effects on net exports to the home country outweigh the adverse effect of crowding out of private consumption and investment ($2\lambda\gamma>(1-\gamma)\sigma$) or not. Hence, in a European Monetary Union a fiscal demand expansion can, in contrast to a regime of floating exchange rates, be a beggar-thy-neighbour policy. The spill-over effect of a fiscal demand expansion in the rest of Europe on German employment is less under a European Monetary Union than under the European Monetary System, but the spill-over effect of a German fiscal demand expansion on the rest of Europe is greater.

Before we proceed to a discussion of the optimal coordination of fiscal policies under monetary union, we point out that the optimal supply of European money corresponds exactly to the cooperative outcome under floating as under managed intra-European exchange rates. To assess the potential benefits of the coordination of fiscal policies under European Monetary Union, we adapt the same welfare-loss function as before (i.e., (5.5)) and assume that the European money supply and intra-European exchange rates remain fixed. The reaction function for the rest of Europe is given by:

$$f = \frac{\left[\frac{(1-\gamma)\sigma+2\lambda}{2(\sigma+\lambda)}\right]\left\{y^{d} - \left[\frac{2\lambda\gamma-(1-\gamma)\sigma}{2(\sigma+\lambda)}\right] f^{*}\right\}}{\left[\frac{(1-\gamma)\sigma+2\lambda}{2(\sigma+\lambda)}\right]^{2} + \bar{\vartheta}_{2}} \qquad (5.34)$$

so that if a fiscal demand expansion is a locomotive (beggar-thy-neighbour) policy then the rest of Europe responds to a German fiscal demand expansion with a contraction (expansion) in its fiscal stance. The non-cooperative (or Nash-Cournot) outcome under European Monetary Union follows from intersection of the reaction curves and is given by

$$f_N = f_N^* = \frac{[\frac{(1-\gamma)\sigma+2\lambda}{2(\sigma+\lambda)}]\ y^d}{[\frac{(1-\gamma)\sigma+2\lambda}{2(\sigma+\lambda)}]\ \hat{\gamma} + \bar{\vartheta}_2} > 0 \qquad (5.35)$$

and $y_N=y_N^*=\hat{\gamma}f_N<y^d$. The outcome under the international cooordination of fiscal policies and European Monetary Union is obtained by minimising the global welfare loss (W + W*) and is given by:

$$f_C = f_C^* = \frac{\hat{\gamma}\ y^d}{\hat{\gamma}^2 + \bar{\vartheta}_2} > 0 \qquad (5.36)$$

and $y_C=y_C^*=\hat{\gamma}f_C<y^d$. Since it can easily be established that $f_C>f_N$ if and only if $2\lambda\gamma>(1-\gamma)\sigma$ holds and vice versa, we can establish the following propositions:

(i) Cooperation in fiscal policies under a European Monetary Union yields the same outcome as cooperation under floating exchange rates.

(ii) A non-cooperative European Monetary Union whose fiscal demand expansions are locomotive policies ($2\lambda\gamma>(1-\gamma)\sigma$) leads to too excessively tight fiscal stances and to too low levels of employment and output throughout Europe. Cooperation within the European Monetary Union about fiscal policies would lead each Treasury to loosen its fiscal stance (With our chosen parameter values this is the likely situation).

(iii) A non-cooperative European Monetary Union whose fiscal demand expansions are beggar-thy-neighour policies ($2\lambda\gamma<(1-\gamma)\sigma$) leads to too loose fiscal stances and cooperation would lead each Treasury to tighten its fiscal stance.

Hence, it is possible to have the opposite result to under a regime of floating exchange rates. In order to obtain a better comparison of the three alternative exchange-rate regimes, we will return to the numerical example discussed in the previous section. With the chosen parameter values, it is easy to establish that under a non-cooperative European Monetary Union:

$$y_N = y_N^* = f_N = f_N^* = (\frac{s}{3+4\bar{\vartheta}_2}) < y^d. \qquad (5.37)$$

Since a cooperative European Monetary Union yields the same outcomes as a cooperative regime of floating exchange rates, it follows that $f_C=f_C^*>f_N=f_N^*$. When $\bar{\vartheta}_1=\bar{\vartheta}_2=1$ one has $y_N-y^d=y_N^*-y^d=-0.190s$, $W_N=W_N^*=0.5283s^2$, $y_C-y^d=y_C^*-y^d=-0.167s$

and $W_N=W_N^*=0.528s^2$. A comparison with the alternative exchange-rate regimes is presented in Table 5.1. It follows that a non-cooperative European Monetary Union leads to higher welfare than a non-cooperative regime of floating exchange rates, but yields lower total welfare than a non-cooperative European Monetary System. Germany does better and the rest of Europe does worse under a cooperative European Monetary System rather than under a cooperative European Monetary Union, so it is not clear that Germany has much incentive to cooperate and to give up its hegemony in monetary policy when setting up the European Central Bank.

5.5. Importance of wage indexation throughout the OECD region

So far, the models of unemployment we have used in Chpater 4 and 5 have incorporated the assumption of nominal wage rigidity ($w=w^*=0$). However, the way the labour market operates is crucial for determining the own and spill-over effects of fiscal and monetary policies. For example, monetary policy has no real effects in a small open economy with perfect capital mobility and floating exchange rates and real wage rigidity (and without wealth effects) as doubling the money supply leads to a doubling of the exchange rate and all wages and prices. However, in the standard Mundell-fleming world with nominal wage rigidity, monetary policy is very effective because the associated depreciation of the exchange rate boosts net exports. Another example is the ineffectiveness of fiscal policy in a small open economy with floating exchange rates, perfect capital mobility and nominal wage rigidity, because any fiscal expansion of demand is completely crowded out by the fall in net exports induced by the appreciation of exchange rate. However, with real wage rigidity, the apreciation of the real exchange rate reduces the real price of imported goods and thus reduces the consumers' price index and the wage so that aggregate supply expands and fiscal policy is effective. Hence, whether real of nominal wages are rigid reverses the effectivenesss of fiscal and monetary policy and thus makes a lot of difference for the analysis and for policy recommendations.

It has been argued that the US economy has stickyness of nominal wages (i.e., has money illusion) whilst the European and Japanese economies have real wage rigidity (see Branson and Rotemberg, 1980; Bruno and Sachs, 1985;

van der Ploeg, 1987a). To investigate the relative importance of real versus nominal wage rigidity, we used time-series data for the seven largest OECD economies to estimate the following regressions (also see Attanasio and van der Ploeg, 1989):

$$\Delta w = \alpha_0 + \alpha_1 \Delta p_C + (1-\alpha_1)\Delta w_{-1} - \alpha_2 u - \alpha_3 \Delta u + \alpha_4 PROD + \alpha_5 NC - \alpha_6 (w - t_2 - p_C) + \varepsilon, \qquad (5.38)$$

where p_C, t_2, u, PROD, NC and ε denote the logarithm of the consumers' price index, the employees' (direct) tax rate, the unemployment rate (except for Japan for which it is the ratio of jobs wanted to jobs offered), the trend of the logarithm of the output-employment ratio, a measure for industrial conflict (except for the UK for which it is an incomes policy dummy) and a white-noise error term, respectively. Equation (5.38) is an error-correction mechanism, which ensures that the (after-tax real) consumers' wage, $w-t_2-p_C$, always eventually returns to its long-run equilibrium values given by

$$[\alpha_0 - \alpha_1 \rho - \alpha_2 u + \alpha_4 PROD + \alpha_5 NC] / \alpha_6 > 0,$$

where ρ denotes the feasible growth in real wages (trend growth in labour productivity). The long-run consumers' wage increases when the bargaining strength of workers or "wage push" increases, i.e., when unemployment falls ($\alpha_2>0$) and labour productivity increases ($\alpha_4>0$), and when the firms' ability to pay, i.e., the feasible growth in real wages decreases ($\alpha_1>0$). There may also be hysteresis effects, so that changes in (rather than the levels of) the unemployment rate determine the bargaining strength of workers ($\alpha_3>0$). One reason for hysteresis is that the long-term unemployed do not actively seek for a job and therefore do not exercise a downward pressure on wages. An alternative explanation is based on an analysis of insiders versus outsiders.

To allow for some nominal inertia in the short run, the growth in nominal wages is assumed to depend on a weighted average of inflation in the consumers' price index and past growth in nominal wages ($0<\alpha_1\leq 1$). When wages are instantaneously indexed to the consumers' price level ($\alpha_1=1$), there is no nominal inertia or money illusion and therefore one has <u>real wage rigidity</u>. When there are lags in the process of wage indexation ($\alpha_1<1$), one has <u>nominal wage rigidity</u>. Note that the homogeneity of (5.38) ensures that in the long

run, the growth in nominal wages is fully indexed to inflation in the consumers' price index and therefore in the long run real wage rigidity always prevails. An alternative interpretation is that core inflation influences wage inflation in the consumers' price index under "rational expectations" (real wage rigidity) and is a weighted average of past rates of inflation in the consumers' price index under "adaptive expectations" (nominal wage rigidity). However, the interpretation of α_1 as an adjustment coefficient in the indexation process seems preferable.

Table 5.2 presents the regression results for Canada (CA), France (FR), Germany (GE), Italy (IT), Japan (JA), UK and US. All the equations appear to be well determined, the reported diagnostics show no signs of misspecification, and all coefficients are significant and of the right sign or insignificant at the 5 per cent level. The main point to notice is that the null hypothesis that there is real wage rigidity cannot be rejected at the 5 per cent significance level for FR, GE, IT and JA, because the coefficients on Δw_{-1} (i.e., $1-\alpha_1$) are insignificantly different from zero. CA, the US and, to a lesser extent, the UK do have a significant degree of nominal inertia. Hence, the European economies (apart from the UK) and the Japanese economies can be characterised by real wage rigidity whilst the Canadian and US economies have a significant degree of nominal wage rigidity.

Before we show how this distinction will be captured in our model, we will replace the mark-up hypothesis, equation (4.11), by the aggregate supply (AS-) schedule:

$$y = -\beta(w + \tau - p), \quad \beta > 0 \tag{5.39}$$

which gives the demand for labour and the supply of goods as a decreasing function of the producers' real wage. Such an AS-curve may come from the maximisation of profits under perfect or imperfect competition between firms. The mark-up hypothesis correponds to the special case that β tends to infinity. In any case, the reduced-form AS-curve is given by

$$y = \left(\frac{\beta}{1+\beta}\right)(m - w - \tau + \lambda r) \tag{4.13'}$$

and under nominal wage rigidity (w=0) it is observationally equivalent to the AS-curve, (4.13), obtained with the mark-up hypothesis in Chapter 4. The

interpretation of an upward-sloping AS-curve can now be as follows. A high interest rate leads to an excess supply of money, which exerts an upward pressure on prices, erodes the real value of the wage and thus boosts the demand for labour and aggregate supply. However, under pure real wage rigidity one has full indexation of nominal wages to changes in the cost-of-living index so that

$$w = p_c = p + \alpha c. \tag{5.40}$$

Upon substitution of (5.40) into the AS-schedule, (5.39), one immediately obtains the reduced-form AS-curve:

$$y = -\beta(\tau + \alpha c). \tag{5.41}$$

Hence, under real wage rigidity a depreciation of the real exchange rate or an increase in the tax wedge increases the wedge between producers' and consumers' wages and this reduces the demand for labour and supply goods. Furthermore, the effect of a fiscal supply expansion is less under nominal wage rigidity than under real wage rigidity. This is the reason why the adverse supply shocks in the seventies and eighties (the OPEC oil-price hikes) hit the European economies much more than the US economies. (Note that the intermediate cases between real and nominal wage rigidity, $w=\zeta p_c$, $0\leq\zeta\leq 1$ (see equation (4.44)), were already employed in Sections 4.6-4.8).

5.6. Real wage rigidity throughout Europe

To start off, we will consider the effectiveness and international spill-over effects of fiscal policies within Europe when all European countries are characterised by real wage rigidity. There is no point to discuss the coordination of monetary policies under such a view of Europe, because expanding the money supply is neutral and has no effects on real exchange rates, real interest rates, employment and output at home or abroad.

The home goods market equilibrium (GME-) locus is obtained by equating aggregate demand for home goods, (4.12), with aggregate supply of home goods, (5.41), and is given by:

$$r = [(\delta+\alpha\beta)c + f + \gamma f^* + \beta\tau] / \sigma. \tag{5.42}$$

By symmetry, the foreign goods market equilibrium (GME*-) locus is given by:

$$r^* = [(-\delta+\alpha\beta)c + f^* + \gamma f + \beta\tau^*] / \sigma. \tag{5.43}$$

Both the GME- and the GME*-loci are presented in Fig. 5.1. The GME-locus for the rest of Europe is downward-sloping, because a depreciation of the real exchange rate increases net exports and aggregate demand and at the same time increases the wedge between producers' and consumers' wages and thus reduces aggregate supply, so that the resulting excess demand for home goods must be choked off by a rise in European interest rates. The GME-locus shifts up when there is a home or foreign fiscal demand expansion and when there is a fiscal supply expansion (such as a cut in taxes) at home. The GME*-locus for Germany has similar properties.

High mobility of financial assets throughout Europe is ensured when capital controls are (eventually) completely abolished and leads to a convergence of interest rates throughout Europe ($r=r^*$). This together with equilibrium in all European goods markets leads to the equilibrium European interest rate and the equilibrium intra-European exchange rate (also see Fig. 5.1):

$$r = r^* = \tfrac{1}{2}[(1+\gamma)(f+f^*) + \beta(\tau+\tau^*)] / \sigma \tag{5.44}$$

$$c = \tfrac{1}{2}\{(1-\gamma)(f^*-f) + \beta(\tau^*-\tau)] / (\delta+\alpha\beta). \tag{5.45}$$

Upon substitution of (5.45) into the AS-schedule, (5.41), one obtains

$$y = \tfrac{1}{2}\left(\frac{\alpha\beta}{\delta+\alpha\beta}\right) [(1-\gamma)(f-f^*) - \beta\tau^* - \left(\frac{2\delta+\alpha\beta}{\alpha}\right)\tau] \tag{5.46}$$

which is also presented in Fig. 5.2. Finally, real incomes ($w-p_C$) are under real wage rigidity never changed and are thus unaffected by fiscal, tax and monetary policies.

A permanent fiscal demand expansion at home shifts up the GME-locus by more than the GME*-locus, so that the incipient excess demand for goods is choked off by a rise in European interest rates and a fall in the relative

price of home goods. The real appreciation of the home currency reduces the wedge and increases aggregate supply at home, but increases the wedge and reduces aggregate supply abroad. The boost in foreign aggregate demand, due to the real depreciation of the foreign exchange rate and the boost in home activity, must be choked off by a rise in European interest rates. Clearly, as far as employment and output are concerned, a unilateral fiscal demand expansion is a beggar-thy-neighbour policy when all countries are characterised by real wage rigidity and this does not depend on what kind of exchange-rate regime prevails. This could be contrasted with a standard Mundell-Fleming world with floating exchange rates and nominal wage rigidity in which a fiscal demand expansion is a locomotive policy (see Section 5.2). The reason that it does matter for real outcomes whether there is a regime of floating, fixed or managed exchange rates is, of course, that monetary policy does not matter anyway in a world characterised by real wage rigidity (or more generally, characterised by full indexation). However, the type of international regime of exchange rates that prevails does matter for nominal outcomes. To see this, it is worthwhile to solve for the relative price of home goods ($p-p^*$) from the LM-curves, (4.8)-(4.9), and for the nominal exchange rate (e):

$$p - p^* = m - m^* + \left(\frac{\alpha\beta}{\delta+\alpha\beta}\right)[(1-\gamma)(f^*-f) + (\delta/\alpha)(\tau-\tau^*)] \qquad (5.47)$$

$$e = m - m^* + \left(\frac{1}{2(\delta+\alpha\beta)}\right)[(1+2\alpha\beta)(1-\gamma)(f^*-f) + (1-2\delta)\beta(\tau^*-\tau)]. \qquad (5.48)$$

Under floating exchange rates the money supplies are fixed ($m=m^*=0$), so that a fiscal demand expansion at home leads to a real appreciation or, alternatively, to an increase in the relative price of home goods ($c\equiv p^*+e-p\downarrow$). Since $p-p^*$ falls, the nominal exchange rate appreciates ($e\downarrow$) by more than the real exchange rate. Under managed exchange rates the intra-European nominal exchange rates and the German money supply are fixed ($e=m^*=0$), so that a fiscal demand expansion in Germany (the rest of Europe) leads to a contraction (expansion) of the money supply in the rest of Europe, say in France, and a real appreciation (depreciation) of the Deutschmark or an increase (decrease) in the relative price of German goods ($c\equiv p^*-p\uparrow(\downarrow)$). Hence, as a result of fixed nominal exchange rates, the relative price of German goods (p^*-p) must fall (increase) under managed exchange rates ($\partial(p^*-p)/\partial f^* = -\frac{1}{2}(1-\gamma)(\delta+\alpha\beta)<0$) whilst the relative price of German goods increases (falls) under floating

exchange rates ($\partial(p^*-p)/\partial f^*=\alpha\beta(1-\gamma)(\delta+\alpha\beta)>0$). Under a European Monetary Union, the intra-European exchange rates and the European money supply are fixed ($e=0$, $m^E\equiv\frac{1}{2}(m+m^*)=0$). A fiscal demand expansion in one country then leads to an increase in the home money supply and an equal fall in the foreign money supply and also to an increase in the relative price of home products ($\partial(p-p^*)/\partial f=\frac{1}{2}(1-\gamma)(\delta+\alpha\beta)>0$).

A fiscal demand expansion in all European countries leaves output at home and abroad and exchange rates and relative prices unaffected, but leads to a rise in European interest rates and price levels. This means that a common adverse demand shock throughout a Europe characterised by real wage rigidity leaves employment and real incomes throughout Europe unaffected and therefore warrants no policy actions from the Treasuries.

A common adverse supply shock throughout Europe ($\tau=\tau^*=s>0$) leaves exchange rates, relative prices and real incomes unaffected, but leads to falls in employment and output throughout Europe ($\partial y/\partial s=\partial y^*/\partial s=-\beta$) and to increases in European interest rates. Hence, <u>real wage rigidity in Europe implies that unemployment rates are unaffected by common adverse demand shocks but are badly affected by common adverse supply shocks</u>. A beneficial supply shock or a fiscal supply expansion at home ($\tau\downarrow$) leads to a fall in European interest rates and to a depreciation of the home real exchange rate and thus to a fall in the relative price of home goods, which leads to a boost in home employment and output and a smaller boost in foreign employment and output. Hence, <u>tax cuts are a locomotive policy in a Europe characterised by real wage rigidity</u>.

We will now move on to the international coordination of fiscal demand policies in the face of a European adverse supply shock ($y^d=\beta s$). For this purpose, we will again assume that governments on the one hand wish high deficits in order to achieve full employment and on the other hand wish low deficits for sound public-finance reasons. Hence, we will adopt the welfare-loss function (5.5) and we note that the real-income terms will be irrelevant when nominal wages are fully indexed to consumers' prices. The reaction function of each Treasury is upward-sloping, because whenever there is a fiscal demand expansion abroad this leads to a depreciation of the home real exchange rate, an increase in the wig between producers' and consumers' wages and thus a fall in employment and output so that the Treasury responds with a

fiscal demand expansion. Intersection of the reaction curves yields the non-cooperative (or Nash-Cournot) outcome

$$f_N = f_N^* = \tfrac{1}{2}[\alpha\beta/(\delta+\alpha\beta)](1-\gamma)y^d / \vartheta_2 > 0 \qquad (5.49)$$

and $y_N=y_N^*=0$. The cooperative outcome follows from the minimisation of the European welfare loss $(W+W^*)$ and yields $f_C=f_C^*=0$ and $y_C=y_C^*=0$. The non-cooperative outcome in a Europe characterised by real wage rigidity leads to excessive levels of public sector deficits relative to the cooperative outcome. This is a consequence of the beggar-thy-neighbour policy nature of fiscal demand expansions in a Europe characterised by indexation of wages to the cost-of-living indices, because in the non-cooperative outcome each government ignores the adverse consequences of a fiscal demand expansion on the other countries. In effect, each government attempts (in vain) to have a high real exchange rate in order to boost employment at home and to export unemployment and this is what leads to excessive public sector deficits. The cooperative outcome realises the futility of such actions and therefore sets the public-sector deficits at their no inflation levels. The inefficiencies of the non-cooperative outcome increase when the priorities attached to achieving the full-employment targets increase and when the desired increase in activities increases. It can easily be shown that, when one country, say France, attaches a higher priority to full employment than, say, Germany (witness the Mitterrand Experiment), then France ends up with a higher deficit than Germany, France has an increase in employment at the expense of Germany, and the real exchange rate of France appreciates.

As far as supply-side improvements are concerned, they are locomotive policies in a Europe characterised by real wage rigidity. It is clear that, in the absence of international policy coordination, supply-side improvements, such as tax cuts, in each member state of the European Community do not go far enough as the beneficial effects on the rest of Europe are not internalised.

Returning to the pioneering work of Hamada (1985) on the international conflict over inflation and the balance of payments and the coordination of monetary policies, discussed in Section 4.1, we note that this analysis also applies to a Europe characterised by a full indexation of wage to consumers' prices and not just to a world with full employment. The reason is, of course,

that employment and output cannot be affected by monetary policies when all nominal variables are indexed.

5.7. Nominal wage rigidity in the US and real wage rigidity throughout Europe

Let us now consider the interactions between the US economy on the one hand and the European economies on the other hand. We will focus in particular on the period after Bretton Woods, namely the seventies and early eighties. These can best be described by asymmetric labour markets, that is nominal wage rigidity in the US and real wage rigidity in Europe (see Section 5.5), by an international regime of floating exchange rates, and by perfect international mobility of financial assets. The world real interest rate and the cross-Atlantic exchange rates follow from the conditions for equilibrium in the US and European goods markets. If Europe is home and the US is abroad (denoted by an asterisk), then the European GME-locus is given by (see equations (4.12) and (5.41))

$$y = -\sigma r + \delta c + f + \gamma f^* = -\beta(\tau+\alpha c) \qquad (5.50)$$

whilst the US GME*-locus is given by (see equations (4.12)and (4.13))

$$y^* = -\sigma r - \delta c + f^* + \gamma f = m^* - \tau^* + \lambda r. \qquad (5.51)$$

The main difference between the US and Europe is that US aggregate supply increases with the interest rate, as this depresses money demand, raises prices and erodes the real wage, whilst European aggregate supply decreases with the relative price of US goods, as this raises relative consumers' prices and wages. The solution follows from the intersection of the GME- and GME*-loci and is presented in Fig. 5.2. The algebraic solutions are:

$$r = \{[\delta+\gamma(\delta+\alpha\beta)]f + (\delta\gamma+\alpha\beta+\delta)f^* + \delta\beta\tau + (\delta+\alpha\beta)(\tau^*-m^*)\} / \Delta \qquad (5.52)$$

$$c = \{-[\sigma(1-\gamma)+\lambda]f + [\sigma(1-\gamma)-\gamma\lambda]f^* - \beta(\sigma+\lambda)\tau + \sigma(\tau^*-m^*)\} / \Delta \qquad (5.53)$$

where $\Delta \equiv \sigma\delta + (\sigma+\lambda)(\beta\alpha+\delta)$.

The effects of European fiscal demand expansion are presented in Fig. 5.2. The excess demand for European goods is partially choked off by a fall in the relative price of US goods, which induces an increase in European supply and US demand and a fall in demand for European goods, and by a rise in the world interest rate, which induces a fall in the demand for European and US goods and an increase in the US supply of goods. The above is supported by the fact that the upward shift of the GME-locus dominates the upward shift of the GME*-locus. Hence, a European fiscal demand expansion increases output and employment in both Europe and the US and is therefore a locomotive policy. However, the appreciation of the European real exchange rate implies that it is a beggar-thy-neighbour policy as far as real income is concerned.

For a US fiscal demand expansion, the shift in the GME*-locus, as long as $\sigma(1-\gamma)>\gamma\lambda$, dominates the shift in the GME-locus and therefore results in a rise in the world interest rate and an increase in the relative price of US goods. Hence, a US fiscal demand expansion increases output in the US and leads to a depreciation of the European real exchange rate, an increase in the European wedge between producers' and consumers' wages and therefore a reduction in European output and is therefore a beggar-thy-neighbour policy. However, if the negative effects of financial crowding out on European consumption and investment are small relative to the positive spill-over effects of US activity on European exports (if $\bar{\sigma}/\lambda<\gamma$), then a US fiscal demand expansion leads to an appreciation of the European real exchange rate and is then a locomotive policy. With the parameter values used so far ($\sigma=1$, $\gamma=0.5$, $\lambda=2$), a US fiscal demand expansion leads to a depreciation of the US real exchange rate and has positive spill-over effects. (The condition for a positive spill-over effect is exactly the same as the one for a positive effect of a German demand expansion on the rest of Europe under managed exchange rates; see Section 5.3). Hence, a US fiscal demand expansion has ambiguous effects on European employment and output, but in the normal case that it leads to an appreciation of the US real exchange rate it is a beggar-thy-neighbour policy.

An increase in the European money supply has no real effects, because European wages are fully indexed to increases in the cost of living. It simply increases the European inflation and nominal interest rates one-for-one. The effects of an increase in the US money supply are presented in Fig. 5.3. This exerts an upward pressure on the US price level and increases US aggregate supply; the resulting excess supply of US goods is choked off by a fall in the

relative price of US goods and a real appreciation of the European exchange rate. This reduces the European wedge between producers' and consumers' wages and thus increases European aggregate supply. The world-wide fall in interest rates boosts aggregate demand in Europe in line with aggregate supply in Europe. Also, US real income falls as relative consumers' prices in the US increase. Clearly, a US monetary expansion is a locomotive policy as far as European employment and output are concerned whilst a European monetary expansion has no real effects. For a US monetary expansion, this is of course exactly the opposite to what happens in a standard Mundell-Fleming world.

A cut in US tax rates has exactly the same effects as an equal percentage increase in the US money supply (see Fig. 5.3), so it benefits employment and output both at home and abroad. A cut in European tax rates shifts out the AS-schedules and shifts down the GME-locus, so that the real interest rate falls, the European real exchange rate appreciates, the European wedge falls, European employment and output increase, and US employment and output fall. Hence, a cut in US tax rates is a locomotive policy whilst a cut in European tax rates is a beggar-thy-neighbour policy.

So far we have showed that a European fiscal demand expansion, an increase in the US money supply and a US tax cut stimulate activity at home and abroad. This typically means that, in the absence of international policy coordination, the US (Europe) ignores the beneficial effects on European (US) output and employment of an increase in the money supply or a supply-side incentive (a fiscal expansion). Hence, the US will have a too tight money supply and does not offer enough supply-side incentives whilst Europe's fiscal stance is too tight relative to the outcomes under international policy coordination. Similarly, a cut in European taxes and, in certain cases, a US fiscal demand expansion have negative spill-over effects. This means that in the absence of international policy coordination, European supply-side improvements are too far-reaching whilst US fiscal policy will be too tight. Since most of the popular policy debate about the performance of the OECD economies in the eighties seems to be concerned with the relative tightness of the European (and Japanese) fiscal stance and the relative looseness of the US fiscal stance, many people have advised the US to engage in a fiscal demand contraction and Europe to engage in a fiscal demand expansion. However, none of the governments on the two sides of the Atlantic have been particularly keen to implement these recommendations. The two-country model with asymmetric

labour markets that we have used in this section gives some understanding of why the US and European governments have no apparent desire to implement the above policy recommendations and of why recovery in Europe seems so hard.

To aid our understanding of the above, we will consider the optimal determination of the European and US fiscal demand shocks. For simplicity, we will assume that each government cares about low deficits and high acitivity but not about real income (so that $\bar{\vartheta}_1=0$ in the welfare-loss function (5.5)). However, we will complicate matters and add a sense of realism by assuming that Europe has a greater unemployment problem than the US ($y^d > y^{d*} > 0$). The description of the European (home) and US (foreign) economies can be summarised by:

$$y = \omega_1 f - \omega_2 f^*, \qquad \omega_1 > 0 \tag{5.54}$$

$$y^* = \omega_1^* f^* + \omega_2^* f, \qquad \omega_1^*, \omega_2^* > 0 \tag{5.55}$$

The optimal fiscal demand expansions in Europe and the US can, in the absence of international coordination of fiscal policies, be determined from the following non-cooperative reaction functions:

$$f = -\psi(y-y^d) = \psi(\omega_2 f^* + y^d) \;/\; (1+\psi\omega_1) \tag{5.56}$$

$$f^* = -\psi^*(y^*-y^{d*}) = -\psi^*(\omega_2^* f - y^{d*}) \;/\; (1+\psi^*\omega_1^*) \tag{5.57}$$

where $\psi \equiv \omega_1/\bar{\vartheta}_2$ and $\psi^* \equiv \omega_1^*/\bar{\vartheta}_2$. Both Europe and the US "lean against the wind", that is the public sector deficit is increased when output falls below its full-employment level. If Europe reduces its deficit, US output falls and the US Treasury reacts and increases its deficit. The European reaction curve is upward- or downward-sloping depending on whether a US fiscal demand expansion leads to an appreciation or a depreciaton of the US real exchange rate and thus whether it is a beggar-thy-neighbour ($\omega_2>0$) or locomotive ($\omega_2<0$) policy, respectively. If the negative effects of financial crowding out dominate the positive spill-over effects of US activity on European exports ($\bar{\sigma}/\lambda > \gamma$), a US fiscal demand expansion is a beggar-thy-neighbour policy and thus Europe reacts with a fiscal demand expansion as well. The non-cooperative (Nash-Cournot) outcome is the solution to (5.56)-(5.57), which is given by:

$$f_N = [(1+\psi^*\omega_1^*)\psi y^d + \psi\omega_2\psi^* y^{d*}] \; / \; \Delta_N \tag{5.58}$$

$$f_N^* = [-\psi^*\omega_2^*\psi y^d + (1+\psi\omega_1)\psi^* y^{d*}] \; / \; \Delta_N \tag{5.59}$$

where $\Delta_N \equiv (1+\psi\omega_1)(1+\psi^*\omega_1^*) + \psi\omega_2\psi^*\omega_2^* > 0$. Note that, when the desired change in home output increases, each country increases its public sector deficit, and more so when the priority on achieving full employment is high. An increase in the desired level of employment in Europe leads to a higher deficit in Europe and thus to more employment in the US, so the US can afford to have a tighter fiscal stance. An increase in the desired level of employment in the US only leads to a tighter fiscal stance in Europe in the unlikely case that a US fiscal demand expansion leads to a depreciation of the US real exchange rate and is a locomotive policy.

The outcome under international policy coordination minimises a global welfare-loss function, where ω will denote the relative weight of the European welfare loss in the global welfare loss. The cooperative reaction functions are:

$$f = -\psi(y-y^d) - \omega^{-1}\psi_*(y^*-y^{d*}) \tag{5.60}$$

$$f^* = -\psi^*(y^*-y^{d*}) + \omega\psi_*^*(y-y^d) \tag{5.61}$$

where $\psi_* \equiv \omega_2^*/\bar{\vartheta}_2 > 0$ and $\psi_*^* \equiv \omega_2/\bar{\vartheta}_2$ is positive (negative) when a US fiscal demand expansion is a beggar-thy-neighbour (locomotive) policy. Hence, as long as fiscal demand expansions are locomotive policies, they respond to unemployment both at home and abroad. However, in the more likely case that a US fiscal demand expansion is a beggar-thy-neighbour policy, cooperation means that the US tightens its fiscal stance when there is unemployment in Europe. The cooperative outcomes follow from the intersection of (5.60) and (5.61) and are given by:

$$f_C \equiv \frac{\Delta_N f_N + \psi_*\psi_*^*(\omega_1^* y^d + \omega_2 y^{d*}) + \omega^{-1}\psi_* y^{d*}}{\Delta_N + \omega_2\psi_*^*(\omega+\psi_*\omega_2^*) + \omega_2^*\psi_*\omega^{-1} + \psi_*^*\omega_1^*\psi_*\omega_1} \tag{5.62}$$

$$f_C^* \equiv \frac{\Delta_N f_N^* + \psi_* \psi_*^* (\omega_1 y^{d*} - \omega_2^* y^d - \omega_\psi^* y^d}{\Delta_N + \omega_2 \psi_*^* (\omega + \psi_* \omega_2^*) + \omega_2^* \psi_* \omega^{-1} + \psi_*^* \omega_1^* \psi_* \omega_1} \qquad (5.63)$$

Intuitively, one expects that the European fiscal stance is too tight ($f_N < f_C$) and that, when a US fiscal expansion is a beggar-thy-neighbour policy, the US fiscal stance is too loose ($f_N^* > f_C^*$). However, this result does not follow immediately and only holds in certain cases. To illustrate the conditions under which this result holds, it is best to consider two special cases.

Consider the case where the US dominates the G3 and G7 summits ($\omega \to 0$, $y^d = 0$). In that case, it is easy to show that the US maintain a public sector deficit consistent with no inflation ($f_C^* = 0$) whilst Europe is forced to have an inflationary deficit in order to achieve full employment in the US ($f_C = y^{d*}/\omega_2^* > 0$). In the absence of international policy coordination, the US fiscal stance is too loose ($f_N^* > f_C^* = 0$) whilst the European fiscal stance is too tight ($f_N = f_C(\omega_2 \omega_2^* \psi \psi^* / \Delta_N) < f_C$). This explains why the US urges Europe to expand demand, especially as this would justify a fiscal demand contraction in the US (see (5.57)). To understand Europe's reluctance to engage in a fiscal demand expansion, consider the case where the Europeans dominate global welfare ($\omega \to \infty$, $y^{d*} = 0$). Now Europe has a zero-inflation deficit ($f_C = 0$) whilst the US must, typically, have a deflationary deficit in order to achieve full employment in Europe ($f_C^* = -y^{d*}/\omega_2 < 0$ for $\omega_2 > 0$). Now absence of international policy coordination means that the European fiscal stance is too loose ($f_N > f_C = 0$) and the US fiscal stance is, typically, also too loose ($0 > f_N^* = f_C^*(\omega_2 \omega_2^* \psi \psi^* / \Delta_N) > f_C^*$ for $\omega_2 > 0$). Since the European fiscal stance is now too loose, <u>it is understandable that the European governments have been reluctant to succumb to US pressure to expand demand</u>.

It is possible to generalise the above results to allow both countries to have an unemployment problem ($y^d, y^{d*} > 0$). When the US dominates global welfare ($\omega \to \infty$), it can be shown that $f_N > f_C = 0$ and $f_N^* > f_C^* = -y^{d*}/\omega_2$ still hold for the case $\omega_2 > 0$.

It is clear that, whatever the weights the international summits attach to US and European welfare (or whatever the relative bargaining strenghts of the US and Europe), <u>the US fiscal stance is too loose and therefore policy coordination involves a reduction in the US deficit</u>. It is not so clear what policy coordination implies for the European fiscal stance. <u>If the US has its</u>

way, international policy coordination implies that Europe would expand demand. However, if Europe has more bargaining strength, trans-Atlantic coordination implies that Europe would reduce its public sector deficits.

So far it has been assumed that a US fiscal expansion leads to an appreciation of the US real exchange rate and is a beggar-thy-neighbour policy ($\omega_2>0$). In the more unlikely case that it is a locomotive policy ($\omega_2<0$), a dominant US ($\omega\to 0, y^d=0$) implies, as before, that the US fiscal stance is too loose ($f_N^*>f_C^*=0$) and that the European fiscal stance is too tight ($f_N<0<f_C$) whilst a dominant Europe ($\omega\to\infty$, $y^{d*}=0$) implies that the European fiscal stance is too loose ($f_N>f_C=0$) and the US fiscal stance is too tight ($f_N^*<0<f_C^*$).

5.8. Interactions between the US and a European Monetary Union

We will now consider the interactions between the US and a European Monetary Union. For analytical convenience, we will assume that Europe is made up of only two economies, say Germany (1) and France (2), whose combined size exactly matches the size of the US economy (*). The European Monetary Union fixes the intra-European exchange rate and also fixes the European money supply (m^E), hence any increase in the Franch money supply must be exactly off-set by an equal decrease in the German money supply (as in Section 5.4). The interactions between Europe and the US are determined by a floating trans-Atlantic exchange rate (as in Section 5.2). We will abstract from the problems of wage indexation, so we will employ the Keynesian assumption of nominal wage rigidity throughout the world economy (as in Section 5.2-5.4). We also assume perfect mobility of financial assets. The model can be summarised by the following reduced form stabilisation problems:

$$\min_{f_1} W_1 \equiv \tfrac{1}{2}[\tfrac{1}{4}(\hat{\gamma}+\gamma')f_1 + \tfrac{1}{4}(\hat{\gamma}-2\gamma')f_2 + \tfrac{1}{2}\hat{\gamma}f^* - y^d]^2$$

$$+ \tfrac{1}{2}\bar{\vartheta}_1[\tfrac{1}{4}\hat{\alpha}(f_1+f_2) - \tfrac{1}{2}\hat{\alpha}f^* - \bar{\omega}]^2 + \tfrac{1}{2}\bar{\vartheta}_2 f_1^2 \qquad (5.64)$$

$$\min_{f_2} W_2 \equiv \tfrac{1}{2}[\tfrac{1}{4}(\hat{\gamma}-2\gamma')f_1 + \tfrac{1}{4}(\hat{\gamma}+2\gamma')f_2 + \tfrac{1}{2}\hat{\gamma}f^* - y^d]^2$$

$$+ \tfrac{1}{2}\bar{\vartheta}_1[\tfrac{1}{4}\hat{\alpha}(f_1+f_2) - \tfrac{1}{2}\hat{\alpha}f^* - \bar{\omega}]^2 + \tfrac{1}{2}\bar{\vartheta}_2 f_2^2 \qquad (5.65)$$

$$\underset{f^*}{\text{Min}}\ W^* \equiv \tfrac{1}{2}[\tfrac{1}{2}\hat{\gamma}(\tfrac{1}{2}f_1 + \tfrac{1}{2}f_2 + f^*) - y^d]^2$$

$$+ \tfrac{1}{2}\bar{\vartheta}_1[\tfrac{1}{4}\hat{\alpha}(f_1+f_2) - \tfrac{1}{2}\hat{\alpha}f^* + \bar{\omega}]^2 + \tfrac{1}{2}\bar{\vartheta}_2 f^{*2} \qquad (5.66)$$

where $\hat{\alpha} \equiv \alpha(1-\gamma)/\delta$, $\hat{\gamma} \equiv (1+\gamma)\lambda/(\sigma+\lambda)$, $\gamma' \equiv (1-\gamma^2)(1-\gamma_2)/(1+\gamma_2)$, $\gamma \equiv \gamma_1/(1-\gamma_2)$, γ_1 denotes the elasticity of aggregate demand with respect to foreign income, γ_2 denotes the elasticity of aggregate demand with respect to own income for the US and with respect to the other European country's income for Germany and France, and α denotes the value-share of European (US) goods in total US (European) expenditures (see equations (5.3), (5.4) and (5.5)). The first term in each welfare-loss function reflects the full-employment target, the second term the real-income or cost-of-living target, and the third term the budgetary-balance target. Three outcomes can be considered:

(i) Global cooperation, that is Germany, France and the US coordinate their fiscal policies to minimise the global welfare loss $(\frac{1}{4}W_1+\frac{1}{4}W_2+\frac{1}{2}W^*)$.

(ii) Cooperation within Europe, that is Germany and France coordinate their fiscal policies to minimise the European welfare loss $(\frac{1}{2}W_1+\frac{1}{2}W_2)$, and Europe and the US behave in a non-cooperative (Nash-Cournot) fashion.

(iii) There is both an intra-European and a trans-Atlantic failure to coordinate fiscal policies, so this is a fully non-cooperative regime with a floating trans-Atlantic exchange rate and a fixed intra-European exchange rate.

When Europe coordinates its policies, France and Germany can be considered together as one country of the same size as the US. It follows that the outcome under global cooperation, i.e., (i), corresponds to (5.10)-(5.12) whilst the outcome under cooperation within Europe only, i.e., (ii), corresponds to (5.7)-(5.8). Hence, right-wing governments (high $\bar{\vartheta}_1$) have a too loose fiscal stance in outcome (ii) relative to outcome (i) whilst left-wing governments (low $\bar{\vartheta}_1$), have a too tight fiscal stance. Obviously, outcome (i) Pareto-dominates outcome (ii). In order to assess the properties of global non-cooperation, outcome (iii), we return to the numerical example discussed in Sections 5.2-5.4. The parameters are as before, but also γ_1=0.25, γ_2=0.5, γ=0.5, $\hat{\gamma}$=1 and γ'=0.25. The case $\bar{\vartheta}_1=\bar{\vartheta}_2$=1 corresponds to right-wing governments

because inequality (5.6) or, alternatively, $\bar{\vartheta}_1 > (\hat{\gamma}/\hat{\alpha})^2 = 0.694$ is satisfied. If we denote outcome (iii) by the subscript E, it follows that $f_E = 0.308s$, $f_E^* = 0.497s$, $y^d - y_E = y^d - y_E^* = -0.0693s$, $(w-p_c)_E = -(w^*-p_c^*)_E = -0.1132s$, $W_E = 0.6694s^2$ and $W_E^* = 0.5192s^2$. This should be compared with $W_N = W_N^* = 0.6464s^s$ for outcome (ii) with cooperation within Europe and with $W_C = W_C^* = 0.5278s^2$ for outcome (i) with global cooperation (see Sections 5.2 and 5.3). Table 5.4 summarises and compares the results for the three outcomes. When governments have right-wing preferences, cooperation within Europe makes the European countries better off and the US worse off, both Europe and the US loosen their fiscal stance, and there is more over-employment in both Europe and the US. The point is that when neither the European nor the US governments cooperate, outcome (iii), the US has a looser fiscal stance than the European economies and thereby is able to appreciate the real value of the dollar and increase its real income at the expense of real incomes in Europe. Hence, when there is global non-cooperation the US achieves a lower welfare loss than the European countries. Cooperation within Europe aggravates the trans-Atlantic attempts to appreciate the currency and export inflation, as Europe now acts as one large country, and therefore leads to looser fiscal stances. Since the US and Europe now are of equal size, the US can no longer dump inflation on Europe and therefore Europe is better off and the US is worse off.

However, as Table 5.4 also shows, these results may change when you have left-wing governments ($\bar{\vartheta}_1 = 0$). When none of the countries cooperate, the US still has a looser fiscal stance than Europe and now has a larger welfare loss than Europe because left-wing governments do not care about the reduction in the cost-of-living index associated with the real appreciation of the dollar. Since left-wing governments do not engage so much in competitive appreciations in order to export inflation, cooperation within Europe does not lead to much loosening of fiscal stances. In fact, Europe loosens its fiscal stance and the US tightens its fiscal stance. Cooperation within Europe means that the US tightens its fiscal stance and this makes Europe worse off as far as unemployment is concerned. In particular, when governments have left-wing preferences, cooperation within Europe never pays. Hence, cooperation within Europe increases real income and reduces the cost of living, but increases unemployment. When the latter effect is important, international coordination of fiscal policies within a European Monetary Union may be counterproductive.

5.9. Summary of the results

This Chapter was concerned with the international coordination of fiscal policies under alternative exchange-rate regimes. Section 5.1 pointed out that the international coordination of fiscal policies in a world with floating exchange rates, distortionary taxes and full employment leads Treasuries to reduce tax rates and levels of public spending. The reason is that a unilateral increase in taxes or public spending leads to a fall in foreign welfare, so that in the absence of international policy coordination taxes and public spending are too high. In a model with government debt these results can be reversed, because a unilateral increase in taxes and government spending leads to a long-run accumulation of foreign debt and thus a depreciation of the real exchange rate is required to service this debt so that foreign consumption of home goods and foreign welfare rise. Hence, in the long run absence of international policy coordination may imply that taxes and government spending are too low.

Sections 5.2-5.4 considered two-country models with perfect mobility of financial assets and unemployment caused by nominal wage rigidity under floating exchange rates, under the European Monetary System with German hegemony, and under European Monetary Union, respectively. Under floating exchange rates a fiscal demand expansion is a locomotive policy as far as foreign employment and output is concerned and a beggar-thy-neighbour policy as far as foreign real income or the cost of living is concerned. It follows that a right-wing Treasury responds to a foreign fiscal demand contraction with a fiscal demand contraction whilst a left-wing government responds with a fiscal demand expansion. Also, international policy coordination under floating exchange rates implies that right-wing governments, mainly concerned with the cost of living, thighten their fiscal stance whilst left-wing governments, mainly concerned with the full-employment target, loosen their fiscal stance. A fiscal supply expansion, such as a tax cut, acts in the same way as a monetary expansion and therefore has a negative effect on foreign employment and output. Section 5.3 considered the European Monetary System with German hegemony, that is the Bundesbank sets the German money supply whilst the other European central banks peg their currencies to the Deutschmark. A fiscal supply expansion, such as a tax cut, increases real income at home and abroad. A tax cut or another fiscal supply expansion in countries other than Germany leads to an increase

in their money supplies and is a beggar-thy-neighbour policy, that is raises employment and output in the rest of Europe and reduces German employment and output. However, a tax cut or another fiscal supply expansion in Germany does not necessarily lead to a fall in the money supplies of the other European countries and therefore can, in principle, be a locomotive policy. A fiscal demand expansion in countries other than Europe is a locomotive policy, because it raises employment and output throughout Europe. A German fiscal demand expansion, however, is less of a locomotive policy and can, when the fall in non-German money supplies is large enough, be a beggar-thy-neighbour policy. Hence, Germany always responds with a fiscal demand contraction to a fiscal demand expansion elsewhere in Europe whilst the rest of Europe responds, when a German fiscal demand expansion is a beggar-thy-neighbour policy, with a fiscal demand expansion. Also, in a non-cooperative European Monetary System Germany always has a tighter fiscal stance than the rest of Europe and all countries in Europe will have a too tight fiscal stance relative to the cooperative outcome irrespective of their preferences. Hence, the European Monetary System has a built-in deflationary bias in fiscal policies. This means that Germany has a greater incentive to cooperate in the European Monetary System than the rest of Europe. Since the European Monetary System avoids the conflict inherent in competitive appreciations and exporting inflation, it is nevertheless superior to floating intra-European exchange rates. Section 5.4 moved on to a European Monetary Union, which is a symmetric exchange-rate arrangement without German hegemony in monetary policy so that the European central banks fix the European money supply. In a European Monetary Union a fiscal demand expansion can, in contrast to floating exchange rates, be a beggar-thy-neighbour policy. When this is the case, a non-cooperative European Monetary Union leads to too loose fiscal stances. However, when fiscal demand expansions are locomotive policies, the fiscal stances are too tight in the absence of international policy coordination. The main advantage of a European Monetary Union, as it is for the EMS, is that it avoids the conflict inherent in exporting inflation. However, Germany does better and the rest of Europe does worse under a cooperative EMS rather than under a cooperative EMU, so it is not clear that Germany has much incentive to cooperate and give up its hegemony when setting up the European Central Bank. McKibbin and Sachs (1986a,b) use their empirical multi-country model and their findings support the results obtained in Sections 5.2-5.4 on floating exchange rates, the EMS

and the EMU. They also argue that a regime of fixed exchange rates works well for global shocks but not necessarily well for country-specific shocks. Hence, the choice of an international exchange-rate regime depends crucially on the source of origin and nature of the shocks hitting the world economy as well as on the nature of the preferences of the various governments.

Section 5.8 extended the model of Sections 5.2-5.4 to allow for the interactions between the US and the countries making up a European Monetary Union. When none of the countries coordinate their fiscal policies, the US exploits the smaller size of the European economies by appreciating the real value of the dollar and exporting inflation to Europe. The US does this by having a looser fiscal stance than the European economies. When fiscal policies in Europe are coordinated, the US can no longer employ this tactic and thus Europe has a lower cost of living and higher real income than before. However, the US now has a tighter fiscal stance than before and therefore unemployment throughout the world is higher. Hence, coordination of fiscal policy within Europe can be counterproductive, especially when governments care a great deal about unemployment.

Sections 5.5-5.7 considered the empirical relevance and importance for the policy debate of indexation of nominal wages to cost-of-living indices. Section 5.5 presented some empirical results to demonstrate a lack of indexation in the short run, i.e., nominal wage rigidity, for the US and Canada, and a great deal of indexation, i.e., real wage rigidity, for the European countries and Japan. This suggests that for Europe a depreciation of its real exchange rate (or an increase in the tax wedge) raises the wedge between producers' and consumers' wages and thus reduces aggregate supply and that adverse supply shocks (such as the OPEC oil-price hikes in the seventies) affected Europe much more badly than the US. Section 5.6 considered the interactions between the European economies when they are all characterised by full indexation (real wage rigidity). The main lesson is that, as far as real outcomes such as unemployment and output are concerned, monetary policy has no efffects and therefore the particular exchange-rate regime (EMS, EMU, etc.) in force has no effects. Also, a fiscal demand expansion is always a beggar-thy-neighbour policy because it leads to a depreciation of the foreign real exchange rate and a fall in foreign supply. It follows that under real wage rigidity common adverse demand shocks do not affect unemployment, although common adverse supply shocks increase unemployment throughout Europe. Tax cuts

within Europe are locomotive policies. In the absence of international coordination of fiscal policies, public sector deficits are too tight and supply-side improvements do not go far enough relative to the cooperative outcome for Europe. This seems an important problem for the European economies in the seventies and eighties.

Section 5.7 considers the global interactions between the US, with nominal wage rigidity, and Europe, with real wage rigidity. A US monetary expansion and a European fiscal demand expansion are then locomotive policies. A US fiscal demand expansion is, typically, a beggar-thy-neighbour policy, because the negative effects of financial crowding on European consumption and investment typically dominate the positive spill-over effects of US activity on European exports. Also, OPEC oil-price shocks hit Europe much harder than the US. It is then not surprising that, in the aftermath of the OPEC oil-price shocks and in the absence of international policy coordination, the European fiscal stance has been too tight, the US fiscal stance has been too loose and the US monetary stance has been too tight. All of these policies have contributed to the recent rise in European unemployment and they explain why most of the trans-Atlantic policy debates urge the US to contract demand and Europe to expand demand.

Table 5.1: Fiscal Stances, Unemployment Rates and Welfare Losses under Alternative Exchange-Rate Regimes

Exchange-Rate Regime	Germany			Rest of Europe		
	Fiscal Stance (f^*)	Unemployment Rate (y^d-y^*)	Welfare Loss (W^*)	Fiscal Stance (f)	Unemployment Rate (y^d-y)	Welfare Loss (W)
European Monetary System:						
Non-Cooperative	0.130	0.195	0.5276	0.153	0.184	0.5287
Cooperative	0.143	0.176	0.5258	0.187	0.154	0.5293
European Monetary Union:						
Non-Cooperative	0.143	0.190	0.5283	0.143	0.190	0.5283
Cooperative	0.167	0.167	0.5278	0.167	0.167	0.5278
European Float:*						
Non-Cooperative	0.511	-0.178	0.6464	0.511	-0.178	0.6464

* A cooperative regime of floating intra-European exchange-rates yields exactly the same outcome as a cooperative monetary union in Europe.

Table 5.2: Tests for Real and Nominal Wage Rigidity in the OECD Economies

Δw	CA	FR	GE	IT	JA	UK	US
Constant	-0.785	-0.569	-2.235	-1.310	-0.014	-0.810	-0.306
t-ratio	2.09	3.26	3.52	3.48	0.05	2.73	1.65
Δp_c [a]	0.632	0.913	0.808	0.992	0.895	0.717	0.641
t-ratio	5.81	7.28	4.63	7.26	7.90	5.65	4.40
Δw_{-1} [a]	0.368	0.087	0.192	0.008	0.105	0.283	0.359
t-ratio	3.38	0.69	1.10	0.06	0.93	2.23	2.47
u [b]	-0.444	-0.164	-1.458	-1.367	-0.083	-0.350	-
t-ratio	2.22	6.56	5.02	1.62	3.02	1.77	
Δu	-	-1.750	-	-	-	-	-0.514
t-ratio		1.85					2.90
PROD	0.202	0.069	0.561	0.282	0.062	0.366	0.071
t-ratio	1.85	2.30	3.58	2.71	0.59	2.87	1.23
NC [c]	0.0084	0.035	-	0.0391	0.0082	-0.0796	0.0113
t-ratio	2.07	4.07		2.43	0.45	5.49	1.92
$w-t_2-p_c$	-0.200	-0.073	-0.565	-0.225	-0.087	-0.338	-0.130
t-ratio	1.88	1.56	3.83	2.79	0.78	2.72	1.62
standard error	0.0094	0.0112	0.0174	0.0256	0.0145	0.0163	0.0083
SARGAN [d]	9.97	11.23	10.54	8.25	8.37	6.79	11.41
d.f.	6	7	8	8	6	7	8
LM1 [e]	0.27	0.11	0.03	1.07	1.14	1.16	0.49
HETERO [f]	7.26	0.09	0.01	0.16	0.14	0.45	1.29

Contd/...

Table 5.2 contd

Notes:

(a) These coefficients have been restricted to add up to unity. The restrictions were not rejected at the 5 per cent significance level.

(b) The unemployment rate statistics for JA are not a very good measure of labour market conditions (Hamada and Kurosaka, 1986), hence instead the series of the ratio of jobs wanted to jobs offered has been used.

(c) For CA and IT, this is the logarithm of the number of days lost through strikes (lagged). For FR, this is the logarithm of the number of conflicts. For the US, this is the logarithm of the number of conflicts (lagged). For the UK, this is an incomes policy dummy for the years 1976-77.

(d) Sargan's test for serial correlation of IV residuals.

(e) Test for residual serial correlation .

(f) Test for homoskedasticity.

Table 5.3: International Interdependence under Alternative Exchange-Rate Regimes +

Policies	f	f^*	τ	τ^*	m	m^*	e
Trans-Atlantic Float: NWR/NWR*							
y	+	+	-	+	+	-	n.a.
$w-p_c$	+	-	?	-	-	+	n.a.
Trans-Atlantic Float: RWR/NWR*							
y	+	?	-	-	0	+	n.a.
y^*	+	+	+	-	0	+	n.a.
$w-p_c$	-	?	-	(-)	0	-	n.a.
European Monetary System: NWR/NWR*							
y	+	?	-	?	n.a.	+	+
y^*	+	+	+	-	n.a.	+	+
$w-p_{c*}$	0	0	-	-	n.a.	0	-
w^*-p_c	0	0	-	-	n.a.	0	+
Europe: RWR/RWR*							
y	+	-	-	-	0	0	0

+ Europe with RWR/RWR* is relevant for any exchange-rate regime, whether the EMU, EMS or floating intra-European exchange rates. For the second trans-Atlantic model home is Europe and abroad is the US, whilst for the EMS abroad is Germany and the rest of Europe is home.

Table 5.4: Interactions Between the United States and a European Monetary Union

	Europe				United States			
RIGHT-WING GOVERNMENTS	Fiscal Stance	Unemploy-ment	Real Income	Welfare Loss	Fiscal Stance	Unemploy-ment	Real Income	Welfare Loss
Global Cooperation	0.167	0.167	0	0.5278	0.167	0.167	0	0.5278
Cooperation within Europe	0.511	-0.178	0	0.6464	0.511	-0.178	0	0.6464
Global Non-Cooperation	0.308	-0.069	-0.113	0.6694	0.497	-0.069	0.113	0.5192
LEFT-WING GOVERNMENTS	f	y^d-y	$w-p_c$	W	f^*	y^d-y^*	$w^*-p_c^*$	W^*
Global Cooperation	0.167	0.167	0	0.0278	0.167	0.167	0	0.0278
Cooperation within Europe	0.111	0.222	0	0.0309	0.111	0.222	0	0.0309
Global Non-Cooperation	0.087	0.232	-0.017	0.0307	0.116	0.232	0.017	0.0336

Fig. 5.1: Effects of a fiscal demand expansion with real wage rigidity throughout Europe

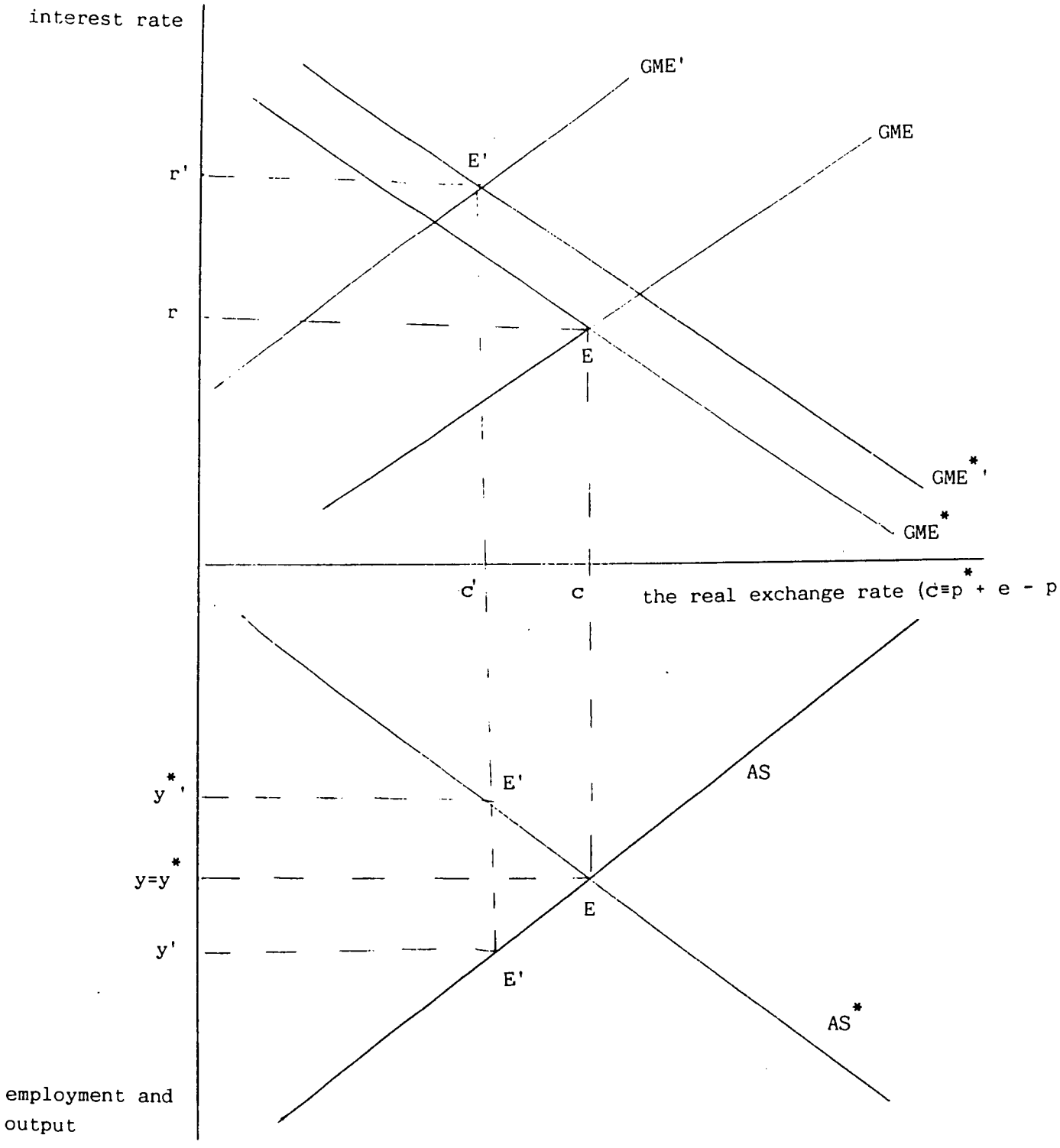


Fig. 5.2: Interdependence of the European and US Economies: A European Fiscal Demand Expansion

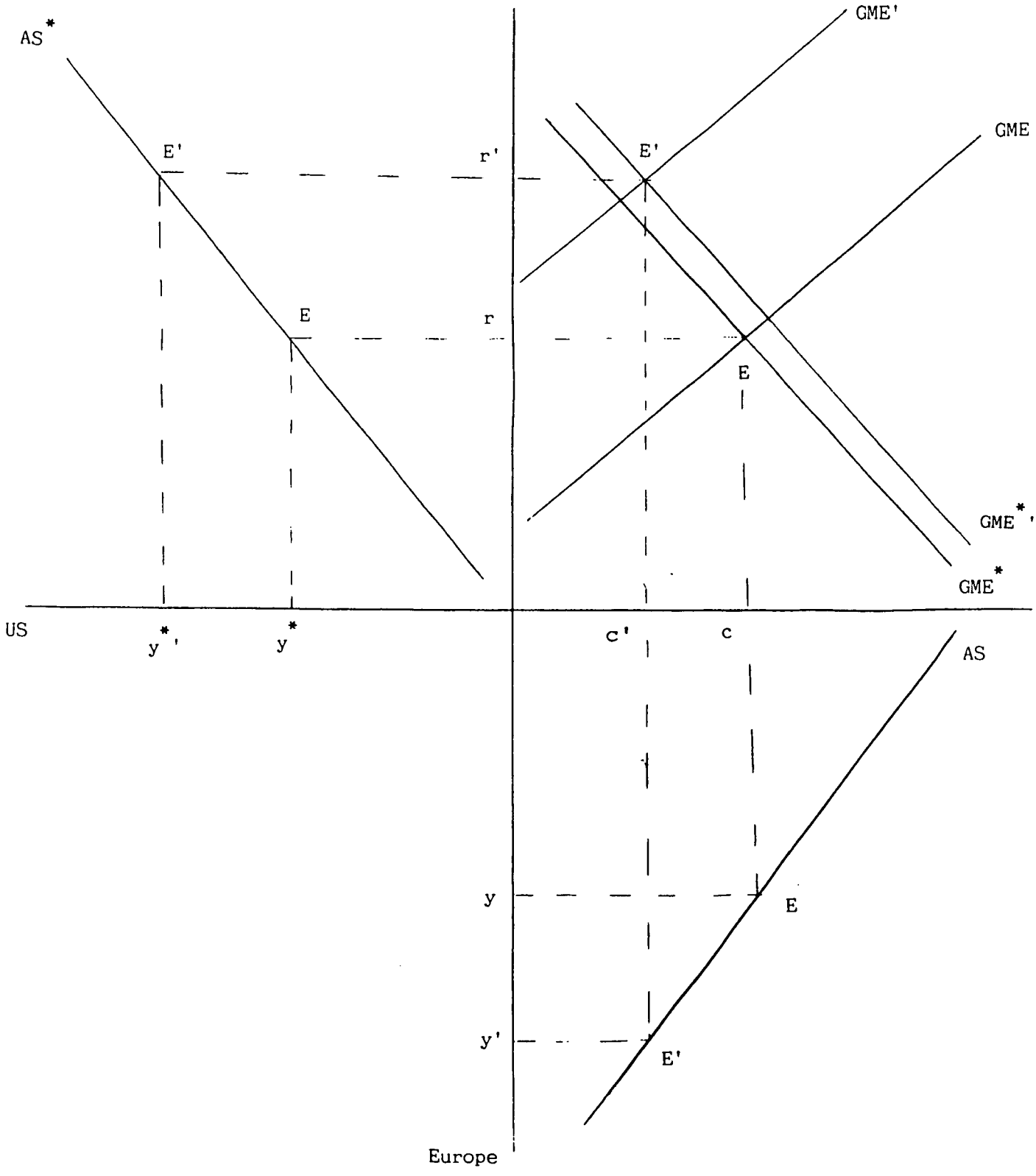
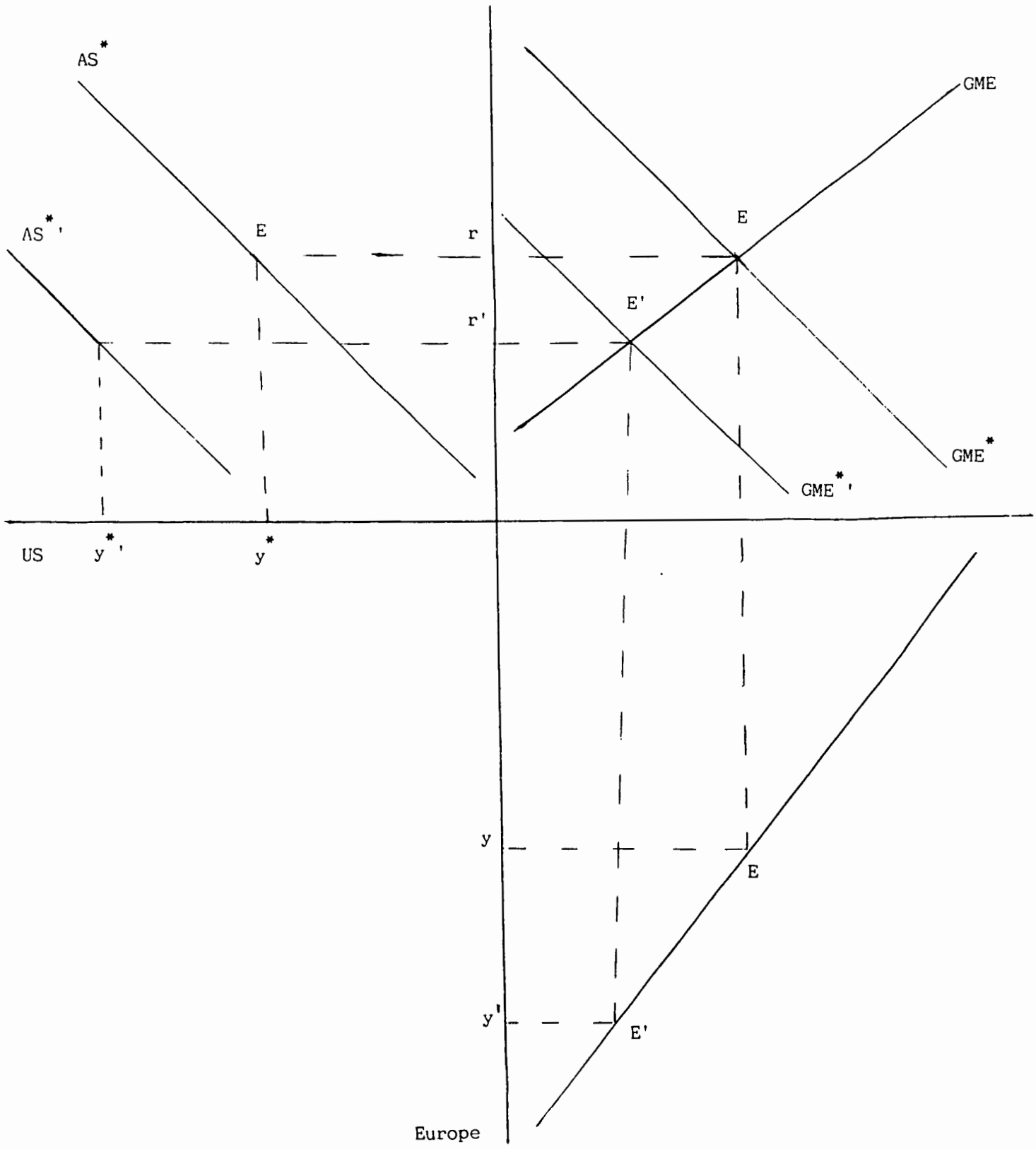


Fig. 5.3: Interdependence of the European and US Economies: An Increase in the US Money Supply or Cut in US Tax Rate



6. Can International Policy Coordination be Counterproductive?

Most laymen and indeed most policymakers and economists seem to be of the opinion that international policy coordination is always a good thing. In fact, most of the discussion in Chapters 4 and 5 gives the impression that international coordination of monetary and/or fiscal policies either raises or, in any case, does not reduces the welfare of the countries concerned. However, it is important to explain that there may be circumstances under which international policy coordination worsens the welfare of countries. The objective of this short chapter is to function as a warning by giving three good reasons why international policy coordination can be counterproductive. Section 6.1 points out that international policy coordination can worsen the credibility problems of the various central banks vis-à-vis their private sectors and can therefore be counterproductive. Since this effect works via the exchange rate, this problem is less severe under a European Monetary Union. Section 6.2 argues that policy coordination among a sub-set of countries (say, among the European economies) may be counterproductive, because this may provoke an adverse response from third countries (such as the US). Section 6.3 shows that, when policymakers of the different governments around the conference table have uncertainty or disagreement about how the international economy functions, then international policy coordination can easily make the countries concerned worse off. Finally, Section 6.4 concludes this chapter.

6.1. Coordination can worsen the credibility of central banks

In this section we will argue that international policy coordination can worsen the credibility of the central banks vis-à-vis private sector agents. The point is that, in a two-country world, there are really at least four players, viz. the central bank of the home country, the central bank of the foreign country, the private sector of the home country and the private sector of the foreign country (see Fig. 6.1). International coordination of monetary policies implies a coalition between the two central banks, but this coalition can provoke an adverse response from the other two players, i.e., the two private sectors. In other words, a coalition among a sub-group of players can

worsen the game with the remaining players. Under floating exchange rates each central bank has an incentive to announce a low money supply in order to attempt to persuade the private sector to settle for low nominal wages, but once the private sector is locked into contracts with low nominal wages the central bank has an incentive to renege and implement a surprise increase in the money supply. Such a possibility to renege should be excluded in equilibrium, unless central banks can tie their own hands and pre-commit themselves, so that strategies of the central bank should be credible and be believed by the private sector in the sense that they must be rational to carry out if called upon to do so. It is straightforward to show that credible equilibria, relevant when central banks have no reputation or ability to pre-commit themselves, lead to higher monetary growth and inflation rates. The point is that international policy coordination destroys a discipline device and therefore gives central banks a greater incentive to renege (Rogoff, 1985; van der Ploeg, 1988). The reason is that, in the absence of international policy coordination, there is a smaller incentive to renege, because reneging leads to a depreciation of the currency and inflation costs which acts as a disincentive to renege. The same point can be made with respect to fiscal policies (Kehoe, 1986). Similarly, under managed intra-European exchange rates, each central bank has an incentive to renege with a surprise devaluation in order to fool the private sector, erode real wages and boost activity (as in the small open economy discussed by Horn and Persson, 1988). The point is that international policy coordination can be counterproductive, because it worsens these credibility problems about unanticipated devaluations of the nominal exchange rate. However, a European Monetary Union with irrevocably fixed intra-European exchange rates avoids those credibility problems and this is indeed, one of the main attractions of such a system.

To illustrate the above discussion, we will discuss the desirability of international policy coordination with and without pre-commitment or reputation within the context of a classical model of two interdependent monetary economies with micro foundations and a long-run trade-off between inflation and output (cf. van der Ploeg, 1988; Sections 4.2 and 5.1). There are flexible prices, there is imperfect substitution between home and foreign goods, and agents hold only domestic cash in their portfolios. Labour is immobile. The government levies distortionary taxes on income from production and also

imposes "inflation taxes" in order to finance the provision of public goods. The home households maximise their utility,

$$\int_0^{\infty} \exp(-\delta t)[\alpha_1 \log(C_D) + \alpha_2 \log(C_M) + \alpha_3 \log(1-\ell^S) + \alpha_4 \log(G) + v(M)]dt,$$

$$\alpha_1+\alpha_2+\alpha_3+\alpha_4=1,\ \alpha_i \geq 0,\ v''(m)>0, \qquad (6.1)$$

subject to its budget constraint,

$$\dot{m} = (1-\tau)(w\ell^S+z) - C_D - eC_M - \pi M, \qquad (6.2)$$

where δ, C_D, C_M, ℓ^S, G, M, τ, w, z, e and π denote the pure rate of time preference, consumption of home goods, consumption of foreign goods, labour-supply, public spending, real money balances, the tax rate, the real wage, profits, the exchange rate and the inflation rate, respectively. Clearly, $C_D=\alpha_1/\lambda$, $C_M=\alpha_2/e\lambda$, $\ell^S=1-\alpha_3/[(1-\tau)w\lambda]$ and

$$\dot{\lambda} = (\delta+\pi^e)\lambda - v'(M) \qquad (6.3)$$

where λ denotes the marginal value of money balances and π^e denotes expected inflation. Putting money in the utility function gives us a demand for money, which is a negative function of inflation. There exists an M, say M_F, such that $v'(M)=0$ and this will be called Friedman's optimal quantity of money (OQM). Firms maximise profits, which gives the demand for labour, ℓ^d, from $f'(\ell^d)=w$ where f(.) is the production function. Labour market equilibrium gives employment $\ell=1-\alpha_3/[(1-\tau)f'(\ell)\lambda]$, which can be solved to give $\ell=L((1-\tau)\lambda)$, $L'>0$. Money market equilibrium gives $\mu=\tau+\dot{M}/M$, where μ denotes the growth in the nominal money supply. The government budget constraint is given by $\mu M=d\equiv G-\tau f(\ell)$, where d denotes the public sector deficit. The foreign economy has identical tastes and preferences and the same population size. As usual, foreign variables are denoted with an asterisk. Goods market equilibrium is given by $f(\ell)=C_D+G+C_M^*$, where C_M^* denotes exports. Exchange market equilibrium gives $C_M^*=eC_M$, so that $e=\lambda/\lambda^*$. Finally, perfect foresight gives $\pi^e=\pi$. The perfect-foresight equilibrium (PFE) gives the endogeneous variables conditional on expectations of current and future values of the government's

policy instruments. In particular, the demand for real money balances depends negatively on the expected inflation rate and therefore the price level is history-dependent and jumps in reaction to "news" about future events. Hence, real money balances also change instantaneously in response to "news". The objective of each government is to choose its fiscal and monetary policies (τ, G and μ) to maximise the utility of the representative household subject to the constraints of the PFE.

Before we proceed to a discussion of the decentralised market outcomes under non-cooperative central banks and under international policy coordination, we briefly discuss the first-best outcome of the world economy as this gives an upper bound on the welfare that can be obtained in a system of cooperative or non-cooperative interdependent market economies. The first-best optimum for the world economy corresponds to a command or centrally planned economy and is not attainable in a world of interdependent market economies. The first-best optimum is characterised by (see also Sections 4.2 and 5.1): (i) the marginal rate of substitution between home and foreign consumption of home, public and foreign goods is unity ($\alpha_1/C_D=\alpha_2/C_M=\alpha_3/G= \alpha_1/C_D^*=\alpha_2/C_M^*=\alpha_3/G^*$); (ii) zero tax distortions ($\tau=\tau^*=0$); and (iii) Friedman's Optimum Quantity of Money ($M=M^*=M_F$). The implied monetary growth rate if $\mu=G/M_F$, so that in general the full liquidity rule of zero nominal interest rates, i.e., $\mu=-\delta$, does not even hold in a first-best optimum for the world economy. For linear technologies, $f(\ell)=\beta\ell$, one obtains $C_D=C_D^*=\alpha_1\beta$, $C_M=C_M^*=\alpha_2\beta$, $G=G^*=\alpha_4\beta$, $1-\ell=1-\ell^*=\alpha_3$ and $\mu=\mu^*=\alpha_4\beta/M_F$.

We will now move back to the decentralised market outcomes associated with the perfect-foresight equilibrium. We already mentioned the forward-looking character of real money balances. This means that the central bank or Treasury of each country can announce a change in policy at some future event and, if believed by the private sector, then the private sector will respond today. The credibility problems arising from these intertemporal linkages give rise to a game between each government and private sector agents. There is also a game between the home and foreign government (see Fig. 6.1) arising from the externalities induced by changes in foreign policy. An increase in the foreign tax rate or foreign level of public spending leads to a reduction in the foreign demand for home goods. The incipient trade deficit is choked off by a depreciation of the home market exchange rate, which reduces home

consumption of foreign goods and therefore worsens home welfare. This is the nature of the externality facing home and foreign governments.

Four market outcomes will be considered:

(i) Non-cooperation between home and foreign governments, but pre-commitment or reputation vis-à-vis private sector agents.

(ii) International policy coordination and pre-commitment or reputation vis-à-vis private sector agents.

(iii) Non-cooperation between home and foreign governments and lack of credibility vis-à-vis private sector agents.

(iv) International policy coordination and lack of credibility vis-à-vis private sector agents.

In outcome (i) governments do not cooperate in their choice of tax rates, levels of government spending and monetary growth. Furthermore, each government pre-commits itself to the announced policies for the future. This pre-commitment can be done through constitutional law, institutional constraints or the build-up of a reputation for "sticking to your guns". In other words, private sector agents believe the governments and act accordingly. It can be easily shown that pre-commitment is required, because the non-cooperative outcomes under (i) are time inconsistent as each government has an incentive to cut distortionary taxes and increase monetary growth and inflation in order to erode the real value of money balances and thus increase welfare. The rationale behind this incentive to renege is that the increase in seigniorage revenues permits a cut in distortionary taxes, leading to more employment, and an increase in government spending, both of which improve welfare. This time inconsistency arises despite the fact that there is no conflict between private and public objectives! If there are no binding contracts or reputational forces that prevent each government from reneging on its private sector, expectations will not be fulfilled and the government will soon loose its credibility. In that case, outcome (iii) becomes relevant and the government has to treat its price level or, alternatively, its stock of real money balances as a predetermined rather that as a jump variable. Hence, this has been coined the non-cooperative, "loss of leadership" outcome as each government is resigned to the fact that it has no reputation and cannot manipulate the holdings of real money balances. It is easily shown that outcome (iii) leads to higher tax rates and the resulting distortions in relative prices reduce the opportunity cost of leisure, so that labour supply is less.

Also, output and the consumption of home and foreign goods is less than under outcome (i) (and thus a fortiori less than in the first-best outcome for the world economy). The main feature of the non-cooperative outcome without pre-commitment or reputation, outcome (iii), is, however, that real money balances are lower than under outcome (i), because then the governments will have no incentive to renege and impose a surprise inflation tax. Clearly, outcome (iii) always yields lower welfare than the non-cooperative outcome with pre-commitment (i).

Now consider outcome (ii), that is the outcome under international policy coordination with pre-commitment or reputation vis-à-vis private sector agents. The main difference with the non-cooperative outcome with pre-commitment, (i), is that the negative externalities of higher taxes and public spending on foreign welfare will be internalised, that is international policy coordination leads to lower taxes and public spending than under outcome (i). It is easily shown that international policy coordination still leads to the problem of time inconsistency, that is both governments have a joint incentive to renege on private sector agents. In fact, there is a greater incentive to renege than under the non-cooperative outcome, (i), and therefore an even greater need to have binding contracts or reputation. The reason is that international policy coordination destroys to a large extent the monetary discipline of central banks. Non-cooperative policies have a built-in disincentive to renege, i.e., discipline device, because a surprise levy of an inflation tax immediately leads to a depreciation of the real exchange rate and the associated inflation reduces welfare and acts as a disincentive to renege. International policy coordination no longer has this built-in disincentive to renege on private sector agents, because when both governments impose a joint surprise inflation tax the exchange rate is unaffected and the associated discipline device is demolished. The above discussion explains why international policy coordination with central banks who lack credibility vis-à-vis their private sector agents, i.e., outcome (iv), leads to excessive monetary growth and inflation rates and thus to very low levels of real money balances; low levels of monetary growth would simply not be believed by private sector agents who fear a surprise inflation tax. The high inflation reduces welfare and is the main reason why international policy coordination, when central banks lack credibility with private sector agents, can be counterproductive. There is an off-setting effect, which has to do with the fact that

outcome (iv) has no distortionary taxes ($\tau=\tau^*=0$) and that the provision of public goods is less than in the non-cooperative outcome, (iii), ($G_C=G_C^*=\alpha_4\beta<G_N$). Hence, the fiscal policy instruments in the cooperative outcome, (iv), are exactly the same as in the first-best outcome for the world economy. International policy coordination is counterproductive, when the adverse welfare effects of excessive monetary growth (caused by lack of credibility) outweigh the beneficial welfare effects of no tax distortions and optimal provision of public goods.

Table 6.1 presents a numerical example that compares the first-best optimum for the world economy with the four market outcomes discussed above. The first-best optimum and coordination under "loss-of-leadership", outcome (iv), both have zero tax rates, yet the latter is vastly inferior due to much higher inflation eroding the holdings of real money balances. Non-cooperative decisionmaking under "loss of leadership", outcome (iii), yield higher welfare than international policy coordination (a welfare loss of 1.797 rather than 1.885), despite the presence of distortionary taxes and resulting falls in employment, output and consumption. International policy coordination is counterproductive, as there is no longer a disincentive to renege, because when both governments impose a surprise inflation tax there will be no induced depreciation of the real exchange rate and thus no inflation costs. In other words, international policy coordination removes the threat of a depreciation and thereby the disincentive to levy an unanticipated inflation tax, so that inflation is higher and welfare lower. The welfare-ranking is as follows: the best is the first-best command optimum for the world economy, the second best is international policy coordination with pre-commitment, outcome (ii), the third-best non-cooperative decisionmaking with pre-commitment, outcome (i), the fourth best is non-cooperative decisionmaking without pre-commitment, outcome (iii), and the worst is international policy coordination without pre-commitment. Hence, international policy coordination without a reputation for "sticking to your guns" with private sector agents reduces welfare.

Rogoff (1985) and the survey given in McKibbin (1987) make exactly the same point within the context of a Keynesian two-country real-exchange-rate overshooting model with unemployment and short-run nominal wage rigidity. In contrast to the public-finance model discussed above and in van der Ploeg (1988), central banks have an incentive to renege and impose an unanticipated increase in the money supply because this leads to higher prices, erodes the

real value of the predetermined nominal wage, and thus increases activity (rather than because this permits an unanticipated cut in distortionary taxes and increase in public goods). However, the idea that international policy coordination destroys the disincentive to renege, as there is no longer an induced depreciation of the real exchange rate and inflation costs, is the same and Rogoff (1985) arrives at a similar welfare ranking.

Similar problems of the counterproductivity of international policy coordination do not arise so easily in a system of managed exchange rates, even though exchange rates can be realigned and credibility problems may arise (see the analysis of Horn and Persson for a small open economy). The point is that a surprise devaluation of the currency raises consumers' prices and acts as an unanticipated incomes policy and boosts activity. This incentive exists under non-cooperative decisionmaking and it is to be traded off against the disincentive to renege in the form of higher inflation costs. International policy realises that it is futile to attempt to manipulate the exchange rate, so that reneging does not take place. Obviously, international policy coordination can then never be counterproductive. Hence, under a cooperative regime of managed exchange rates (such as the EMS) or under a European Monetary Union, international policy coordination eliminates the incentive for central banks to renege on private sector agents and thus international policy coordination is never counterproductive. This is one of the main advantages of a European Monetary Union or of a cooperative European Monetary System over a regime of floating intra-European exchange rates as it leads to lower inflation rates.

6.2. Coordination within Europe can be counterproductive

It is a standard proposition in game theory that a coalition among a sub-group of players need not improve and can, indeed, worsen the utilities of this sub-group of players. The reason is, of course, that the remaining players may be provoked into a response that worsens the utilities of the players making up the coalition. This idea can also be applied to the potential counterproductivity of international policy coordination among a sub-set of countries. In particular, international policy coordination between the

European governments can worsen their welfare because it may provoke an adverse response from the US government. An example of this counterproductivity of the coordination of monetary policies within Europe is presented in Basevi and Giavazzi (1987) and briefly discussed in Section 4.7. Much more relevant is the question of whether the coordination of fiscal policies in Europe will be desirable once a monetary union and a European Central Bank has been established. This question has been adressed at length in Section 5.8. The point is that coordination of fiscal policies in a European Monetary Union avoids the real appreciation of the dollar, caused by a looser fiscal stance in the US than in Europe under a fully non-cooperative world, and thus avoids the increase in the cost of living and the fall in real income for the European economies. This raises welfare in Europe. However, cooperation within Europe also leads to more unemployment throughout the world economy because the US now has a tighter fiscal stance as it no longer attempts to appreciate the real value of the dollar and export inflation. When governments in Europe care more about unemployment than about real income or the cost of living, coordination of fiscal policies in Europe is counterproductive. Hence, a European Monetary Union does not necessarily imply that it is desirable to coordinate fiscal policies in Europe.

6.3. Uncertainty and disagreement on how the world economy functions

Many economists and policy advisers in supranational organisations such as the International Monetary Fund and the World Bank argue that many countries are reluctant to participate in international policy coordination, because either they are uncertain on how the world economy functions and on the nature of the interdependencies between their economy and other economies or their view on these matters differ from the views of their partners in summit meetings. German officials often argue that a fiscal demand expansion in Germany is actually bad for German employment and output, which obviously is at variance with what most economists teach and are taught and at variance with what officials in other countries think. Since many economists quibble about how the way the (world) economy operates, it is no surprise that government officials either have the wrong view of how the world economy operates or disagree about how the world economy functions. The problem is

that such a lack of knowledge can easily render international policy coordination futile.

To illustrate this point, it is probably best to give an example. Imagine the government officials on both sides of the conference table have been well trained in the standard two-country Mundell-Fleming model and that they operate on the assumption that fiscal demand expansions are locomotive policies, say $y=y^*=f+f^*$ (see Section 5.2). Also, assume that each government cares about full employment and small budget deficits but does not care about real income (so we will use the welfare-loss function (5.5) with $\bar{\vartheta}_1=0$ and, for the sake of definiteness, $\bar{\vartheta}_2=1$). It follows that the non-cooperative (or Nash-Cournot) outcomes are given by $f_N=f_N^*=y^d/3$. Each government will <u>think</u> that it achieves an output level of $y_N=y_N^*=2y^d/3$ and a welfare loss of $W_N=W_N^*=y^{d2}/9$. International policy coordination leads, as fiscal demand expansions are perceived to be locomotive policies, to looser fiscal stances, that is $f_C=f_C^*=2y^d/5>f_N$. Now each government will <u>think</u> that it gets closer to full employment, $y_C=y_C^*=4y^d/5>y_N$, and achieves a smaller welfare loss, $W_C=W_C^*=y^{d2}/10<W_N$, so each government believes at first sight that cooperation pays. However, let us assume that the government officials have been taught a dreadfully out-of-date model and that in fact fiscal demand expansions are beggar-thy-neighbour policies, say $y=y^*=\beta(f-f^*)$. This may be the case when real consumers' wages rather than nominal wages are fixed in the short run (see Section 5.6). In that case, <u>neither</u> the non-cooperative <u>nor</u> the cooperative fiscal stances make any head-way on achieving the target of full employment, $y_N=y_N^*=y_C=y_C^*=0$, so that the welfare loss under the non-cooperative outcome is given by $W_N=W_N^*=5y^{d2}/9$ whilst the welfare loss under international policy coordination is given by $W_C=W_C^*=29y^{d2}/50$. When the government officials around the conference table have the correct "beggar-thy-neighbour" view of international interdependencies, then it is easy to show that in the non-cooperative (Nash-Cournot) outcome each government has a very loose fiscal stance and does not score on the full-employment target, $f_N=f_N^*=y^d$, $y_N=y_N^*=0$, $W_N=W_N^*=y^{d2}$, whilst in the outcome under international policy coordination neither government atttempts to boost employment and output as it realises that in equilibrium this would be futile, $f_C=f_C^*=0$, $y_C=y_C^*=0$, $W_C=W_C^*=\frac{1}{2}y^{d2}$. Finally, when the government officials believe that fiscal demand expansions are beggar-thy-neighbour policies whilst in fact they are locomotive policies, then $y_N=y_N^*=2y^d$, $W_N=W_N^*=y^{d2}$ and $y_C=y_C^*=0$, $W_C=W_C^*=\frac{1}{2}y^{d2}$. The results on the non-cooperative and

cooperative welfare losses under all the permutations of perceived and actual workings of the world economy are presented in Table 6.2. This table allows us to draw the following conclusions:

(i) When the perceived view on global interdependence is correct, then international policy coordination does not make any of the countries worse off.

(ii) However, when countries have the wrong view on the nature of global interdependence, then international policy coordination can make all countries concerned worse off (0.58>0.556).

(iii) Conversely, when countries have the wrong view on the nature of global interdependence and when they do not cooperate, they can be much better off than when they have the correct view on the nature of global interdependence and do not cooperate (0.556<1.0). Hence, better information need not pay off when countries do not cooperate.

These are quite radical propositions, because they demolish the myth that international policy coordination always makes countries better off and that countries should always try to get the best information they can on the workings of the world economy. Indeed, many have argued that not knowing the true model of the economy is the main barrier to successful international policy coordination.

The above discussion was based on a stylistic example, but Frankel and Rockett (1987) show that these insights may be quite important from an empirical point of view. There are many multi-country models of the OECD economies, which all give different own and cross multipliers for economic policy. The studies reported in Bryant et al. (1988) compare the main available empirical multi-country models. Each modelling team can of course maintain that they have the "true" model and that all other models are wrong, but this would be a silly way to proceed. An alternative is for each team to pretend their model is the correct one, but to realise that this is just a convenient language to use as the model is not the literal truth. This is probably what most economists do. Yet another approach is to recognise that a variety of conflicting models of the world economy co-exist. This seems the most satisfying approach from an intellectual point of view. The multi-country models discussed in Bryant et al. (1988) are the Federal Reserve Board's MCM model, the Japanese EPA model, the New-Classical Liverpool model developed by Patrick Minford and his associates, the agnostic Vector Autoregressive Model, the OECD INTERLINK

model and the model developed by the LINK project of Lawrence Klein and his associates. They are presumably the best that these agencies and modelling teams can do, yet they are most likely to be all wrong. A theorist might argue that, if policymakers have different "information" and use diffferent models of the world economy, then they should share it with each other and agree on a common model. Hence, a theorist argues that one should first get the "true" model and then international policy coordination always pays off (except when the cases discussed in Sections 6.1 and 6.2 matter). Given that when you ask 10 macroeconomists to give an answer to a problem they are very likely to give 10 different answers, theorists must live in "cloud-cuckoo" land when they think that macroeconomists, let alone policy makers, can agree on a common model.

Table 6.3. shows the true gain from the coordination of US fiscal and monetary policies given the six models discussed in Bryant et al. (1988) and this will serve to illustrate the above points. Of the 216 ($=6^3$) combinations in Table 6.3, 180 ($=216-6^2$) involve disagreement between the policymakers and, thus, given that the fiscal and monetary authorities have the same preferences, involves coordination. Of these 180, welfare is improved by coordination in 105 cases, worsened in 54 cases and more or less unchanged in 21 cases. However, in 60 (2x6x5) of these cases, one of the two authorities has the true model, so that welfare must improve. For the remaining 120 cases the authorities' models differ not only from each other but also from the true model and welfare is perceptibly improved in 6 and worsened in 54 cases. It follows that, <u>when there is disagreement on the "true" model, coordination need not pay off</u>. Also, <u>potential gains from coordination may be better realised from bargaining over the correct model rather than over the policies</u>.

6.4. Summary of the results

There are at least three good reasons why international policy coordination may be counterproductive. They are:

(i) International policy coordination may worsen the credibility problems of the central banks and Treasuries vis-à-vis their private sectors, because when there is no international cooperation there is a built-in disincentive in the form of inflation costs to renege and impose a

surprise inflation tax (either in the form of an unanticipated increase in the money supply or an unanticipated devaluation). Under international policy coordination reneging is more profitable, because there is no depreciation of the currency and thus no inflation costs. It follows that international policy coordination leads to higher inflation and lower welfare.

(ii) Coordination among a sub-set of countries, say among the member states of the European Community, may provoke an adverse response from the remaining countries, say the US, and may therefore worsen welfare. This is particularly relevant for the coordination of fiscal policies in a European Monetary Union when governments care mostly about unemployment rather that about the cost of living.

(iii) Uncertainty or disagreement about the workings of the international economy can be a reason why international policy coordination does not pay.

Hence, one can not take for granted that international policy coordination always increases the welfare of the countries concerned. In particular, it should be pointed out that, as far as point (i) is concerned, a European Monetary Union avoids the credibility problems associated with surprise devaluations and therefore is superior from that point of view to a regime of floating exchange rates or to a non-cooperative European Monetary System. It is also straightforward to think of examples where the international coordination of monetary policies alone is counterproductive, because this worsens the conflict between the fiscal authorities.

Fig. 6.1: International Policy Coordination and the Credibility Game with Private Sector Agents

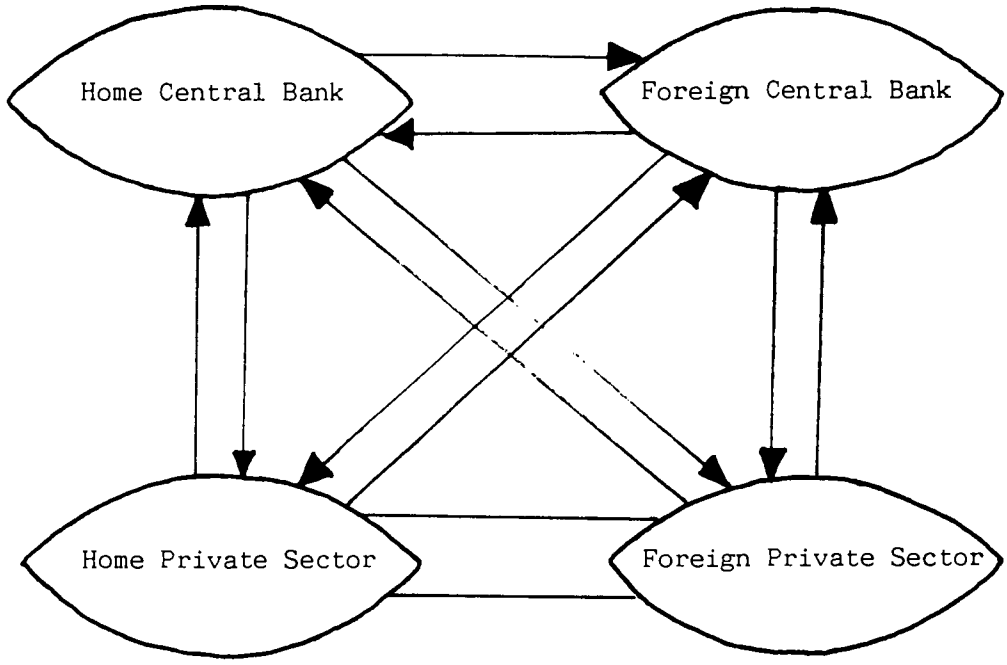


Table 6.1: Coordinated and Competitive Outcomes for Interdependent Monetary Economies with Flexible Exchange Rates [1]

	FIRST-BEST OPTIMUM	PRE-COMMITMENT		LOSS OF LEADERSHIP	
		COORDINATED	COMPETITIVE	COORDINATED	COMPETITIVE
Tax rate, τ	-	0.197	0.296	0.0	0.364
Public spending, g	0.2	0.191	0.255	0.2	0.250
Public sector deficit, d	-	0.052	0.045	0.2	0.0
Real money balances, m	1.0	0.944	1.020	0.4	0.761
Monetary growth rate, μ	0.2	0.055	0.044	0.5	0.0
Consumption of home goods, c_D	0.35	0.329	0.288	0.35	0.278
Consumption of foreign goods, c_M	0.2	0.188	0.165	0.2	0.159
Leisure, $1-\ell$	0.25	0.292	0.292	0.25	0.313
Indirect utility, V	-1.358	-1.362	-1.377	-1.358	-1.383
Utility of m, v	-0.4	-0.4	-0.4	-0.527	-0.414
Total welfare, U=V+v	-1.758	-1.762	-1.777	-1.885	-1.797
Welfare ranking	I	II	III	V	IV

Parameters: $\alpha_1 = 0.35$; $\alpha_2 = 0.2$; $\alpha_3 = 0.25$; $\alpha_4 = 0.2$; $\alpha_5 = 0.4$; $m_F = 1.0$; $\beta = 1.0$; $\delta = 0.1$.

[1] The utility of real money balances, v(m), and total welfare of the representative household, $U(c_D, c_\mu, 1-\ell, g, m)$, are evaluated at the steady-state outcomes of m.

Table 6.2: Wrong view of Global Interdependence and International Policy Coordination

	Welfare Losses			
Believed Interdependence	Locomotive		Beggar-thy-Neighbour	
Actual Interdependence	Non-Cooperative	Cooperative	Non-Cooperative	Cooperative
Locomotive	0.111	0.1	1.0	0.5
Beggar-thy-Neighbour	0.556	0.58	1.0	0.5

Table 6.3: True Gains from Coordination, Six Models

Percent of output, squared

Model subscribed to by fiscal authority	*Model subscribed to by central bank*					
	MCM	*EPA*	*LIVERPOOL*	*VAR*	*OECD*	*LINK*
MCM						
Model representing reality						
MCM	0.0000	1.3484	0.0171	0.0001	0.0041	0.0001
EPA	0.0000	2.2770	0.0546	0.0015	0.0119	−0.0003
LIVERPOOL	0.0000	2.0602	0.0015	−0.0001	−0.0190	−0.0004
VAR	0.0000	31.7657	0.2946	0.0000	−0.0384	0.0003
OECD	0.0000	3.1227	0.0235	0.0008	0.0041	−0.0001
LINK	0.0000	0.2490	−0.0041	−0.0000	−0.0007	0.0000
EPA						
Model representing reality						
MCM	0.0000	0.0000	0.0077	−0.0011	0.0009	0.0003
EPA	0.0003	0.0000	0.0012	0.0002	0.0034	0.0001
LIVERPOOL	−0.0030	0.0000	0.0001	−0.0002	−0.0137	−0.0004
VAR	−0.0180	0.0000	0.0245	0.0000	−0.0381	−0.0008
OECD	−0.0011	0.0000	0.0091	0.0004	0.0022	−0.0003
LINK	−0.0002	0.0000	0.0042	−0.0004	−0.0004	0.0000
LIVERPOOL						
Model representing reality						
MCM	18.9109	0.2028	0.0000	−0.0091	0.0248	1.1951
EPA	41.0267	0.4280	0.0000	−0.0076	0.0366	2.5755
LIVERPOOL	14.9907	0.0772	0.0000	0.0002	0.0158	1.5469
VAR	309.6838	3.5307	0.0000	0.0000	0.0943	19.6586
OECD	24.6334	0.3501	0.0000	−0.0029	0.0006	1.1995
LINK	0.2288	0.0048	0.0000	−0.0032	0.0045	0.0214
VAR						
Model representing reality						
MCM	0.0018	−0.0032	0.0172	0.0000	−0.0081	0.0001
EPA	0.0076	0.0062	0.0167	0.0000	−0.0001	−0.0003
LIVERPOOL	0.0003	0.0012	0.0013	0.0000	0.0001	−0.0004
VAR	0.0004	0.0006	0.0000	0.0000	0.0006	0.0000
OECD	0.0035	0.0041	0.0079	0.0000	0.0020	−0.0002
LINK	0.0003	−0.0014	0.0064	0.0000	−0.0030	0.0000
OECD						
Model representing reality						
MCM	0.0280	0.0116	0.2626	−0.0038	0.0000	−0.0002
EPA	0.0699	0.0339	0.5784	−0.0016	0.0000	−0.0009
LIVERPOOL	−0.0352	−0.0307	0.0385	−0.0003	0.0000	−0.0003
VAR	0.1135	0.0269	1.5194	0.0001	0.0000	0.0017
OECD	0.0246	0.0163	0.1165	0.0002	0.0000	0.0001
LINK	−0.0015	−0.0017	0.0101	−0.0014	0.0000	0.0000
LINK						
Model representing reality						
MCM	0.0004	−0.0001	0.0005	0.0000	−0.0002	0.0000
EPA	0.0013	0.0004	0.0016	0.0000	0.0001	0.0000
LIVERPOOL	0.0002	0.0005	0.0001	0.0000	0.0005	0.0000
VAR	−0.0081	−0.0021	−0.0104	0.0000	−0.0005	0.0000
OECD	−0.0010	−0.0001	−0.0013	0.0000	0.0000	0.0000
LINK	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Frankel (1988)

7. Assessment of the case for European monetary integration

As a way of concluding this essay, we will assess the case for moving towards a European Monetary Union and the establishment of a European Central Bank.

The main advantages of more monetary integration in Europe are:

(i) The move towards a European Monetary Union is a political end in itself, because it will be part of the whole process of political unification in the European Community. However, the Prussian and the Japanese experiences in the 19th century suggest that monetary unification is always preceded by political unification.

(ii) The move towards one European currency will save an enormous amount on information and transaction costs and thus yield massive benefits, because households and firms need no longer change currency when they trade with other Europeans. In addition, there is the efficiency of a single money as unit of account and store of value.

(iii) There will be less or no intra-European exchange-rate fluctuations, which reduces risk and is good for export-business. This argument relies, of course, on the absence of a complete and perfect set of forward exchange-rate markets, because otherwise firms could hedge themselves against exchange-rate risk.

(iv) The liberalisation of international markets for financial assets in Europe means that it is difficult to fend off speculative attacks on the currency, since especially France and Italy have in the past used capital controls to avoid such attacks. Under a European Monetary Union intra-European exchange rates are irrevocably fixed, hence speculative attacks no longer occur and thus abolishing capital controls throughout Europe will be easier. For the Netherlands this argument does not apply, because they already have unrestricted capital movements across the Dutch borders. Nevertheless, monetary union in Europe would dampen some of the huge speculative flows between member states when capital markets are liberalised.

(v) A move towards irrevocably fixed exchange rates and a common monetary policy set by a European Central Bank will avoid the beggar-thy-neighbour policies of appreciations of the exchange rate in order to dump inflation on neighbouring countries. International policy coordination under a clean float also realises that such attempts to improve real income are futile and would

thus in the face of unemployment lead to looser monetary policies and more jobs. Hence, a regime of fixed exchange rates acts as a partial substitute for international policy coordination.

(vi) Under a clean float an increase in monetary growth reduces real interest rates and increases capital accumulation and activity throughout the world, hence in the absence of international policy coordination monetary growth and inflation will be too low, real interest rates too high, and activity too low as none of the central banks internalises the beneficial effects of higher monetary growth on the rest of the world. Under a European Monetary Union such a coordination failure does not arise, because there is a common inflation rate and thus the costs as well as the benefits of reducing European real interest rates are shared by all member states. Given the apparent problem of a capital shortage in Europe, this advantage may be of some importance.

(vii) International coordination of monetary policies under a clean float destroys a discipline device of central banks and thus leads to high inflation and may be counterproductive because without coordination a surprise inflation tax leads to an unanticipated depreciation of the exchange rate and a higher cost of living which acts as a disincentive to renege. However, a European Monetary Union with irrevocably fixed intra-European exchange rates avoids such credibility problems altogether and thus leads to lower inflation rates throughout Europe.

(viii) When the member states of the European Monetary System suffer from wide-spread unemployment and do not coordinate their fiscal stances, Germany has an incentive to gain competitiveness at the expense of the rest of Europe by having a tighter fiscal stance and benefitting from the looser fiscal stances elsewhere. Under a European Monetary Union there is no German hegemony, so Germany will carry the full fiscal burden of fighting unemployment and be a "locomotive engine of growth" for Europe.

The main disadvantages of increased monetary integration in Europe are:

(i) Some countries do not like to give up their political and economic sovereignity in monetary policy, since they have no confidence in a European Central Bank, a desire for an independent monetary policy and a deep-seated aversion to having their national powers diluted. This seems the position of Mrs. Thatcher and the United Kingdom. In order for the British, French and Italians to reap the low-inflation benefits of the Bundesbank's credibility,

they would have to leave it largely untouched as an institution. However, this would be unpopular with their electorates as it would imply a loss of national sovereignty. If the United Kingdom does not participate, one could seriously question the political and economic feasibility of a European Monetary Union.

(ii) The establishment of a European Central Bank will mean a more symmetric exchange-rate regime for Europe, because German hegemony in monetary policy will be replaced by all central banks having a say on how European monetary policy is conducted. France and Italy are particularly keen on this. There is a real danger that this will raise inflation in northern Europe and reduce inflation in southern Europe, because the Mediterranean countries have a larger black economy and thus a smaller tax base and a greater need for seigniorage revenues (witness the horrendous Italian problem of public debt). The convergence of inflation rates that would occur under a European Monetary Union may thus not be desirable from a public-finance point of view. Hence, one could argue for a crawling peg to accommodate inflation differentials between northern and southern Europe. (This would also avoid straining the cohesiveness of the European currencies if the dollar falls by a further 20%). As far as the Netherlands is concerned, German hegemony in monetary policy results in lower inflation and this might favour the European Monetary System.

(iii) A European Central Bank may not be as conservative and not have the credibility, discipline and reputation of the Bundesbank, hence average European inflation will increase.

(iv) In a perfect world with no externalities and no wide-spread unemployment, the well-known advantages of a common currency area discussed above make a strong case for more monetary integration in Europe. However, when certain areas of Europe are depressed and suffer from unemployment and wages do not adjust immediately to clear all labour markets, the case for a European Monetary Union is much weaker, especially as there is little mobility of labour between the member states of Europe. In a perfect world wages in the depressed region would fall until full employment is reached and there would be no need for a realignment of exchange rates. However, when wages are for institutional or other reasons rigid, the lack of effective demand in the depressed region would induce a depreciation of the nominal exchange rate and this would eventually also cure unemployment in the depressed region. Hence, unemployment in a particular region may be more persistent under a European Monetary Union and thus this creates a greater need for stabilisation and

active fiscal policy. It is of some interest to point out that Germany and the Netherlands have had the highest sacrifice ratios (unemployment years for each point reduction in inflation) in the OECD region and there is no reason to think that this will become any better under a European Monetary Union.

(v) Under a European Monetary Union it is not possible to engage in competitive appreciations of the exchange rate and this is why, in the face of wide-spread unemployment, there is a built-in deflationary bias in fiscal policies. Hence, coordination should ensure that governments expand their fiscal stances when there is unemployment.

(vi) Under fixed exchange rates disequilibria in the balance of payments take longer to disappear than under a float. The mechanism is that a surplus leads to an increase in the money supply, which boosts income and imports and thus reduces the surplus. This implies a coordination task for the European Central Bank, for it must ensure that the growth in European reserves matches the average preference for accumulating reserves.

As far as policy conclusions are concerned, increased monetary union seems, as long as governments are prepared to engage in more active fiscal policies when unemployment is wide-spread, on balance desirable for a small country such as the Netherlands. The main disadvantage may be a somewhat higher inflation rate, but this may not be too bad in view of the large public debt in the Netherlands. For Europe as a whole, it is not so clear that a European Monetary Union with irrevocably fixed exchange rates is either feasible or desirable. It may, as Rudiger Dornbusch advocates, be more sensible to have a crawling peg with frequent realignments between the northern and southern currencies of Europe in order to stabilise competitiveness of the "commercial" exchange rate and to allow for inflation differentials, whilst a separate exchange rate for financial transactions should float and not be restricted by intervention limits. This can also include some of the features of Williamson's (rather than McKinnon's proposal), albeit with much smaller bands for real exchange rates, and may be the best way of widening exchange-rate management in Europe for the nest two decades. Finally, it is of the utmost importance that monetary integration must be accompanied by appropriate changes in fiscal structures in order for it to be a success.

References

Argy, V. (1986). "Exchange rate policy for a small open economy", seminar paper no. 369, IIES, University of Stockholm.

Artis, M.J. (1987). "The European Monetary System: An evaluation?", Journal of Policy Modeling, vol. 9, no. 1, pp. 175-198.

Artis, M.J. and M.P. Taylor (1988). "Exchange rates and the EMS: Assessing the track record", discussion paper no. 250, Centre for Economic Policy Research, London.

Artus, P. (1987). "Asymmetries in the European economies and policy coordination", presented to the AEA conference on Monetary and Financial Models, Geneva.

Attanasio, O. and F. van der Ploeg (1988b). "Interdependence in the OECD economies: An econometric model of the Group of Seven", mimeo, CentER for Economic Research, Tilburg University.

Basevi, G. and F. Giavazzi (1987). "Conflicts and coordination in the European Monetary System", in A. Steinherr and D. Weiserbs (eds.), Employment and Growth: Issues for the 1980's, Martinus Nijhoff, Dordrecht.

Basevi, G., F. Delbono and V. Denicolò (1988). "International monetary cooperation under tariff threats", discussion paper no. 235, Centre for Economic Policy Research, London.

Bean, C.R., P.R.G. Layard and S.J. Nickell (1986). "The rise in unemployment: A multi-country study", Economica (Supplement), vol. 53, pp. S1-S22.

Bean, C.R. (1988). "Europe after the crash: Economic Policy in an era of adjustment", mimeo, London School of Economics and Centre for European Policy Studies, Brussels.

Begg, D. and C. Wyplosz (1987). "Why the EMS? Dynamic games and the equilibrium policy regime", in Bryant and Portes (eds.).

Bergsten, C.F. (1975). Towards a New International Economic Order, Lexington Books, Lexington.

Branson, W.H. and J.J. Rotemberg (1980). "International adjustment with wage rigidity", European Economic Review, vol. 13, pp. 309-322.

Branson, W.H. (1988). "International adjustment and the dollar: Policy illusions and economic constraints", mimeo, Princeton University.

Bruno, M. and J.D. Sachs (1985). The Economics of Worldwide Stagflation, Basil Blackwell, Oxford.

Bryant, R.C. and R. Portes (eds.) (1987). Global Macroeconomics, Policy Conflict and Cooperation, MacMillan, London.

Bryant, R.C., G. Holtham and P. Hooper (eds.) (1988). External Deficits and the Dollar, The Brookings Institution, Washington, D.C.

Bryant, R.C. et al. (eds.) (1988). Empirical Macroeconomics for Interdependent Economies, The Brookings Institution, Washington, D.C.

Buiter, W.H. and R.C. Marsten (eds.) (1985). International Economic Policy Coordination, Cambridge University Press, Cmabridge.

Buiter, W.H. (1987). "The current global economic situation, outlook and policy options, with special emphasis on fiscal policy issues", discussion paper no. 210, Centre for Economic Policy Research, London.

Buiter, W.H. (1988). "The right combination of demand and supply policies: The case for a two-handed approach", in H. Giersch (ed.), Macro and Micro Policies for More Growth and Employment, J.C.B. Mohr, Tübingen.

Canzoneri, M.B. and J.A. Gray (1985). "Monetary policy games and the consequences of non-cooperative behaviour", International Economic Review, vol. 26, no. 3, pp. 547-564.

Canzoneri, M.B. and D.W. Henderson (1987). Strategic Aspects of Macroeconomic Policymaking in Interdependent Economies, mimeo, Board of Governors of the Federal Reserve System, Washington, D.C.

Canzoneri, M.B. and C.A. Rogers (1988). "Is the European Community an optimal currency area? Optimal tax smoothing versus the cost of multiple currencies", mimeo, Georgetown University, Washington, D.C.

Cecco, M. de (1988). "The European Monetary System and national interests", mimeo, European University Institute, Florence.

Cnossen, S. (1988). "Fiscaal beleid in de Europese gemeenschap", in Preadviezen van de Koninklijke Vereniging voor Staathuishoudkunde, Belastinghefffing en Belastinghervorming, Stenfert Kroese, Leiden.

Cohen, D., J. Melitz and G. Oudiz (1988). "The European Monetary System and the franc-marc asymmetry", discussion paper no. 245, Centre for Economic Policy Research, London.

Cohen, D. and C. Wyplosz (1988). "The European monetary union: An agnostic evaluation", presented to a conference on Macroeconomic Policies in an Interdependent World, Brookings Institution, Washington, D.C.

Cooper, R.N. (1985). "Economic interdependence and coordination of economic policies", in R.W. Jones and P.B. Kenen (eds.), Handbook of International Economics, Vol. II, Elsevier Science Publishers, Amsterdam.

Currie, D. and S. Wren-Lewis (1987). "Evaluating the extended target zone proposal for the G3", mimeo, Queen Mary College, London.

Dornbusch, R. (1976). "Expectations and exchange rate dynamics", Journal of Political Economy, vol. 84, pp. 1161-1176.

Dornbusch, R. (1987). "The EMS, the dollar and the yen", discussion paper no. 216, Centre for Economic Policy Research, London.

Dornbusch, R. and J. Frankel (1987). "The flexible exchange rate system: Experience and alternatives", presented to a conference on Survival and Growth in a Polycentric World Economy, Basle, Switzerland.

Dornbusch, R. (1988). "The need for further dollar depreciation", mimeo, MIT, Cambridge, MA.

Drèze, J. et al. (1987). "The two-handed growth strategy for Europe: Autonomy through flexible cooperation", Centre for European Polciy Studies, Brussels.

Edison, H.J., M.H. Miller and J. Williamson (1987). "On evaluating and extending the target zone proposal", Journal of Policy Modeling, vol. 9, no. 1, pp. 199-224.

Eichengreen, B. (1987). "Hegemonic stability theories of the international monetary system", discussion paper no. 193, Centre for Economic Policy Research, London.

Feldstein, M. (ed.) (1987). International Economic Cooperation, NBER Summary Report, Cambridge, MA.

Feldstein, M. (1988). "Feldstein on the dollar. Let the market decide", 3 December, The Economist, pp. 21-24.

Fischer, S. (1982). "Seignorage and the case for a national money", Journal of Political Economy, vol. 90, no. 2, pp. 295-313.

Frankel, J.A. and K. Rockett (1987). "International macroeonomic policy coordination when policymakers disagree about the model", working paper no. 8744, University of California, Berkeley.

Frankel, J.A. (1988). "The implications of conflicting models for coordination between monetary and fiscal policymakers", in Bryant et al. (eds.).

Friedman, M. (1969). The Optimum Quantity of Money and Other Essays, Aldine, Chicago.

Giavazzi, F. (1986). "Britain and the EEC", presented to a conference on The British Economy, Chelwood Gate, Sussex.

Giavazzi, F. and A. Giovannini (1986a). "The EMS and the dollar", Economic Policy, vol. 2, pp. 456-485.

Giavazzi, F. and A. Giovannini (1986b). "Monetary policy interactions under managed exchange rates", discussion paper no. 123, Centre for Economic Policy Research, London. Forthcoming in Economica.

Giavazzi, F. and M. Pagano (1986). "The advantage of tying one's hands: EMS discipline and central bank credibility", discussion paper no. 135, Centre for Economic Policy Research, London.

Giavazzi, F. and A. Giovannini (1987). "Models of the EMS: Is Europe a greater Deutschmark area?", in Bryant and Portes (eds.).

Giavazzi, F. (1989). "The exchange-rate question in Europe", discussion paper no. 298, Centre for Economic Policy Research, London.

Giavazzi, F., S. Micossi and M. Miller (eds.) (1988). The European Monetary System 1979-1987, Cambridge University Press, Cambridge.

Giavazzi, F. and A. Giovannini (1989). Limiting Exchange Rate Flexibility: The European Monetary System, Cambridge University Press, Cambridge.

Giavazzi, F. and A. Giovannini (1989). "Can the EMS be exported?", Lessons from ten years of monetary policy coordination in Europe, discussion paper no. 285, Centre for Economic Policy Research, London.

Giovannini, A. (1988). "How do fixed-exchange-rates regimes work: The evidence from the gold standard, Bretton Woods and the EMS", discussion paper no. 282, Centre for Economic Policy Research, London.

Goodhart, C. (1988). "An approach to European currency unification", LSE Financial Markets Group, London.

Grauwe, P. de (1988). "Is the European Monetary System a DM-zone?", mimeo, University of Leuven and CEPS.

Hamada, K. (1976). "A strategic analysis of monetary interdependence", Journal of Political Economy, vol. 84, no. 1, pp. 677-700.

Hamada, K. (1985). The Political Economy of International Monetary Interdependence, MIT Press, Cambridge, MA.

Horn, H. and T. Persson (1988). "Exchange rate policy, wage formation and credibility", European Economic Review, vol. 32, pp. 1621-1636.

Kehoe, P. (1986). "International policy coordination can be undesirable", Research Department staff report 103, Federal Reserve Bank of Minneapolis.

Kenen, P.B. (1987). "Global policy optimization and the exchange-rate regime", Journal of Policy Modeling, vol. 9, no. 1, pp. 19-63.

Kenen, P.B. (1988). "Exchange rates and policy coordination in an asymmetric model", discussion paper no. 240, Centre for Economic Policy Research, London.

Klundert, Th. van de and F. van der Ploeg (1988). "Fiscal policy and finite lives in interdependent economies with real and nominal wage rigidity", discussion paper no. 1, CentER for Economic Research, Tilburg University.

Kyriazis, N. and N. Chryssanthon (1986). US-EC Monetary Relations, economic series no. 8, Directorate General for Research, European Parliament.

Laskar, D. (1987). "The 'Rules of the Game' and sterilization under a fixed exchange rate system: A strategic argument", Richerche Economiche, vol. XLI, no. 3-4, pp. 439-456.

Layard, R., S. Nickell and R. Jackman (1985). "European unemployment is Keynesian and classical but not structural", working document no. 13, Centre for European Policy Studies, Brussels.

Ludlow, P. (1982). The Making of the European Monetary System, Butterworths, London.

Marston, R.C. (1984). "Exchange rate unions as an alternative to flexible exchange rates", in J.F.O. Bilsten and R.C. Marston (eds.), Exchange Rate Theory and Practice, MIT Press, Cambridge, MA.

McKibbin, W.J. and J.D. Sachs (1986a). "Comparing the global performance of alternative exchange rate systems", working paper no. 2024, NBER, Cambridge, MA.

McKibbin, W.J. and J.D. Sachs (1986b). "Coordination of monetary and fiscal policies in the OECD", forthcoming in J. Frenkel (ed.), International Aspects of Fiscal Policy, University of Chicago Press, Chicago.

McKibbin, W.J. (1987). "The economics of international policy coordination", research discussion paper no. 8705, Reserve Bank of Australia.

McKinnon, R.I. (1986). "Monetary and exchange rate policies for international financial stabililty: A proposal", mimeo, Stanford University.

Melitz, J. (1987). "Monetary discipline, Germany, and the European Monetary System", discussion paper no. 178, Centre for Economic Policy Research, London. Also, in Giavazzi, Micossi and Miller (eds.).

Melitz, J. (1988a). "The prospect of a depreciating dollar and possible tension inside the EMS", discussion paper no. 97, Centre for Economic Policy Research, London. Also, Revue Suisse d'Economie Politique et de Statistique, no. 1.

Melitz, J. (1988b). "Monetary discipline and cooperation in the EMS: a synthesis", discussion paper no. 219, Centre for Economic Policy Research, London.

Miller, M.H. and P. Weller (1988). "Target zones, currency options and the dollar", mimeo, University of Warwick.

Miller, M.H. and J. Williamson (1988). "The international monetary system: An analysis of alternative regimes", discussion paper no. 266, Centre for Economic Policy Research, London.

Minford, P. (1985). "The effects of American policies - A New Classical interpretation", in Buiter and Marston (eds.).

Muller, P. and R.W.R. Price (1984). "Structural budget deficits and fiscal stance", working paper no. 15, Economics and Statistics Department, OECD, Paris.

Mundell, R.A. (1968). International Economics, MacMillan, London.

Oudiz, G. and J. Sachs (1984). "Macroeconomic policy coordination among the industrial economies", Brookings Papers on Economic Activity, no. 1. pp. 1-75.

Oudiz, G. and J. Sachs (1985). "International policy coordination in dynamic macroeconomic models", in Buiter and Marston (eds.).

Ploeg, F. van der (1986). "Monetary disinflation in a simply two-country model", Economics Letters, vol. 22, no. 1, pp. 73-76.

Ploeg, F. van der (1987a). "International interdependence and policy coordination in economies with real and nominal wage rigidity", discussion paper no. 217, Centre for Economic Policy Research, London.

Ploeg, F. van der (1987b). "Coordination of optimal taxation in a two-country equilibrium model", Economics Letters, vol. 24, no. 3, pp. 279-285.

Ploeg, F. van der (1987c). "Capital accumulation, inflation and long-run conflict in international objectives", Oxford Economic Papers, forthcoming.

Ploeg, F. van der (1988). "International policy coordination in interdependent monetary economies", Journal of International Economics, vol. 25, pp. 1-23.

Ploeg, F. van der (1989). "Monetary and fiscal policy in interdependent economies with capital accumulation, death and population growth", discussion paper no. 7, CentER for Economic Research, Tilburg University.

Portes, R. (1986). "Finance, trade and development: Issues in transatlantic cooperation", discussion paper no. 100, Centre for Economic Policy Research, London.

PPC (1988). After the Louvre: Promoting Exchange Rate Stability, Report of an International Committee chaired by Lord Croham, Public Policy Centre, London.

Rogoff, K. (1985). "Can international monetary policy cooperation be counterproductive?", Journal of International Economics, vol. 18, pp. 199-217.

Roubini, N. (1986). "Strategic policy interactions in a three-country world", mimeo, Harvard University.

Roubini, N. (1987a). "Leadership and policy cooperation in the EMS", mimeo, Harvard University.

Roubini, N. (1987b). "Leadership and cooperation under alternative exchange rate regimes: A simulation approach", mimeo, Harvard University.

Sachs, J. and N. Roubini (1987). "Sources of macroeconomic imbalances in the world economy: A simulation approach", working paper no. 2339, NBER, Cambridge, MA.

Steinherr, A. (1984). "Convergence and coordination of macroeconomic policies: Some basic issues", mimeo, Catholic University of Louvain.

Steinherr, A. (1988). "The EMS with ECU at centerstage: A proposal for the reform of the European exchange rate systems", mimeo, Catholic University of Louvain.

Tew, B. (1988). The Evolution of the International Monetary System, 1945-88, Hutchison, London.

Williamson, J. (1983). The Exchange Rate System, Institute for International Economics, Washington.

Williamson, J. and M. Miller (1987). "Targets and indicators: A blueprint for the international coordination of economic policy", Institute of International Economics, Washington, D.C.

WRR (1986). The Unfinished European Integration, 28-th Report to the Government, Netherlands Scientific Council for Government Policy, The Hague.

WRR (1988). Financing the European Community, 32-nd Report to the Government, Netherlands Scientific Council for Government Policy, The Hague.

Wyplosz, C. (1988). "The swinging dollar: Is Europe out of step?", discussion paper no. 241, Centre for Economic Policy Research, London.