Essays on interdependent macro- and mesoeconomics

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vrijdag 3 december 1993 te 14.15 uur

door

Martinus Antonius van Tuijl

ey cooperation born te Eindhoven
promotor: Prof. Dr. A.H.J.J. Kolnaar
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Martin van Tuijl
October 1993
## CONTENTS

1. Introduction 1

2. Fiscal Policy, Interdependence and Mesoeconomics 15

3. The Twin-Debt Problem in an Interdependent World 41

4. Financial Integration and Fiscal Policy in Interdependent Two-Sector Economies with Real and Nominal Wage Rigidity 69

5. Goods Markets Integration and Fiscal Policy in Interdependent Two-Sector Economies with Real and Nominal Wage Rigidity 111

6. Aspects of Goods Markets Integration 133

7. Fiscal Policy and Public Capital in Interdependent Economies 167

8. Summary in Dutch 219
CHAPTER 1  INTRODUCTION AND SUMMARY

1.1  PRELUDE

This thesis consists of six papers, brought together under the general heading of 'Essays on Interdependent Macroe- and Mesoeconomics'. This title emphasizes the key concept, interdependence, as well as the different approaches, macro- and mesoeconomics, featuring the reflections throughout the book.

During the last quarter of a century, interdependence among (blocks of) countries has increased dramatically. This interdependence concerns financial, goods and labour markets, as 'this has happened in regard to trade-to-GNP ratios, in terms of a variety of indices that suggest closer integration of capital markets among the OECD countries, and in several important instances even in the increased flows of human beings across nation states' (Bhagwati, 1992 see also Kolnaar 1991, 1993).

The main purpose of this thesis is to shed some light on the consequences of interdependence and integration, apparently the important if not dominant tendencies of today's economic development, for the possibilities and limitations of economic policy. In this attempt only a number of theoretical aspects will be dealt with.

At first sight, a multi-country setting, allowing for financial, trade as well as factor flows, seems the obvious way of attending to these questions. However, to keep things clear, only the comparatively simple case of a two-country model is studied. In addition, interregional factor mobility is ignored.

Moreover, economic policy must be taken in the admittedly narrow sense of fiscal policy. At least since the seminal work of Frenkel and Razin (1987) the notion has gained field that the effects of fiscal policy are not always invariant to the composition of the change in government expenditure. Therefore, in chapter 2 as well as chapters 4 till 6, the effects and spill-over effects of fiscal policies are studied in the context of a two-country-two-sector framework, distinguishing between tradables and nontradables. The outcomes cast serious doubt on the robustness of pure macroeconomic results to desaggregation. Nevertheless, macroeconomics still seems to have a value of its own. That's why two
major problems which the world economy faces, the U.S.' twin-deficit twin-debt problem (chapter 3) and the seemingly worldwide lack of physical infrastructure (chapter 7), are tackled, using a macroeconomic framework.

Table 1  
Overview of the main assumptions

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The above table presents an overview of the main assumptions underlying the models of the distinguished chapters. It makes clear that these chapters have as common features flexible prices in the goods
markets, a floating exchange rate and - except for chapter 2 - long-run labour market equilibrium. As indicated above, they all deal with the (spill-over) effects of changes in government expenditure.

In the short run, extra government expenditure inevitably implies crowding out of (one of the) other spending categories. Needless to say, the extent to which this crowding out occurs and the type of spending harmed, crucially depends on the assumptions underlying the model.

For instance, in case of short-term nominal wage rigidity, the rise in the producers' price level, triggered by an expansionary fiscal policy, lowers the real producers' wage. This boosts production capacity, thus partly satisfying the increase in aggregate demand.\(^1\) In addition, under Classical assumptions on saving (chapter 7), the decrease of the wage share hampers private consumption. Consequently, crowding out of other spending categories is relatively weak.

In the long run, the conclusions are even less ambiguous. Now, flexible real wages equilibrate the labour market. A country conducting an expansionary fiscal policy invariably experiences a higher government debt ratio and a less favourable net foreign asset position. Servicing the external debt requires higher net exports. This implies that now domestic private spending solely suffers from crowding out. Chapter 7 forms the proverbial exception to this rule. Government spending on public capital formation is supposed to raise productivity then so vehemently, that both private consumption and private investment are higher than in the initial situation.

1.2 OVERVIEW

Mundell (1968), using a static fix-price two-country model with uncovered interest parity (UIP), floating exchange rates, static expectations, and nominal wage rigidity in both regions, showed that a monetary expansion is a beggar-thy-neighbour policy, whereas a fiscal expansion is a locomotive policy. The Mundell-model gained wide

\(^1\) In case of real wage rigidity, with money wages linked to the CPI, the fall in the real producers' wage and, therefore, the rise in production capacity are comparatively small.
recognition, Dornbusch even referring to it as 'the Volkswagen of the field, easy to drive, reliable and sleek'.

Casas (1975) and Sachs (1980) pointed at the significance of wage formation for the effects of economic policy in the small open economy models, developed earlier by Mundell (1963) and Fleming (1962).

Argy and Salop (1983) extended the analysis of Casas and Sachs to a two-country setting. Using a two-country model of the Mundell-type they analyzed the effects and spill-over effects of fiscal policy under different types of wage rigidity (nominal, NWR and real, RWR) in both regions. They confirmed the 'Mundell-case': a fiscal expansion, while both regions are featured by NWR, yields a locomotive policy. However, RWR in both countries implies that a fiscal expansion is a beggar-thy-neighbour policy. RWR in the active country combined with NWR in the passive country results in a locomotive policy, whereas in the reverse case the outcome is either a beggar-thy-neighbour- or a locomotive policy, depending on the relative strength of the interest- and the real-exchange-rate-effect on the passive country.

Van der Ploeg (1988) extends this analysis to monetary policy and supply-side shocks. The results presented there can be considered as standard within the context of this type of models. Van der Ploeg also points at the empirical relevance of the RWR/NWR-case for analyzing the interactions between Europe (RWR) and the U.S. (NWR). As a sidestep, Van der Ploeg (op. cit., p.3) refers to some German commentators, who 'might have the "law of one price" (purchasing power parity) in mind, when they argue that European fiscal policy has no real effects whatsoever (as it cannot affect the wedge)...'.

De Groof and Schaling (1991) investigate the robustness of these standard results to desaggregation, allowing for a tradables- and a nontradables-sector. They develop a reference situation in which the standard outcomes are duplicated. However, they also show that, in the context of their two-sector model, these results are very sensitive to alternative assumptions with respect to technology, sector structures and preferences.

The purpose of chapter 2, originating from De Groof and Van Tuijl (1992), is relatively modest. Using an extended version of the model of De Groof and Schaling (1991), it is shown that the German commentators'
"fiscal policy ineffectiveness postulate" does not stand up to desaggregation. With the law of one price (LOP) only applying to the tradables-sector and, therefore, no longer equivalent to purchasing power parity, a fiscal expansion on (home produced) tradables turns out to be a beggar-thyself policy, whereas a fiscal expansion on nontradables appears to be a locomotive policy. Sensitivity analysis with respect to the behavioural parameters proves these results to be fairly robust. However, changes in the technology would alter the conclusions quite drastically.

It should be noted that chapter 2 has originally been written in the Spring of 1990, thus before the German reunification. Looking at things after the events, it is plain and clear that this reunification forced Germany to give up its former reluctance to conduct an expansionary fiscal policy. Therefore, with the benefit of hindsight, one could also pretend that chapter 2 tries to analyze the short-term effects of the German fiscal expansion arising from the reunification. One may remark that the abovementioned results shed a different light on the external complaints with respect to Germany's fiscal policy. However, these complaints may apply to the eighties (when it was too tight) or the medium-run consequences of the debt-financed amalgamation (which caused a severe recession as well as the collapse of the E.R.M.), but not to the effects on impact.

Models of the Mundell-Fleming variety have a long history as the mainstay of open economy macroeconomics. Nevertheless, they still seem to be influential in guiding the thinking of macroeconomists and provide a powerful and flexible tool for policy analysis (Van der Ploeg, 1992). However, they are subject to considerable criticism. Stevenson et al (1988), for instance, remark that the way of modelling capital flows makes Mundell-Fleming models only appropriate for short-term situations. The balance of payments is cleared by the exchange rate without the requirement of long-run current account equilibrium. Ignoring stock-flow dynamics associated with, e.g., government debt and private asset holdings and, consequently, the failure to integrate wealth effects into the analysis is another, though very concomitant point of criticism. Van der Ploeg admits that models of the 'short-run Keynesian Mundell-Fleming variety' are 'a trifle old-fashioned' (op. cit., p. 19).
As a consequence, in the remaining chapters the time-honoured portfolio model is used, which still seems to be a good workhorse (Van de Klundert, 1991). In open economy macroeconomics, ample attention has been paid to portfolio analysis. However, examples of two-country portfolio models are less numerous, Tobin and De Macedo (1980), Branson and Henderson (1985) and Ribe and Beeman (1986) being among the exceptions.

The model of chapter 3, which will appear as De Groof and Van Tuijl (1994), is an adapted version of the framework of Van de Klundert (1991). The major difference lies in the fact that account is taken of - short- and medium-run - NWR in the U.S. and RWR in Europe, instead of assuming flexible wages. Like the framework of Van de Klundert, the model allows for rational expectations, intertemporal government budget constraints, current account dynamics, capital accumulation, the q-theory of investment, wealth effects, imperfect asset and commodity substitution, a floating exchange rate and international factor immobility. It is investigated whether institutional differences concerning wage formation between the two regions influences the efficacy of strategies aimed at reducing U.S.' external and government debt. This turns out not to be the case.

It is shown that a contractionary U.S.' fiscal policy immediately starts diminishing the U.S.' twin-debt problem. In terms of production, employment and private consumption, in the short run a U.S.' fiscal contraction appears to be a beggar-thyself policy. In the long run, the Phillips-mechanism restores labour market equilibrium, whereas in terms of production as well as private consumption the decrease in government expenditure yields a beggar-thy-neighbour policy. Both U.S.' government and external debt are then at a substantially lower level.

It is assumed that a passive U.S.' policy of 'wait and see', implying persistent government budget as well as current account deficits, will eventually cause the share of U.S.' assets in foreign portfolios to exceed a critical value. This is supposed to result in a 'financial crisis', which is modelled as an exogenous shift in European asset preferences away from U.S.' bonds. In the short- and medium-run this leads to a lower external debt, however, at the expense of an increasing government debt. The U.S. also pay a price for their lack of decisive power in the form of lower private consumption for a long spell of time. Only in the long run a
simultaneous reduction of both external and government debt will be accomplished.

The common framework of chapters 4 and 5, which appeared as De Groof and Van Tuijl (1993a) and (1993b), is, broadly outlined, a desaggregation of the model of chapter 3. It allows for a distinction between the tradables and the nontradables-sector. The q-theory of investment is replaced by a more ad hoc way of modelling investment, which seems to be more in accordance with the assumptions underlying the other behavioral relationships. In addition, an all-embracing private sector's real disposable income instead of terms-of-trade corrected output is taken account of in the consumption function.

Chapter 4 tackles the problem of the consequences of financial integration for the (qualitative) effects and spill-over effects of fiscal policy. Here, fiscal policy takes the form of raising expenditure on either 'home produced' tradables or nontradables. The effects and spill-over effects are measured in terms of real disposable income of the private sector and, more in line with common practice, real output. These variables indicate the spending power and the productive efforts of a region, respectively.

It should be noted that using real disposable income of the private sector as a measure of spill-over effects has a major disadvantage. In the active country, the expansionary fiscal policy raises government debt which causes higher taxes, depressing the private sector's real disposable income. Meanwhile, public consumption increases. It would have been preferable to take this effect into account.

Following Feldman (1986), the process of financial integration is considered to have proceeded further, the larger capital flows are provoked by given yield differentials. Here, this is given shape by manipulating the domestic and foreign interest-elasticities in the demand functions for bonds. It is supposed that, after the process of financial integration has been accomplished, in the short run the Mundell-Fleming situation of uncovered interest parity prevails, irrespective of the type of the fiscal shock. However, later on, a wedge between the domestic and the expectations-corrected foreign nominal interest rate emerges. This is due to the fact that investors are only willing to absorb a higher share of financial assets of the active country in their portfolios, if the
corresponding yield is higher. However, the long-run yield differential is smaller than before the process of financial integration started. Logically, the reverse holds for the net foreign debt position of the initiating region.

In this two-country two-sector setting, it turns out that financial integration does not affect the (qualitative) effects and spill-over effects of fiscal policy, as measured by real disposable income of the private sector. In terms of real output, financial integration appears to influence both the short-term and long-term (spill-over) effects in case of a fiscal expansion on home produced tradables. In case of a fiscal expansion on nontradables, in the long run financial integration leaves these (spill-over) effects unaffected. This is only one out of many indications, emerging from the analysis of this chapter, that 'disaggregation matters'. This points at the fact that a purely macroeconomic analysis does not deserve unqualified confidence (cf. Van Nunen, 1988).

Chapter 5 is in fact a sequel to chapter 4. The major difference is that now the problem of the consequences of goods markets integration (henceforth GMI) for the (qualitative) effects and spill-over effects of fiscal policy is dealt with. A minor difference is that fiscal policy now takes the form of cutting instead of increasing expenditure on either 'home produced' tradables or nontradables.

Following Van der Ploeg (1989), the process of goods markets integration is considered to have proceeded further, the larger trade flows are provoked by given changes in the terms of trade. International trade flows, resulting from given changes in price differentials, depend on the elasticity of substitution between home and foreign produced tradables.

The consequences of GMI for the (spill-over) effects of fiscal policy are traced as follows. The results of the reference situation, in which we follow the so-called Armington tradition, implying that home and foreign produced tradables are imperfect substitutes, are compared to those obtained in case home and foreign produced tradables are perfect substitutes. Then, the well-known LOP holds for tradables. It is also shown in chapter 5 that raising the elasticity of substitution between home and foreign produced tradables also encapsulates the intuition, that
the rate of 'Local Good Preference' (LGP) decreases, as the process of GMI proceeds.

GMI turns out to affect the qualitative (spill-over) effects of fiscal policy, as measured in terms of real disposable income. To be more specific, a European contraction falling on home produced tradables is in the short run a locomotive policy in case of GMI, whereas in case of a low degree of substitutability between home and foreign produced tradables this type of contraction is a beggar-thy-neighbour policy. This difference is absent if Europe cuts spending on nontradables. So, the results of this chapter also reinforce the statement derived in chapter 4 that 'desaggregation matters'.

Chapter 6, which is virtually identical to De Groof and Van Tuijl (1993c), considers several possible ways to model GMI. Besides, the consequences of GMI for the efficacy of fiscal policy are studied. Thereby, a vehicle is used, which is obtained by desaggregating the two-country optimizing model of Van de Klundert (1993) into a corresponding two-sector framework. The model allows for imperfectly substitutable domestic and foreign bonds, finite lives, intertemporal budget constraints for the governments and private sectors, capital accumulation, current account dynamics and floating exchange rates. This framework shows some similarity to the model of Obstfeld (1989). However, in our analysis LOP is not assumed throughout the analysis. In addition, we assume international immobility of factors of production and intersectoral immobility of capital goods instead of perfect international and intersectoral mobility of factors of production.

The influence of GMI turns out to depend crucially on the way GMI is modelled, as well as on the type of fiscal shock (home produced tradables, foreign produced tradables or nontradables). The latter, once more, points to the fact that 'disaggregation matters', in that the effects of fiscal policy depend on the commodity composition of the change in government expenditure.

It should be noted that this chapter assumes wages to be market-clearing. This assumption is made to avoid rationing problems (Meijdam, 1991). Moreover, abstracting from money implies the impossibility of taking short- and medium-run rigidities into account. Regrettably, the
assumption of market-clearing wages makes the model unsuited to analyze the effects of OMI on wage bargaining (Huizinga, 1993).

Chapter 7 investigates the (spill-over) effects of expansionary fiscal policies directed at public capital formation. Thereby, a macroeconomic two-country framework is used, which shows close resemblance to the model developed by Schouten (1987), elaborated by his disciple Meulendijks (1992). However, in these models the distinction between public consumption and public investment is absent. Moreover, our assumptions concerning wage formation, price formation, money creation and taxation of wages differ considerably.

The main characteristics of the model are imperfectly substitutable domestic and foreign goods as well as domestic and foreign assets, static expectations, Kaleckian or Kaldorian assumptions on saving and consumption, capital accumulation, government budget and current account dynamics, a floating exchange rate, international factor immobility, real wage rigidity in one region (say Europe) and nominal wage rigidity in the other region (say the U.S.). It should be stressed that supply-effects concerning the labour market, which could alter the results substantially, are ignored.

The main findings are as follows. In the short run, a rise in government investment primarily influences the demand side of the economy. The outcomes are remarkably identical to the standard Argy and Salop-results; a European fiscal expansion yields a locomotive policy, while an expansionary fiscal policy of the U.S. results in a beggar-thy-neighbour policy. In the long run, both regions benefit from the active country's higher stock of public capital. The active country's level of production is substantially higher, while the passive region profits from gains in the terms of trade and a capital income account surplus.

1.3 Method

The complexity of the models presented in chapters 2 till 7 makes an analytical solution intractable. Therefore, comprehensive sets of simulations are carried out, using linearizations of the respective models.
around their steady-state values\(^2\). Analytical models sacrifice reality, for instance by ruling out several sources of dynamics, in order to keep the analysis manageable. On the other hand, the results of the simulations approach are coefficient specific. To overcome this dilemma, intervals of robustness for all behavioural parameters have been established (cf. Karakitsos, 1989). Besides, in chapters 2, 4 and 5, the role of the economies' sector structure and technology has been critically analyzed. As for the latter, we reverse the sectors' factor intensities as compared to the reference situation, in which tradables production is assumed to be capital intensive.

Expressing variables as described above is not unfamiliar (see e.g. Schouten and Kolnaar, 1967, Van de Klundert, 1982 and Meulendijks, 1992). It permits a simple linear presentation of otherwise rather complex non-linear systems.

Analogously to the preceding section, the characterizations of the policies pursued will be indicated as 'locomotive policy' (LOC), 'backward locomotive policy' (BLOC), 'beggar-thy-neighbour policy' (BTN) and 'beggar-thyself policy' (BTS). These expressions grasp both the effects for the country taking the initiative, as well as the spill-over effects for the passive region. They can be defined by means of the following scheme, in which country 1 is supposed to be the active region

\[ \begin{array}{cccc}
\text{LOC} & \text{BLOC} & \text{BTN} & \text{BTS} \\
+x_1 & +x_2 & - & - \\
- & + & - & -
\end{array} \]

where \( x \) is the variable which is taken as the criterion for the (spill-over) effects. The advantage of this way of presenting the results is its compactness. However, the price to be paid is the loss of insight into the quantitative proportions. Therefore, in all chapters, except for chapters 4 and 5, tables containing quantitative results are presented as well.

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\(^2\) The simulation of similar nonlinear models generally takes a lot of computing time. We have experimented with the full nonlinear models of chapters 3 through 6, using the SIMPC package developed by Don (1990). They were found to have the same properties as the linear version of the model.
REFERENCES


Klundert, Th. van de (1982), 'Distribution, Taxation and Employment in an Open Economy', *De Economist*, vol. 130, no. 1, pp. 9-37.


2. De stelling van Leslie (Leslie, Advanced Macroeconomics: beyond IS/LM, McGraw-Hill, London, 1993, p. 39) dat 'Of the many of thousands of economic models that are on offer, very few are actually useful beyond providing theorists with a means of advancing their careers' dient, dit proefschrift mede in acht genomen, volmondig te worden beaamd.


4. Al te frequente onderwijsevaluatie leidt onvermijdelijk tot onderwijsdevaluatie.

5. De volgorde onderwijs....onderzoek komt in de Nederlandse universitaire wereld anno 1993 louter voor in geval van alfabetisch-lexicografische ordening.

6. Mede met het oog op de wenselijkheid van internationalisering van het universitair onderwijs, dient het gebruik van Nederlandstalige dictaten, parallel met Engelstalige handboeken, ten stelligste te worden ontraden.

7. Zoals de ontwikkeling van de functie van universitair docent zich thans aftekent, zal in allengs afnemende mate het misverstand worden oegeroepen dat de afkorting U.D. staat voor Utile Dulci.

8. In de Nederlandse onderwijs- en wetenschapswereld werd het geluid van In 't Veld al snel weer overstemd door de geluiden 'uit het veld'.

9. En overigens ben ik van mening dat P.S.V. bij Romario had moeten blijven.
CHAPTER 2  FISCAL POLICY, INTERDEPENDENCE AND MESOECONOMICS

This chapter is a thoroughly revised version of the publication with the same title (in Dutch: Budgettaire politiek, interdependentie en sectoranalyse) in *Maandschrift Economie*, vol. 56, no. 1, 1992, pp. 24-41. It was co-authored by Dr. R.J. de Groof.

2.1. INTRODUCTION

During the eighties the European economies were characterized by a slow recovery and persistent unemployment. Some commentators (Layard et al., 1984) ascribed this to a lack of international policy coordination. Van der Ploeg (1988) based the same conclusion on a thorough investigation of the effects and spill-over effects of economic policies of individual regions, using a static flex-price Mundell-Fleming two-country model, with floating exchange rates and sluggish labour markets. These (spill-over) effects turn out to depend crucially on the assumptions with respect to, on the one hand, the type of wage rigidity, and, on the other hand, the degree of substitutability between domestic and foreign goods. Van der Ploeg assumes that indexation of the wage rate to the consumers' price index is an important feature of both the European and Japanese economies. So, when treated as a bloc, Europe is said to be characterized by real wage rigidity and the U.S. by nominal wage rigidity (cf. Branson and Rotemberg, 1980, Bruno and Sachs, 1985 and Attenasio and Van der Ploeg, 1988). However, recent empirical work casts some doubt on the existence of RWR in Europe (Gordon, 1988 and Garretsen and Lensink, 1989). Furthermore, Van der Ploeg follows the so-called Armington tradition, assuming that domestic and foreign goods are imperfect substitutes. Perfect substitutability would imply that the Law of One Price holds. In that case, domestic and foreign goods have the same price, expressed in one currency at the going exchange rate. Empirical research, however, indicates that prices tend to move in the same direction, but are not equal (cf. Visser, 1989 and the literature cited there). However, the process of global integration of goods markets makes goods increasingly subject to international competition. As a consequence, the Law of One Price (henceforth LOP) may gain validity.
Under the above assumptions (RWR in Europe, NWR in the U.S., Armington tradition), an expansionary fiscal policy in the U.S. is a 'beggar-thy-neighbour-policy', provided that the negative effects on the European economies of the rise in the world interest rate dominate the positive effects of higher U.S.' imports. Van der Ploeg (1988) assumes this to be the typical case. The opposite stand is taken by Van der Lem and Zalm (1990), who argue that cutting the U.S.' budget deficit hampers economic growth in Europe. An expansionary fiscal policy in Europe, however, is a 'locomotive policy', raising output and employment in both regions. Many commentators (Layard et al., 1984) have urged Europe to engage in a fiscal expansion and the U.S. to engage in a fiscal contraction. Thereby, it should be noted that under the above assumptions a fiscal cut-back in the U.S. is a 'beggar-thyself policy' (De Groof and Schaling, 1991). Presumably, this is part of the explanation why the U.S.' government is so hesitant to tackle the problem of its budget deficit. Van der Ploeg (1988, p.3) explains the hesitation of Europe to loosen its fiscal policy partly as follows: "Some German commentators (probably referring to Fels and Fröhlich, 1987, and Hellwig and Neumann, 1987) might have a world with the law of one price in mind when they argue that European fiscal policy has no real effects whatsoever....and, therefore, should be set at a level consistent with no inflation". Indeed, under the LOP, an expansionary fiscal policy seems to lack any sense for a region characterized by RWR. The real exchange rate stays put. Consequently, it is not possible to lower the real producers' wage and, so, to boost output and employment, by forcing up the terms of trade. Meanwhile, both the price level and the interest rate rise.

As stated above, the LOP may gain validity as goods markets become increasingly integrated. This is especially true for so-called tradable goods and services. Therefore, the question arises whether the above conclusion with respect to the impotence of fiscal policy remains valid in the context of a two-sector model, distinguishing between a tradables—and a non-tradables sector (De Groof and Schaling, 1991). Firstly, the existence of these sectors is a fact of life. Consequently, taking the distinction between tradable and non-tradable goods and services into account increases the explanatory power of the model. In this context, it should be noted that this may be one of the reasons why
the Dutch Central Planning Bureau has changed from a purely macroeconomic model (FK'85) to a multi-sector model (FKSEC, C.P.B. 1992) for short-term forecasting purposes. Secondly, in economic theory the main issue is understanding or generalization (Van de Klundert, 1982). In such a two-sector setting, the LOP only applies to the tradables-sector (Argy, 1981, and Frenkel and Mussa, 1985).

It is the purpose of this chapter to analyze the effects of sector-specific fiscal shocks, using a two-country-two-sector-framework. Here, expansionary fiscal policy is defined as a bond-financed increase in government expenditure. It should be kept in mind that the conclusions mentioned above, drawn from a macroeconomic two-country model, strongly hinge on the assumption of real wage rigidity in Europe. As remarked before, recent empirical research casts some doubt on the actuality of this assumption. In case Europe is featured by rigidity of money wages instead of real consumers' wages, the increase in prices arising from an expansionary fiscal policy lowers the real producers' wage and, thus, boosts output. Therefore, we make a distinction between two cases. In both cases the U.S. economy is characterized by nominal wage rigidity (NWR). However, in the so-called 'benchmark case' Europe is featured by real wage rigidity (RWR), whereas in the 'alternative case' Europe is characterized by nominal wage rigidity (NWR).

A model of the Mundell-Fleming variety is used. There are three reasons underlying this choice. Firstly, the proposition concerning the ineffectiveness of fiscal policy under the LOP is formulated in the context of such a model. As a consequence, this seems the most proper way to trace its robustness with respect to desaggregation. Secondly, we have the intention to present the effects of such a desaggregation as simply as possible. Thirdly, the Mundell-Fleming framework is still considered to be useful in theoretical as well as empirical issues (see De Groof and Schaling, 1991 and the literature cited there). Nevertheless, these models are subject to considerable criticism. In our opinion, the neglect of stock adjustments and, consequently, the failure to integrate wealth effects is the most fundamental objection. In this respect, Van der Ploeg (1992) even

1) It should be kept in mind that the indications 'U.S' and 'Europe' are merely used for expositional purposes.
calls them 'a trifle old fashioned'. This makes models à la Mundell-Fleming appropriate for short-term analysis only. As a consequence, we will confine ourselves thereto.

The plan of this chapter is as follows. First, in section 2.2 the most important characteristics of the model are presented. The linearized simulations version of the model is presented in Appendix 2.1, while the underlying numerical assumptions are given in Appendix 2.11. Next, in section 2.3 the effects of different forms of fiscal policy, as well as the relevant transmission mechanisms are discussed. They are illustrated using numerical simulations. The usual extensive sensitivity analysis is reported in section 2.4. Finally, section 2.5 concludes the chapter.

2.2. THE MODEL

As indicated before, a two-country two-sector framework is used. The two regions distinguished are supposed to have the same structural characteristics, with the exception of nominal wage formation in the 'benchmark case'. In both regions, a tradables- and a non-tradables-sector are distinguished. For simplicity, in the reference situation these sectors are assumed to be equal in size, as measured by gross value added. Domestic and foreign tradable goods and services are assumed to be perfect substitutes. Consequently, the Law of One Price (LOP) applies to tradables. Thereby, it should be noted that we abstract from transportation costs etc. Goods markets are cleared instantaneously. In the tradables-sector this implies the continuous equality of global demand and global supply, whereas in the non-tradables-sector domestic demand always equals domestic supply. In contrast, labour markets are sluggish, due to the rigidity of either real consumers' or money wages. As indicated above, both a 'benchmark case' of RWR in Europe and NWR in the U.S. and an 'alternative case', in which NWR characterizes both regions, are studied. Furthermore, we assume perfect intersectoral labour mobility as well as international labour immobility.

A distinction is made between two categories of private sector spending: consumption and investment. Of course, in the context of a short-term analysis capital accumulation is ignored. However, the development of sectoral investment may deviate from sectoral consumption.
Therefore, taking sectoral investment into account enriches the analysis of aggregate demand (De Groof and Schaling, 1990).

We distinguish between (capital) investment by a sector and production of investment goods by a sector. It is assumed that there is technical complementarity between new capital goods produced by the sector itself and investment goods bought from the other sector.

The government sector is not modelled explicitly. In the reference situation it is even absent. Given the nature of the questions at hand and the restriction to a short-run analysis this simplification does not seem to be a major disadvantage. The nominal exchange rate is flexible. As a result, the balance of payments is always in equilibrium. A trade balance surplus (deficit) implies an equiproportionate capital account deficit (surplus), since we abstract from the investment income account. This does not seem to be a major objection either, in the light of our time horizon. The asset menu consists of (home) cash balances and government bonds. The latter are perfectly substitutable across countries. This implies real interest rate parity, since we assume price- and exchange rate expectations to be static.

2.3. THE EFFECTS OF 'DEFICIT SPENDING'.

2.3.1. BENCHMARK CASE: REAL WAGE RIGIDITY IN EUROPE AND NOMINAL WAGE RIGIDITY IN THE U.S.

As mentioned above, the assumption of RWR in Europe and NWR in the U.S. implies a certain degree of asymmetry. As a consequence, a clear distinction must be made between American and European fiscal policy. The results of sector-specific fiscal expansions in both regions are presented in Tables 2.1 and 2.2.

If Europe raises its government expenditure on non-tradables (Table 2.1, column 1) the European interest rate tends to rise above the interest rate in the U.S.. However, this tendency is choked off by capital flows from the U.S. to Europe. Thus, the interest rate rises equiproportionately in both regions, while the European currency (ECU) appreciates.

Consequently, the European price of tradables tends to exceed the
American tradables price (as expressed in the same currency). However, this tendency is nipped in the bud by trade flows from the U.S. to Europe. Logically, demand for American tradables increases and the price of U.S.' tradables rises. With money wages staying put, the real producers' wage in the U.S.' tradables-sector falls. This leads to an increase in the production of American tradables. Thus, the rise in demand can be partly satisfied. At the same time, tradables become relatively expensive for American consumers. As a result, they substitute non-tradables for tradables. Consequently, the price of American non-tradables rises. So, the real producers' wage in the non-tradables sector falls as well and output in this sector rises, too.

In Europe, the fiscal expansion leads to a quite sharp rise in the price of non-tradables. The price of tradables as expressed in European currency hardly changes, since the fall in the nominal exchange rate is counterbalanced by a rise in the (world) price of tradables, as expressed in dollars. The consumer price index is a weighted average of the price of tradables and the price of non-tradables. In the reference situation, it is assumed that tradable and non-tradable goods and services take an equal share in total consumption. In case of real wage rigidity, the nominal wage rate follows the consumer price index (CPI). So, the rise in money wages exceeds the increase in the price of tradables, whereas it falls short of the rise in the price of non-tradables. Consequently, the real producers' wage rises in the tradables-sector, whereas it drops proportionately in the non-tradables-sector. This causes non-tradables output to rise, while the production of tradables declines. On balance, total output in Europe rises, since the impact of the fall in labour costs in the labour-intensive non-tradables sector dominates the effect of the proportionate rise in labour costs in the capital-intensive tradables sector. The increase in both European and U.S.' output justifies the qualification 'locomotive policy'. So, in contrast with the suggestion raised by the 'German commentators' mentioned before, fiscal policy turns out to have an impact on total output in a region characterized by RWR as well.
Table 2.1

<table>
<thead>
<tr>
<th>Table 2.1</th>
<th>Real wage rigidity in Europe, nominal wage rigidity in the U.S. (RWR/NWR)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>fiscal shock</th>
<th>$\xi_n^{\pi}$</th>
<th>$\xi_t^{\pi}$</th>
<th>$\xi_n^{*}$</th>
<th>$\xi_t^{*}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>world</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>real interest rate ($r$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nominal exchange rate (e, ECU's per dollar)</td>
<td>-0.55</td>
<td>1.23</td>
<td>0.47</td>
<td>0.47</td>
</tr>
<tr>
<td>type of (spill-over) effects</td>
<td>LOC</td>
<td>BTN</td>
<td>BTS</td>
<td>BTN</td>
</tr>
</tbody>
</table>

**Europe**

| internal terms of trade ($p_t - p_n$) | -1.01         | 0.30          | 0.32        | 0.32        |
| consumer price index ($p_c$)         | 0.42          | 0.77          | 0.83        | 0.83        |
| real producers' wage                 |               |               |             |             |
| in the tradables-sector ($w - p_t$)  | 0.50          | -0.15         | -0.16       | -0.16       |
| in the non-tradables-sector ($w - p_n$) | -0.50        | 0.15          | 0.16        | 0.16        |
| total consumption ($c$)              | -0.25         | -0.53         | -0.57       | -0.57       |
| consumption of tradables ($c_t$)     | 0.31          | -0.69         | -0.74       | -0.74       |
| consumption of non-tradables ($c_n$) | -0.80         | -0.36         | -0.39       | -0.39       |
| production of investment goods       |               |               |             |             |
| by the tradables-sector ($i^o_t$)    | -0.34         | -0.45         | -0.48       | -0.48       |
| by the non-tradables-sector ($i^o_n$) | -0.34         | -0.45         | -0.48       | -0.48       |
| trade balance surplus ($B_t$)        | -0.39         | 0.41          | 0.56        | 0.56        |
| production of tradables ($y_t$)      | -0.76         | 0.22          | 0.24        | 0.24        |
| production of non-tradables ($y_n$)  | 1.28          | -0.38         | -0.41       | -0.41       |
| total output ($y$)                   | 0.25          | -0.08         | -0.08       | -0.08       |

**United States**

| internal terms of trade             | 0.42          | -0.92         | 0.46        | 0.46        |
| consumer price index                | 0.26          | 0.15          | 0.29        | 0.29        |
| real producers' wage                |               |               |             |             |
| in the tradables-sector             | -0.47         | 0.31          | -0.52       | -0.52       |
| in the non-tradables-sector         | -0.05         | -0.61         | -0.06       | -0.06       |
| total consumption                   | -0.12         | -0.03         | -0.13       | -0.13       |
| consumption of tradables            | -0.35         | 0.48          | -0.38       | -0.38       |
| consumption of non-tradables        | 0.11          | -0.54         | 0.12        | 0.12        |
| production of investment goods      |               |               |             |             |
| by the tradables-sector             | 0.22          | 0.03          | 0.24        | 0.24        |
| by the non-tradables-sector         | 0.22          | 0.03          | 0.24        | 0.24        |
| production of tradables             | 0.71          | -0.47         | 0.78        | 0.78        |
| production of non-tradables         | 0.13          | 1.56          | 0.14        | 0.14        |

2) All variables are expressed as relative deviations from their initial steady-state values (except $B_t$, $g_t$, $g_n$, $g_n'$, for which it is the deviation as a percentage of total gross value added in the initial steady state and $r$, $r'$, for which it is the arithmetic difference from the steady state.
If the U.S.' government raises its expenditure on non-tradable goods and services (Table 2.1, column 2), the world interest rate rises, while the ECU depreciates. As a result, the European price of tradables tends to drop below the U.S.' price of tradables. However, this tendency is choked off by trade flows from Europe to the U.S.. As a result, demand for tradables in Europe increases, whereas it drops in the U.S.. Therefore, the price of European tradables rises, while the price of U.S.' tradables falls. In the U.S., the price of non-tradables sharply rises as a result of the fiscal impulse pointed at this sector. With money wages remaining constant, the real producers' wage in the U.S.' non-tradables sector declines. As a result, production of non-tradable goods and services increases in the U.S.. On the contrary, U.S.' tradables production decreases, since the fall in the price of tradables causes real labour costs in this sector to rise. However, the macroeconomic level of production increases, owing to the relatively sharp decline of the real producers' wage in the labour-intensive non-tradables sector.

In both regions consumption is hampered by the higher real interest rate. As a result, in Europe the price of non-tradables falls, while the increase in the price of tradables is dampened. The positive gap between the nominal wage and the price in the tradables-sector is equal to the corresponding negative gap in the non-tradables-sector. Therefore, the decline in the real producers' wage in the tradables-sector is equal to the increase in the real producers' wage in the non-tradables-sector. Total output in Europe drops, since the fall in output in the labour-intensive non-tradables-sector outweighs the rise in production in the capital-intensive tradables-sector. The combination of higher total output in the U.S. and lower total output in Europe makes a U.S. fiscal expansion on non-tradables a 'beggar-thy-neighbour policy'.

If the European government raises its expenditure on tradables (Table 2.1, column 3), this induces a rise in the world real interest rate and an appreciation tendency of the ECU. As a result, the price of European tradables tends to exceed the price of U.S.' tradables (as expressed in the same currency). This tendency is nullified by trade flows from the U.S. to Europe. These trade flows exert a downward pressure on the ECU. On balance, the nominal exchange rate of Europe drops.
In the U.S., demand for tradables increases, leading to a rise in the price in this sector. With the nominal wage rate constant, this implies a drop in the real producers' wage in the American tradables-sector. Thus, U.S.' output of tradables increases, partly satisfying the rise in demand. Meanwhile, U.S.' consumers shift away from tradable goods and services towards non-tradable goods and services. As a result, a drop in the real producers' wage stimulates output in the non-tradables sector, too.

In Europe, the fiscal impulse directed at the tradables-sector causes the price of tradables to rise quite sharply. Thus, European consumers substitute non-tradable goods and services for tradable goods and services. Nevertheless, consumption of non-tradables drops, since this 'substitution effect' is dominated by the fall in total consumption expenditure caused by the rise in the real interest rate.

The price of tradables exceeds the CPI and, therefore, the nominal wage, whereas the opposite holds for the non-tradables-sector. The rise in the real producers' wage in the labour-intensive non-tradables-sector is equal to the decline in the real producers' wage in the capital-intensive tradables-sector. Therefore, on balance, total output in Europe decreases.

As indicated above, total production in the U.S. increases. As a consequence, the indication 'beggar-thyself' suits this type of policy. It should be noted that the proposition of the German commentators is undermined once more. Fiscal policy conducted in a region characterized by RWR does not leave output in that region unaffected, even if the LOP applies. A fiscal expansion falling on tradable goods and services even turns out to be counter-productive. As a matter of fact, the government of such a region has a clear incentive to abstain from buying tradables, since government spending on this category harms both output and employment. This might give rise to an unbalanced composition of government expenditure.

From column 4 of Table 2.1, it immediately becomes clear that a U.S.' fiscal expansion on tradables yields results that show close resemblance to those of the corresponding European policy. In fact, the only difference concerns the surpluses on the balance of trade and the capital account. Now, of course, Europe runs a trade balance surplus, whereas the European capital account shows a deficit. The fact that the nominal
exchange rate (e) behaves in exactly the same way as in case of a European fiscal expansion on tradables is probably the most striking point.

This can be explained as follows. On impact, an expansionary fiscal policy in the U.S. tends to raise the U.S.' interest rate above the European rate of interest. However, this tendency is choked off by capital flows from Europe to the U.S., inducing an appreciation of the dollar and a rise in the world real interest rate. The increase in U.S.' government expenditure on tradables causes the domestic price of tradables to rise. With money wages constant, this implies a substantial fall in real labour costs in the tradables-sector. As a result, a considerable part of the increase in demand is satisfied by higher domestic production of tradables. So, the balance of trade deficit is small and downward pressure on the dollar is low. This sharply contrasts with the former case of a European fiscal expansion on tradables, which caused European imports to rise vehemently. This can also be reasoned as follows: under the LOP, an increase in the price of U.S.' tradables, simultaneous with a dollar appreciation, does not leave any room for further adjustment of the nominal exchange rate. As stated before, in all other respects the results are virtually identical to those of the corresponding European fiscal expansion. Therefore, the indication 'beggar-thy-neighbour policy' is appropriate.

From Table 2.1 it immediately becomes clear that the signs of the results concerning sectoral production of investment goods may deviate from those with respect to total sectoral output. This must be ascribed to the fact that a part of these new capital goods is supplied to other sectors. Logically, production of new capital goods partially depends on developments in these sectors. However, private consumption and - in case of the tradables-sector - net exports turn out to dominate production of investment goods, as the share of the latter in sectoral output is relatively small.

2.3.2. 'ALTERNATIVE CASE': NOMINAL WAGE RIGIDITY IN BOTH REGIONS

If NWR prevails in both the U.S. and Europe, our two-country model becomes perfectly symmetrical. As a consequence, a U.S.' expansionary, sector-specific fiscal policy yields the same outcomes as its European
equivalent. Therefore, we confine ourselves to European fiscal impulses. The major results are presented in Table 2.2.

An increase in European government expenditure on non-tradables (Table 2.2, column 1) induces the ECU to appreciate and the world interest rate to rise. The underlying mechanisms were elaborated upon in the preceding section. As a result, the price of European tradables tends to reach a level above that of U.S.' tradables (as expressed in the same currency). However, this tendency is nullified by trade flows from the United States to Europe.

As a result, demand for U.S.' tradables rises, whereas European demand for tradables falls. This induces the price of U.S.' (European) tradables to increase (decrease). With money wages fixed, the real producers' wage in the U.S.' (European) tradables-sector falls (rises) and U.S.' (European) production of tradables is boosted (declines). The higher price of tradables induces U.S.' consumers to shift away from tradable consumption goods towards non-tradable consumption goods. In Europe demand for non-tradables is stimulated by the fiscal expansion. Consequently, in both regions the price of non-tradables goes up. Hence, with a constant nominal wage rate, real producers' wages drop and output of non-tradables increases.

In the U.S. output rises in both sectors. In Europe the rise in non-tradables output dominates the increase in the production of tradables. Of course, this must be attributed to the fact that the drop in real labour costs in the labour-intensive non-tradables sector outweighs the increase in real labour costs in the capital-intensive tradables sector. So, total output reaches a higher level. As a result, this policy deserves the qualification 'locomotive policy'.

An increase in European government spending on tradable goods and services (Table 2.2, column 2) yields results at the macroeconomic level that are very similar to those of the preceding case. Again, the characterisation 'locomotive policy' is the right one.

However, some differences should be noticed. Firstly, now the nominal exchange rate remains constant. For, the tendency of the ECU to appreciate, arising from capital flowing from the U.S. to Europe is counterbalanced by an equiproportionate tendency to depreciate, resulting from a balance of trade deficit. Secondly, European production of
Table 2.2 \(^{3)} \) Nominal wage rigidity in both regions (NWR/NWR)

<table>
<thead>
<tr>
<th>fiscal shock</th>
<th>( g_n = 1 )</th>
<th>( g_t = 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>world</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>real interest rate ((r))</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>nominal exchange rate ((\text{ECU's per dollar, } e))</td>
<td>-0.79</td>
<td>0.00</td>
</tr>
<tr>
<td>type of (spill-over) effects</td>
<td>LOC</td>
<td>LOC</td>
</tr>
<tr>
<td><strong>Europe</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>internal terms of trade ((p_t - p_n))</td>
<td>-0.94</td>
<td>0.43</td>
</tr>
<tr>
<td>consumer price index ((p_c))</td>
<td>0.14</td>
<td>0.27</td>
</tr>
<tr>
<td>real producers' wage</td>
<td>0.34</td>
<td>-0.49</td>
</tr>
<tr>
<td>in the tradables-sector ((w^t - p_t))</td>
<td>0.61</td>
<td>-0.05</td>
</tr>
<tr>
<td>in the non-tradables-sector ((w^n - p_n))</td>
<td>-0.12</td>
<td>-0.02</td>
</tr>
<tr>
<td>total consumption ((c))</td>
<td>-0.54</td>
<td>0.12</td>
</tr>
<tr>
<td>consumption of tradables ((c_t))</td>
<td>0.50</td>
<td>-0.36</td>
</tr>
<tr>
<td>consumption of non-tradables ((c_n))</td>
<td>-0.54</td>
<td>0.12</td>
</tr>
<tr>
<td>production of investment goods</td>
<td>0.02</td>
<td>0.23</td>
</tr>
<tr>
<td>by the tradables-sector ((i_t))</td>
<td>0.02</td>
<td>0.23</td>
</tr>
<tr>
<td>by the non-tradables-sector ((i^n))</td>
<td>-0.37</td>
<td>-0.52</td>
</tr>
<tr>
<td>balance of trade surplus ((B_t = y_t + B_t))</td>
<td>-0.51</td>
<td>0.74</td>
</tr>
<tr>
<td>production of tradables ((y_t))</td>
<td>1.55</td>
<td>0.14</td>
</tr>
<tr>
<td>production of non-tradables ((y_n))</td>
<td>0.52</td>
<td>0.44</td>
</tr>
<tr>
<td>total output ((y))</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>United States</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>internal terms of trade</td>
<td>0.40</td>
<td>0.43</td>
</tr>
<tr>
<td>consumer price index</td>
<td>0.25</td>
<td>0.27</td>
</tr>
<tr>
<td>real producers' wage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in the tradables-sector</td>
<td>-0.45</td>
<td>-0.49</td>
</tr>
<tr>
<td>in the non-tradables-sector</td>
<td>-0.05</td>
<td>-0.05</td>
</tr>
<tr>
<td>total consumption</td>
<td>-0.11</td>
<td>-0.12</td>
</tr>
<tr>
<td>consumption of tradables</td>
<td>-0.34</td>
<td>-0.36</td>
</tr>
<tr>
<td>consumption of non-tradables</td>
<td>0.11</td>
<td>0.12</td>
</tr>
<tr>
<td>production of investment goods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by the tradables-sector</td>
<td>0.21</td>
<td>0.23</td>
</tr>
<tr>
<td>by the non-tradables-sector</td>
<td>0.21</td>
<td>0.23</td>
</tr>
<tr>
<td>production of tradables</td>
<td>0.69</td>
<td>0.74</td>
</tr>
<tr>
<td>production of non-tradables</td>
<td>0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>total output</td>
<td>0.41</td>
<td>0.44</td>
</tr>
</tbody>
</table>

\(^{3)} see footnote 2) to Table 2.1
tradables now rises as well. The fiscal expansion directed at the tradables-sector drives up their price, depressing the real producers' wage, which fosters output. However, thirdly, the increase in total production is moderate as compared to the rise in total output in case of an expansionary fiscal policy directed at the non-tradables-sector. For, part of the rise in demand is now satisfied by more imports. Of course, the growth in U.S.' total output is now higher than in the preceding case.

2.4. SENSITIVITY ANALYSIS.

One may argue that the results of our simulations are coefficient-specific and that alternative numerical assumptions may lead to different (macroeconomic) outcomes. Therefore, the system has been submitted to an extensive sensitivity analysis.

Firstly, intervals of robustness for all behavioural parameters have been established, with respect to the macroeconomic characterisations of the policies considered. Table 2.3 presents these intervals for both the 'benchmark case' and the 'alternative case'. These findings suggest that the conclusions are fairly robust, at least as far as the macroeconomic characterizations of the various policies are concerned.

Secondly, the role of the economies' sector structure has been critically analyzed. In the reference situation it has been assumed that the tradables- and the non-tradables-sector are equal in size. However, varying the share of tradables-output in total output between 10% and 60% leaves the macroeconomic results qualitatively unaffected.

Thirdly, the robustness of the conclusions stated above does not hold with respect to the relative sectoral factor intensities. In the reference situation, it is assumed that the production of tradables is relatively capital-intensive. The question arises to what extent our effects depend on this assumption. In order to investigate this the initial factor intensities were reversed. Given uniform initial real producers' wages (in the reference situation all prices equal unity) and a uniform initial rate of return on capital, these factor intensities are reflected by the production elasticities of labour ($\lambda_j$). As mentioned, the results presented in Table 2.1 are obtained under the assumption that production of tradable goods and services is relatively capital-intensive. Hence, in
<table>
<thead>
<tr>
<th>parameter</th>
<th>value in the reference situation</th>
<th>RWR/NWR* 'Benchmark case'</th>
<th>NWR/NWR* 'Alternative case'</th>
</tr>
</thead>
<tbody>
<tr>
<td>elasticity of substitution between capital and labour ( (\varphi_{kl}) )</td>
<td>0.55</td>
<td>0.01 - 1.0</td>
<td>0.01 - 1.0</td>
</tr>
<tr>
<td>elasticity of substitution between tradables and non-tradables ( (\varphi_{tn}) )</td>
<td>1.1</td>
<td>0.01 - 100</td>
<td>0.01 - 100</td>
</tr>
<tr>
<td>income-elasticity of consumption ( (\varepsilon_{cy}) )</td>
<td>1.0</td>
<td>0.6 - 1.2</td>
<td>0.6 - 1.2</td>
</tr>
<tr>
<td>interest-elasticity of consumption ( (\varepsilon_{cr}) )</td>
<td>0.2</td>
<td>0.0 - 1.0</td>
<td>0.0 - 1.0</td>
</tr>
<tr>
<td>income-elasticity of money demand ( (\varepsilon_{my}) )</td>
<td>1.0</td>
<td>0.6 - 1.2</td>
<td>0.6 - 1.2</td>
</tr>
<tr>
<td>interest-elasticity of money demand ( (\varepsilon_{mr}) )</td>
<td>0.3</td>
<td>0.05 - 1.5</td>
<td>0.05 - 1.5</td>
</tr>
<tr>
<td>acceleration coefficient ( (\alpha) )</td>
<td>0.08</td>
<td>0.01 - 0.2</td>
<td>0.01 - 0.2</td>
</tr>
</tbody>
</table>
the reference situation $\lambda_n$ is greater than $\lambda_t$. The reversal of the factor intensities can be obtained by interchanging the values for $\lambda_n$ and $\lambda_t$. This implies that production of non-tradables becomes relatively capital-intensive. This changes the (spill-over) effects quite dramatically in case of RWR in Europe. Instead of a 'locomotive', 'beggar-thy-neighbour' 'beggar-thyself' and a 'beggar-thy-neighbour policy', respectively, now a 'beggar-thyself' and, in the three remaining cases, a 'locomotive policy' result.

Obstfeld (1988) notices the crucial character of the supposition with respect to the relative factor intensities of the tradables- and the non-tradables-sector as well. One of the assumptions underlying his two-country-two-sector model is the relative capital intensity of the production of tradables. Obstfeld even qualifies this assumption as the natural one, however, without giving a motivation for it.

2.5. CONCLUDING REMARKS

In a macroeconomic two-country model, with perfect substitutability of both commodities and financial assets, in the short run fiscal policy conducted in a region featured by RWR has no effect on output of the region itself (Van der Ploeg, 1988). It is shown that this conclusion needs modification in a two-country-two-sector setting, distinguishing between a tradables- and a non-tradables sector. This implies that propositions concerning the nature of the (spill-over) effects of fiscal policy, based on macroeconomic models, are not unconditionally reliable. Desaggregation of such a model into a tradables/non-tradables setting may lead to quite different outcomes. Consequently, the question arises, which level of aggregation may be considered as a solid base for propositions with respect to the (spill-over) effects of fiscal policy.

It is demonstrated that, in case in the passive country NWR prevails, an expansionary fiscal policy conducted by a country characterized by RWR does have consequences for the output of the region itself. In our numerical exercises, a rise in material government expenditure on tradables yields a so-called 'beggar-thyself policy', whereas a fiscal expansion directed at the non-tradables sector deserves the qualification 'locomotive policy'.
In our opinion, these examples make clear that propositions derived from a purely macroeconomic model lack generality. However, one may argue that our simulations lack generality as well, since they heavily depend on the parameter values chosen. However, sensitivity analysis makes clear that our results are fairly robust. Only a reversal of the sectoral factor intensities turned out to change the results qualitatively. However, we do not close our eyes for the shortcomings of this study. Firstly, we have confined ourselves to the short run (t=1). Analyzing the medium- and long-term might be an interesting extension of the study at hand. The interregional equality of real interest rates, arising from the assumptions of uncovered interest parity and static expectations, must be replaced by (potentially) diverging yields on financial assets in the context of a portfolio balance approach with endogenous expectations (De Groof and Van Tuijl, 1993a and 1993b). Moreover, a medium- and long-run analysis requires a careful modelling of the dynamics of both the current account and the government budget, satisfying the corresponding intertemporal constraints. Next, an analysis of a current topic as, for instance, European economic integration, takes a three-country-model, distinguishing between Germany, the Rest of Europe and the Rest of the World. In that case, at least for both European regions the assumptions concerning the interregional and intersectoral mobility of labour should be brought more in line with reality. Finally, international coordination of economic policies could be fruitfully analyzed.

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**APPENDIX 2.I  THE LINEAR MODEL**

In this appendix the two-country two-sector model is presented by focussing on the equations of the home country (Europe). The variables of the foreign country (the U.S.) are denoted by an asterisk. The subscript j (j=t,n) refers to the (home) tradables-sector (j=t) and the non-tradables-sector (j=n), respectively.

All variables are expressed as relative deviations from their steady-state values. Exceptions are the nominal (and real) interest rate (r), which is expressed as the arithmetic difference from its steady-state value, and the balance of trade surplus (B_t), as well as government expenditure on tradables (g_t) and non-tradables (g_n), which are expressed as a fraction of steady-state macroeconomic production. It should be kept in mind that in the reference situation the latter three variables equal zero. Capital
letters denote nominal values, small letters symbolize real values and
prices. Greek letters denote parameters. Exogenous variables are barred. A
tilded variable refers to its initial steady-state value. All coefficients
are defined positively. Their numerical values are given below.

The monetary submodel

\[ M = \varepsilon_{my} y + p_y - \frac{\varepsilon_{mr}}{r} r \]

money market equilibrium \quad (1)-(2)

in which: \( M \) = (exogenous) money supply
\( p_y \) = producers’ price index
\( r \) = real (and nominal) interest rate
\( r \) = idem, initial steady-state value
\( \varepsilon_{my} \) = elasticity of money demand with respect to macro-

economic output
\( \varepsilon_{mr} \) = elasticity of money demand with respect to the
interest rate

\[ r = r^* \]

uncovered interest parity \quad (3)

(static expectations)

The commodity subsystem

\[ c = \varepsilon_{cy} (y + p_y - p_c) - \varepsilon_{cr} \frac{r}{r} \]

total consumption \quad (4)-(5)

in which: \( c \) = total consumption
\( p_c \) = consumer price index
\( \varepsilon_{cy} \) = income-elasticity of consumption
\( \varepsilon_{cr} \) = interest-elasticity of consumption

\[ c_t - c = \gamma_{tn} (p_t - p_c) \]

consumption of tradables \quad (6)-(7)

in which: \( c_t \) = consumption of tradables
\( p_t \) = price of tradables
\( \varphi_{tn} = \text{elasticity of substitution between tradable and non-tradable consumption goods} \)

\[
c_n - c = -\varphi_{tn}(p_n - p_c)
\]

consumption of non-tradables

in which: \( c_n = \text{consumption of non-tradables} \)
\( p_n = \text{price of non-tradables} \)

\[ p_t = p_t^* + e \]

Law of One Price

in which: \( e = \text{nominal exchange rate} \)

\[
i_j = \left( \frac{\alpha}{\delta} \right) k_j^d + \left( 1 - \frac{\alpha}{\delta} \right) k_j
\]

sectoral gross capital investment

in which: \( i_j = \text{gross capital investment by sector } j \)
\( k_j^d = \text{desired stock of capital equipment in sector } j \)
\( \alpha = \text{acceleration coefficient (uniform across sectors)} \)
\( \delta = \text{rate of technical obsolescence} \)

\[
k_j^d = y_j - \frac{\varphi_{kl}}{(r + \delta)}
\]

desired stock of capital equipment in sector \( j \)

in which: \( \varphi_{kl} = \text{elasticity of substitution between capital and labour (uniform across sectors)} \)

\[
i_j^o = y_j o_j i_j + (1 - y_j o_j) i_m
\]

production of new capital goods by the \( j \)-sector

in which: \( i_{jj} = \text{gross capital investment by the } j \text{-sector in the form of } j \text{-goods (} j = t, n) \)
\( i_{jm} = \text{gross capital investment by the } m \text{-sector in the form of } j \text{-goods (} m = n, t, m \neq j) \)
$y_{ij}^{0}$ = share of gross capital investment by the j-sector in production of investment goods by the j-sector.

\[ i_{jj} = i_{mj} \]

complementarity of investment goods (23)-(26)

\[ i_{j} = y_{ij} i_{jj} + (1-y_{ij}) i_{jm} \]

sectoral gross capital investment (origin) (27)-(30)

in which: \( i_{j} \) = gross capital investment by the j-sector
\( y_{ij} \) = share of new capital goods produced by the j-sector in capital investment by the j-sector

\[ y_{j} = \lambda_{j} l_{j} \]

production (capacity) (31)-(34)

in which: \( y_{j} \) = sectoral (potential) output
\( \lambda_{j} \) = sectoral employment
\( \lambda_{j} \) = production-elasticity of labour in sector j

\[ y_{t}^{*} = y_{t}^{*} c_{t} c_{t} + y_{t}^{*} c_{t} + y_{t}^{*} i_{t}^{0} + y_{t}^{*} i_{t} + y_{t}^{*} y_{t}^{*} t_{y} (g_{t} + g_{t}^{*}) \]

income-expenditure equilibrium (tradables-sector) (35)

in which: \( g_{t} \) = (exogenous) government expenditure on tradables

\( y_{c_{t}} \) = ratio of consumption of tradables to total output of the tradables-sector
\( y_{i_{t}}^{0} \) = ratio of production of tradable investment goods to output of the tradables-sector
\( y_{t_{y}} \) = ratio of output of the tradables-sector to macroeconomic production

\[ y_{n} = y_{c_{n}} + y_{i_{n}}^{0} + (1-y_{t_{y}}) g_{n} \]

income expenditure equilibrium in the macroeconomic system (36)-(37)
non-tradables-sector

in which: \( g_n \) = exogenous government expenditure on non-tradables
\( y_{c_n} \) = ratio of consumption of non-tradables to output of the non-tradables-sector
\( y_{i_n}^0 \) = ratio of investment (new capital) goods produced by the non-tradables-sector to output of the non-tradables-sector.

\[ y = y_{c_n} + (1 - y_{c_n}) y_{i_n} \]
macroeconomic production (38)-(39)

in which: \( y \) = macro-economic production

The labour subsystem

\[ w = \zeta p_c \]
nominal wage rate (40)-(41)

in which: \( w \) = nominal wage rate (uniform across sectors)
\( \zeta \) = real wage inertia coefficient
(\( \zeta = 0 \) implies nominal wage rigidity (NWR), whereas \( \zeta = 1 \) implies real wage rigidity (RWR))

\[ l_j = y_j - p_{kj} (w - p_j) \]
employment (42)-(45)

in which: \( p_j \) = sectoral producers' price

\[ l = \frac{\gamma_y \lambda_t}{\lambda} l_t + \frac{(1 - \gamma_y) \lambda_n}{\lambda} l_n \]
macroeconomic employment (46)-(47)

in which: \( l \) = macroeconomic employment
\( \lambda \) = macroeconomic production elasticity of labour

\[ (\lambda = \gamma_y \lambda + (1 - \gamma_y) \lambda_n) \]
Definitional equations

\[ P_c = \gamma_{tc} p_t + (1 - \gamma_{tc}) p_n \]

consumers' price index \((48)-(49)\)

in which: 
\[ \gamma_{tc} = \text{ratio of consumption of tradables to total consumption} \]
\[ 1 - \gamma_{tc} = \text{ratio of consumption of non-tradables to total consumption} \]

\[ P_{ij} = \gamma_{ij} p_j + (1 - \gamma_{ij}) p_m \]

price index of sectoral \((50)-(53)\)

gross capital investment 
\[ j = t, n \quad m = n, t \]

\[ P_y = \gamma_{ty} p_t + (1 - \gamma_{ty}) p_n \]

producers' price index \((54)-(55)\)

\[ B_t = \gamma_{ty}^{-1} (Y_t - \gamma_c c_t - \gamma_i i_t) - \epsilon_t \]

balance of trade surplus \((56)\)

(deviation as a percentage of reference nominal output)

APPENDIX 2.II NUMERICAL ASSUMPTIONS

National accounts

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<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>(Y_{lt})</td>
<td>73.33</td>
<td>(C_t)</td>
<td>83.33</td>
</tr>
<tr>
<td>(D_t)</td>
<td>20</td>
<td>(I_{tt})</td>
<td>10</td>
</tr>
<tr>
<td>(Y_{nt})</td>
<td>6.67</td>
<td>(I_{tn})</td>
<td>6.67</td>
</tr>
<tr>
<td>(Y_t)</td>
<td>100</td>
<td>(X_t)</td>
<td>100</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>(Y_{ln})</td>
<td>82.22</td>
<td>(C_n)</td>
<td>83.33</td>
</tr>
<tr>
<td>(D_n)</td>
<td>13.33</td>
<td>(I_{nn})</td>
<td>6.67</td>
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<td>(Y_{rn})</td>
<td>4.44</td>
<td>(I_{nt})</td>
<td>10</td>
</tr>
<tr>
<td>(Y_n)</td>
<td>100</td>
<td>(X_n)</td>
<td>100</td>
</tr>
</tbody>
</table>
in which: \( Y_{j} \) = wage bill (of sector \( j \))
\( Y_{rj} \) = net profits (of sector \( j \))
\( D_{j} \) = capital depreciation (of sector \( j \))

From the national accounts it follows that

wage share in the tradables-sector
\[ \lambda_{t} = \frac{Y_{lt}}{Y_{t}} = 0.7333 \]

wage share in the non-tradables-sector
\[ \lambda_{n} = \frac{Y_{ln}}{Y_{n}} = 0.8222 \]

ratio of consumption of tradables to total output of tradables
\[ \gamma_{ct} = \frac{C_{t}}{Y_{t}} = 0.8333 \]

total output of non-tradables
\[ \gamma_{cn} = \frac{C_{n}}{Y_{n}} = 0.8333 \]

ratio of investment (new capital) goods produced by the tradables-sector to total output of the tradables-sector
\[ \gamma_{it} = \frac{I_{tt} + I_{tn}}{Y_{t}} = 0.1667 \]

ratio of investment (new capital) goods produced by the non-tradables-sector to total output of the non-tradables-sector
\[ \gamma_{in} = \frac{I_{nn} + I_{nt}}{Y_{n}} = 0.1667 \]

ratio of capital investment by the tradables-sector to total output of the tradables-sector
\[ \gamma_{it} = \frac{I_{tt} + I_{tn}}{Y_{t}} = 0.2 \]

total output of the non-tradables-sector
\[ \gamma_{in} = \frac{I_{nn} + I_{nt}}{Y_{n}} = 0.1333 \]
share of output in the tradables-sector in total output
\[ y_t^y = \frac{Y_t}{Y_t + Y_n} = 0.5 \]

share of output in the non-tradables-sector in total output
\[ 1 - y_t^y = \frac{Y_n}{Y_t + Y_n} = 0.5 \]

share of investment goods produced by the tradables-sector in capital investment by the tradables-sector
\[ y_{tt}^{ot} = \frac{I_{tt}}{I_{tt} + I_{nt}} = 0.6 \]

share of investment goods produced by the non-tradables-sector in capital investment by the non-tradables-sector
\[ y_{nn}^{o} = \frac{I_{nn}}{I_{nn} + I_{nt}} = 0.4 \]

share of capital investment by the tradables-sector in production of investment goods by the tradables-sector
\[ y_{tt}^{it} = \frac{I_{tt}}{I_{tt} + I_{nt}} = 0.5 \]

share of capital investment by the non-tradables-sector in production of investment goods by the non-tradables-sector
\[ y_{nn}^{it} = \frac{I_{nn}}{I_{nn} + I_{nt}} = 0.5 \]

macroeconomic wage share/
macroeconomic production elasticity of labour
\[ \lambda = y_t \lambda_t + (1 - y_t) \lambda_n = 0.7777 \]

So, \( \frac{y_t \lambda_t}{\lambda} = 0.4714 \) and \( \frac{(1 - y_t) \lambda_n}{\lambda} = 0.5286 \)
Other parameter values

\[ \gamma_{kl} = 0.55, \]

\[ \epsilon_{cy} = 0.8, \epsilon_{cr} = 0.2, \epsilon_{my} = 1, \epsilon_{mr} = 0.3, \]

\[ \gamma_{tn} = 1.1, \alpha = 0.08. \]

Moreover,

\[ r = 0.02, \delta = 0.06 \]

It should be noted that the latter implies

\[ k_t = y_t / \delta = 3.3333 \]

\[ k_n = y_n / \delta = 2.2222 \]

in which \( k_t \) (\( k_n \)) is the capital-output ratio of the tradables-sector (non-tradables-sector).
CHAPTER 3  THE TWIN-DEBT PROBLEM IN AN INTERDEPENDENT WORLD


3.1. INTRODUCTION

The reduced supply of and an increasing demand for world savings suggest continuously high interest rates in the years to come. The IMF, OECD and BIS recently expressed their concern about the sustainability of the external deficits in view of the persistent large U.S.' external deficit, the substantial German external deficit caused by the unification, the increased demand for savings to finance the restructuring of the Eastern European economies and the environmental policies. This question seems relevant, especially to the U.S.. For, total claims to the limited U.S.' savings laid by the combined financing needs of private domestic investment and the federal budget deficit, points to an awkward situation. The persistence of this 'savings gap' (cf. Corrigan, 1990), accompanied with a growing budget deficit creates a serious twin-deficit-twin-debt problem (see also, Kremers, 1990).

In this chapter we examine two rather obvious ways to deal with this problem in a world consisting of two interdependent economies. For that purpose, a two-country perfect foresight model, allowing for intertemporal budget constraints, current account dynamics, wealth effects, capital accumulation, imperfect asset and commodity substitution, floating exchange rates and international factor immobility is formulated. In his study of a related problem within the context of a symmetrical two-country general equilibrium model, Van de Klundert (1991) suggests that international institutional differences concerning wage formation between the two economic regions, might be highly relevant. Therefore, in search for a more realistic version of the global problem posed by the U.S.' savings gap, we take account of various hypotheses with respect to wage formation.

There are three ways of dealing with the problem of the savings gap: using the printing press, wait and see, or tackle the causes underlying
the gap. The awkward situation can produce pressures on the monetary authorities to crank up the printing press. However, money creation does not create savings. The fundamental cause of the external debt, which is the savings gap, can not be eliminated definitely by inflationary finance. For these reasons we will not explore this alternative. That leaves only two options: either to do nothing or to eliminate the savings gap.

In case of an unchanged U.S.' position, foreign debt would tend to grow infinitely. Eventually the marketplace might prove to be quite harsh as it goes about financing the U.S.' persistent external deficits. Following Van de Klundert, we will investigate the case, in which the share of U.S.' assets in foreign portfolios exceeds a critical value. This is supposed to result in a 'financial crisis', which is modelled as an exogenous shift in European asset preferences away from U.S.' bonds. This 'policy' of wait and see will result in a reduction of the U.S.' external debt. However, the price tag reads: a higher government debt and lower consumption for a long time to come. It will be shown, that in the long run this passive attitude would be profitable in terms of external debt as well as consumption and employment. However, it is questionable, whether from the policy-makers' point of view the long run is a relevant time-horizon.

There seems to be only one acceptable active way to eliminate the savings gap. A reduction in the rate of investment would be disastrous, and one can not expect a rise in the savings ratio to do the job quickly and safely enough. So, nothing seems left but to reduce the budget deficit, which can be achieved by either increasing taxes or by cutting government spending. An increase in taxes does not seem to be an attractive alternative in times of a low growth rate and increasing worldwide competition (cf. Chimerine and Young, 1986 and Knoester and Kolodziejak, 1992). Therefore, we will confine ourselves to the case of a reduction in U.S.' government spending. A fiscal contraction in the U.S., causing a real depreciation of the dollar, turns out to be an efficacious remedy for the twin-deficit-twin-debt-problem. This finding upholds the proposition of Branson (1988) and Van de Klundert (1991) concerning the possibility to restore international equilibrium by means of fiscal policy.
This conclusion is proof against all kinds of variations in the wage equations. The latter is not true with respect to the effects and spill-over effects of the shocks mentioned above, measured in terms of real output or consumption. Here wage formation proves to play a rather dominant role.

This chapter is organized as follows. In section 3.2 the basic model is presented. Appendix 3.1 gives the numerical assumptions with respect to the initial steady-state situation. In section 3.3 we consider the effects and spill-over effects of the shocks, brought about by the two alternatives mentioned above. This will be done for the basic case, in which nominal wage rigidity is assumed to prevail in one country and real wage rigidity in the other. Appendix 3.11 contains the intervals of robustness for all behavioural parameters. This sensitivity analysis not only gives insight in the generality of the numerical example, but also in how (in)dispensable the various variables are, in connection with the present problem. Appendix 3.111 presents a number of figures, which may be of some help to understand the dynamics of the system. In section 3.4, we report on the consequences of variations in the wage equations. These variations concern the type (nominal or real) of wage rigidity, as well as the Phillips mechanism. The latter relates to the traditional versus the so-called "weak" version of the Phillips mechanism. Section 3.5 concludes the chapter.

3.2. A TWO-COUNTRY MODEL WITH REAL AND NOMINAL WAGE RIGIDITY AND IMPERFECT GOODS AND FINANCIAL ASSETS SUBSTITUTION

In this section we present a symmetric two-country model by focussing on the equations of country \( j \) (\( j = 1,2 \)); the variables concerning the foreign country contain the subscript \( k \) (\( k = 1,2, j \neq k \)). Country 1 stands for Europe and country 2 for the U.S. Except for nominal wage formation, the two countries are identical.

All variables are expressed as percentage deviations from their initial steady-state values. Exceptions are \( f \) and \( t \), which are percentage deviations from steady-state output measured in terms of consumption goods, and \( r \) and \( r_n \), which are absolute deviations (\( \ast 100 \% \)).
Greek letters denote parameters, which are all defined positively. The parameters $\varepsilon$ and $\varphi$ refer to partial demand elasticities and elasticities of substitution, respectively. For instance, $\varepsilon_{\text{mr}}$ is the nominal interest rate $(r_n)$ elasticity of the demand for real cash balances $(m)$, and $\varphi_{kl}$ is the elasticity of substitution between capital $(k)$ and labour $(l)$. The parameter $\gamma$ refers to a ratio applying to the initial steady state. For instance, $\gamma_{k_b}$ is the initial steady-state ratio of bonds issued by firms $(k)$ to the total supply of bonds $(b)$. All parameters are defined in Appendix 3.1. Exogenous variables are barred. The superscript 'e' refers to expectational variables. In order to save space, we present nominal and real exchange rates as country-specific variables. All initial steady-state prices are assumed to equal unity.

The portfolio sub-system of the model draws on Van de Klundert (1991). Agents divide their real non-human wealth $(w_e)$ into real cash balances $(m)$, domestic bonds $(b_{jj})$ and foreign bonds $(b_{jk})$. Asset demand decisions depend on the rates of return on bonds, which are determined by the nominal interest rates $(r_n)$ and the expected change in the nominal exchange rate $(\Delta e_e)$. The real interest rate $(r)$ equals the difference between the nominal interest rate $(r_n)$ and the expected rate of inflation $(\Delta p_c^e)$

$$r_j = r_{n_j} - \Delta p_c^{e_j}$$

The real value of bonds is assumed to be fixed within a period (Haas and Masson, 1986). Bonds are indexed to the consumer price index (CPI), thus constituting sure claims on given amounts of future consumption goods (baskets). Expectations are assumed to be rational. Furthermore, stochastic components are absent. Therefore, agents have perfect foresight.

Transactions demand for (domestic) real cash balances is supposed to increase with real output in terms of consumption goods $(y + p_y - p_c)$ exclusively at the expense of domestic bonds. Moreover, we ignore currency substitution (McKinnon, 1990). Under these assumptions, the demand for the distinct assets as fractions of real non-human wealth can be written as
where \( q_c \) and \( r \) are the real consumption exchange rate\(^1\) applying to
country \( j \), and the initial world interest rate, respectively. Since
symmetry is assumed in the initial steady-state, interest rates are equal
across regions. The numerical assumptions with respect to the asset demand
functions satisfy the familiar "adding-up" constraints (Turnovsky, 1977).

The supply of real cash balances equals the difference between
exogenous money supply \( (M) \) and the CPI \( (p_c) \).

\[
m_j = M_j - p_{cj}
\]  \hspace{1cm} (9)-(10)
Net investment of firms is completely financed by bond issues. It is assumed that all transactions are paid for at the beginning of the period. So, investment goods are bought against today's prices. As a result, the amount of bonds supplied by firms is determined by the real value, in terms of consumption goods, of capital equipment at the beginning of the next period, thus including net investment of the present period. The supply of government bonds equals outstanding government debt \(d\), comprising this period's budget deficit as well. For simplicity, it is assumed that bonds issued by firms and the government are perfect substitutes. Therefore, the supply of domestic bonds \(b\) reads

\[
b_j = \gamma_k (k_{-1}^j + p_y y_j - p_c c_j) + (1 - \gamma_k) d_j
\]

where \(p_y\) denotes the price of home produced goods.

Equilibrium in the international bonds markets is stated by

\[
b_j = \gamma_b b_j + (1 - \gamma_b) b_k j
\]

Finally, real wealth of domestic households equals the sum of real domestic assets and net foreign assets \(f\)

\[
we_j = \gamma_m m_j + (1 - \gamma_m) b_j + \gamma_y f_j
\]

where

\[
\gamma_y = \gamma_k + \gamma_d + \gamma_m
\]

in which \(\gamma\) is the initial steady-state capital-output ratio.

The micro-underpinnings of the foregoing equations concerning the portfolio subsystem, are no more than rudimentary. In this respect, the commodity expenditure equations show close resemblance, as they lack explicit microfoundations in the form of intertemporal choices made by households and firms as well (as, for example, in Van der Ploeg, 1991). As Van de Klundert (1991) observes, a thorough microeconomic foundation of
macroeconomics requires an integration of saving, investment and portfolio decisions. Research in this field is still in its infancy (e.g. Rankin, 1991). Moreover, we agree with Allen (1991, p. 153), who argues, that optimizing models can not avoid ad hoc qualities either, be it of a different nature than non-optimizing models.

Total private consumption (c) is split up between consumption of home (c_h) and foreign produced (c_m) goods. First, consumers decide upon total consumption expenditure according to

\[
c_j = \varepsilon_{cy}(y_j + p_y - p_{c_j} - t_j) + \varepsilon_{cw} w_e_j - \varepsilon_{cr}(\frac{r_{nj} - \Delta p_{c_j}}{p})
\]

Thus, total consumption is positively related to purchasing power of nominal output and real non-human wealth of the private sector, whereas it depends negatively on lump-sum taxes (t) and the real interest rate (r).

Having decided upon total consumption, consumers choose between home (c_d) and foreign (c_m) produced goods and services, by maximizing a CES utility function

\[
c_d = c_j - \varphi_{hm}(p_y - p_{c_j})
\]

\[
c_m = c_j - \varphi_{hm}(p_y + e - p_{c_j})
\]

The accumulation of capital (k) is described by

\[
\Delta k_j = \delta (i_j - k_j)
\]

where \(\delta\) and \(i\) denote the rate of depreciation and gross investment, respectively. Firms produce under perfect foresight and maximize the present value of the cash flow. Account is taken of installation costs of newly installed capital. These are assumed to be such, that the costate variable associated with the state variable \(k\), coincides with the average "Q" or Tobin's Q (Hayashi, 1982). The rate of investment then, is a function of the latter. Under these conditions, the functions with respect to gross investment, the behaviour of Q and the demand for labour
are given by the first order conditions, resulting from the application of the maximum principle

\[ i_j = k_j + \frac{\alpha}{\xi} Q_j \]  
\[ Q_{t+1} = (1 + \bar{r} + \delta) Q_j + r_n \frac{\Delta p_y^e}{\varphi_{kl}} + \bar{r} + \delta \frac{(k - y)}{\varphi_{kl}} \]  
\[ l_j = y_j - \varphi_{kl} (w_j - p_y) \]

where \( w \) is the money wage. Equations (27)-(28) reflect the above assumption, that firms finance their investment outlays on the domestic market for loans. The term \( r_n - \Delta p_y^e \) represent the discount rates, which are relevant for investment, since we assume investment outlays to fall entirely on the domestic sector. The last terms on the right hand side of equations (27)-(28) reflect the assumption of linear homogeneous CES production functions, with \( \varphi_{kl} \) representing the elasticity of substitution between capital and labour (1).

Under the assumptions above, the equations for output read

\[ y_j = \lambda l_j + (1 - \lambda) k_j \]

Equilibrium in the goods markets is represented by

\[ y_j = y_{c_h} c_{h_j} + y_i i_j + y_{g_h} g_{h_j} + y_{g_m} c_{m_k} + y_{b_h} b_{h_j} + y_{b_m} b_{m_k} \]

Here \( g_h \) and \( g_m \) denote exogenous government expenditure on home and foreign produced goods, respectively.

The labour markets are assumed to be segmented internationally. Furthermore, they do not clear in the short run, due to rigidity of either nominal wages or real consumers' wages. Empirical evidence points, at least for the short and medium term, to a high degree of nominal wage

---

2) Equations (27) - (28) can easily be checked, by taking the discrete-time form of the Tobin's Q relation derived by Van de Klundert (1993).
rigidity in the U.S. and real wage rigidity in Europe (Branson and Rotemberg, 1980, Attenasio et al., 1987, Van der Ploeg, 1988). For expositional purposes we assume inertia on the labour market causing (almost) perfect short-run nominal and real wage rigidity in the U.S. and Europe, respectively. According to Attenasio et al. (1987), empirical evidence does not reject the existence of an error-correction mechanism in the wage relation, ensuring consumers' wages to return to their long-run equilibrium value. We assume a stylized version of this mechanism to apply, so that nominal wages adapt gradually to the labour market situation (Phillips mechanism), as well as to the development of the CPI. So, in the long run unemployment is at its natural rate. As mentioned, we investigate the role of wage formation, by modifying the wage equations in a number of ways. Assuming country-specific labour supply to be exogenous, these conditions imply

$$\Delta w_j = (1 - \xi_j) \Delta w_{j-1} + \xi_j \Delta p_{c,j} + \eta \Delta l_j - \eta(1 - \xi_j) \Delta l_{j-1}$$

in which $\xi$ and $\eta$ denote the real wage inertia coefficient and the Phillips-coefficient, respectively.

Government outlays, total real government expenditure plus interest payments on outstanding debt, are financed by lump-sum taxes ($t$), the issue of bonds, or by means of the 'printing press' ($\Delta M_j$). The selling of bonds raises government debt, which immediately becomes clear from writing the government budget identity (Buiter 1986) as

$$d_j = (1 + r_j) d_{j-1} + r_j + \gamma^{-1}_{dy} (g_j - t_j) - \gamma_{my}^{-1} \Delta M$$

where $g$ indicates total real government expenditure. Equations (37)-(38) reflect the above assumption of government bonds being indexed to the CPI. In order to prevent government debt from escalation, we specify a feedback rule for taxes. We chose not to use a feedback rule for government expenditure, because this variable is intended to serve as a policy instrument. A sensible tax rule was introduced by Buiter (1987). Here, it takes the form
where $\beta$ denotes the tax rule feedback coefficient.

The real current account surplus of a country ($\Delta f_j$) by definition equals the sum of its balance of trade surplus and its capital income account surplus. Under flexible exchange rates, this sum equals the capital account deficit, and, consequently, the increase in country $j$'s net real foreign asset position.

$$
\Delta f_j = \phi (r_k - r_j + \Delta q_{c_j}) + r \phi (q_{c_j} + b_{k-1} - b_{k-1})
$$

$$
+ y_{bh} (c_{m_k} - c_{m_j} - q_{y_j}) + y_{bh} (e_{m_j} - e_{m_j} - q_{y_j})
$$

$$
+ (1 - y_{bh}) \cdot (\Delta Q \cdot \Delta Q)
$$

in which

$$
\phi = (1 - y_{bh})(x + y_{dy})
$$

and $q_{y_j}$ represents the real production exchange rate.

Evidently, the exchange rates are related as follows

$$
e_k = -e_j
$$

$$
q_{c_k} = -q_{c_j}
$$

The macroeconomic real exchange rate by definition equals

$$
q_{c_j} = p_{c_k} + e_j - p_{c_j}
$$
The presence of both home and foreign produced goods causes the real consumption exchange rate, $q_c$, to be different from the real production exchange rate, $q_y$:

$$q_y = p_y + e_j - p_y$$

however, it can be verified that

$$q_c = (2 - 1) q_y$$

assuming 'local good preference' ($\gamma > 0.5$), $q_c$ and $q_y$ are positively related, so that there is no need to distinguish carefully between these two types of real exchange rates.

The consumer price index is defined as

$$p_c = \gamma_h p_y + (1 - \gamma_h)(p_y + e_j) = p_y + (1 - \gamma_h) q_y$$

The system is completed by a definitional equation for real government expenditure (in terms of consumption goods)

$$\varepsilon_j = \gamma_{g_h} (\varepsilon_{j,h} + p_y) + \gamma_{g_b} (\varepsilon_{j,b} + p_y + e_j)$$

There are 49 equations in 48 endogenous variables, viz. $r_n$, $r$, $m$, $b_{jj}$, $b_{jk}$, $b$, $w$, $e$, $c$, $c_h$, $c_m$, $i$, $Q$, $y$, $w$, $l$, $k$, $d$, $g$, $t$, $f$, $p_c$, $p_y$, $e$, $q_c$. Invoking Walras' law, one of the equilibrium equations is redundant. As a result, equation (14), which is the condition for equilibrium in the market for foreign bonds, can be eliminated.

The model contains eight backward-looking state variables viz. $k$, $w$, $d$ and $f$, since these are constrained by their history. The five remaining state variables, $p_y$, $Q$ and $e_j = e_k^{-1}$ are unconstrained by their past values and are forward-looking. For saddlepoint stability to hold, one should therefore have eight stable roots and five unstable roots.
3.3. TWO ALTERNATIVE ATTITUDES TOWARDS THE U.S.' DEFICITS-DEBTS PROBLEM

As mentioned before, two ways of dealing with the twin-deficit-twin-debt problem are studied: to let things take their course, which by assumption leads to a financial crisis, or to cut U.S.' government spending. In this section, the international transmission effects of the unanticipated once-and-for-all shocks, connected with these alternatives, will be analyzed. This will be done by passing in review the results of numerical exercises. The simulations have been carried out with the PSREM package for policy simulation of linear dynamic models with constant coefficients and rational expectations of future events, developed by Van der Ploeg and Markink (1991). The simulation of similar nonlinear models generally takes a lot of computing time. We have experimented with the full nonlinear model, using the SIMPC package developed by Don (1990). It was found to have the same properties as the linear version of the model. To avoid potential computing constraints, we chose to use the linear version. As mentioned, the numerical assumptions are presented in Appendix 3.1, while the sensitivity analysis is reported in Appendix 3.11. The consequences of the shocks mentioned above, are shown in Table 3.1.

The first column summarizes the effects and spill-over effects of a preference shift towards European bonds (hₐ₁ = 10) as a consequence of a financial crisis. So, on impact the demand for European bonds increases at the expense of the demand for U.S. bonds, leading to a fall in the European and a rise in the U.S. real interest rate. As a consequence, U.S.' real interest payments and government debt increase (see figure AIII 1a). On the contrary, the U.S.' external debt position improves (figure AIII 1b), owing to a real depreciation of the dollar (figure AIII 1c). The latter implies a strengthening of U.S.' competitiveness and, therefore, a significant trade balance surplus. Increased net exports cause an upward pressure on the U.S.' producers' price and, because of nominal wage rigidity, a downward pressure on the real producers' wage. So, in the short run, U.S.' real output and employment increase. In Europe the fall in the real interest rate boosts private expenditure and, therefore, real output and employment. The required supply-side adjustment comes from a decreased real producers' wage. A real appreciation of the ECU causes the
European CPI and, hence, the nominal as well as the producers' wage to fall, while European producers' prices increase.

When describing effects and spill-over effects of shocks in the medium run \((t = 4)\), one should distinguish carefully between the \textit{level} and the \textit{movement} of a variable. The \textit{level} is represented by the relative deviation of a variable from its initial steady-state value, while the \textit{movement} is the period-to-period change of this level.

In the present case, the medium-term picture for the U.S. can be sketched as follows. There is a further improvement of the external debt position (figure AIII 1b), notwithstanding a real appreciation of the dollar, as compared with the first period (figure AIII 1c). However, a lower, but still high real interest rate causes government debt to rise even further. Production and employment have decreased. The reasons are: a decumulation of capital brought about by crowding out of investment in the past, and an increased real producers' wage, due to a deflationary pressure on the producers' price. The latter comes from a low level of investment and consumption, due to a high real interest rate and a high real exchange rate of the dollar. In Europe, real output is still above its initial level. It has even risen somewhat, because the effect of capital accumulation dominates the effect of the rise in the European real producers' wage. The latter follows from the real depreciation of the ECU (figure AIII 1c), exerting an upward pressure on the CPI and, thus, on money wages, which exceeds the rise in the producers' price.

In the long run, the twin-debt will be reduced at last; both U.S.' government and external debt get below their initial values (figures AIII 1a and 1b). The U.S. acquire a considerable surplus on their capital income account. The reason is, that the real interest rate in Europe has risen fast, choking off excess demand in the goods market. The opposite holds for the U.S.. Europe has to service its long-term external debt by maintaining a trade balance surplus. A real depreciation of the ECU (figure AIII 1c), takes care of the required strengthening of Europe's competitiveness.

The second column of Table 3.1, summarizes the consequences of a cut in U.S.' government spending \((g_{d_2} = -10)\). It can be seen, at a glance, that this policy measure can do the job: it instantly and continually reduces the twin-debt problem (figures AIII 2a and 2b). The price to be
paid for that is lower real output and employment in the short and medium run. On the contrary, U.S. private consumption benefits from this measure continually.

In the short run, the decreased issue of government bonds lowers the real interest rate in the U.S., boosting domestic private expenditure. Meanwhile, a real depreciation of the dollar (figure AIII 2c) induces an increase in U.S. net exports, leading to a decline in external debt. Nevertheless, on impact, the negative effect of the fiscal contraction on total expenditure dominates. This is accompanied by a rise in the real producers' wage, due to a fall in the producers' price. In Europe, the producers' wage falls because of a real appreciation of the ECU, choking off the increase in the CPI and thus in money wages. The budget cut and the connected fall in the interest rate decreases the U.S. government debt.

The U.S. government debt continues to decline in the medium run (figure AIII 2a), in spite of a rise (movement) in the real interest rate. The reasons are, a still low level of the interest rate and the lasting effect of the fiscal contraction. The U.S. external debt also keeps falling (figure AIII 2c), owing to a surplus on the capital income account. To be sure, the surplus on the capital income account has fallen, due to a somewhat less favourable real interest rate differential and a real appreciation of the dollar. Real output in the U.S. increases because of capital accumulation and a decline in the producers' wage. Nevertheless, real output is still below its initial level. In Europe the real depreciation of the ECU causes the CPI and, thus, money wage to rise.

These tendencies are reinforced in the long run by a decrease in the real interest rate in the U.S. and an increase in the real interest rate in Europe. The U.S. government debt falls gradually to a new steady-state level (figure AIII 2a). The same is true for U.S. external debt (figure AIII 2b). The aforementioned interest rate differential, typical for portfolio models, is accompanied by a real depreciation of the dollar (figure AIII 2c). Nevertheless, the U.S. trade balance shows a deficit, due to crowding in of private expenditure. On the other hand, Europe needs this trade balance surplus, in order to service its debt. Crowding in of capital in the U.S. and crowding out of capital in Europe explain the rise and fall in real output in the U.S. and Europe, respectively. So, in the
<table>
<thead>
<tr>
<th>Period</th>
<th>U.S. government debt (F</th>
<th>Real exchange rate (g)</th>
<th>Nominal interest rate (r)</th>
<th>Real interest rate (r)</th>
<th>Consumption of foreign goods (c)</th>
<th>Consumption of domestic goods (d)</th>
<th>Employment (I)</th>
<th>Real output (Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>t</td>
<td>0.00</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.03</td>
<td>-0.03</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>t+1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>t+2</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of shock</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
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<tbody>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**TABLE 3.1**

Effects and spill-over effects of a financial crisis (p = 10) and reductions in U.S. government spending (g = 10)
long run the U.S. fiscal contraction proves to be a 'beggar-thy-neighbour policy'.

3.4. THE ROLE OF WAGE FORMATION

The assumption of nominal and real wage rigidity holding for the U.S. and Europe respectively, only partly investigates the role of wage formation in the two regions distinguished.

In this section we give a more complete picture of this role, by summarizing the most important qualitative deviations from the reference situation, caused by alternative assumptions with respect to wage formation. These assumptions not only concern the type of wage rigidity, but the Phillips-mechanism as well. As for the latter, apart from the standard specification used in section 3.3, we also take a "weak" version into consideration. In this weak Phillips-mechanism, only a change in the level of unemployment induces ceteris paribus changes in the nominal wage rate.

It is found, that the conclusions with respect to the elimination of the twin-debt are untouched by the use of alternative specifications of the wage equations. The same is true with respect to the long-term spill-over effects, with the exception of employment. For, the weak Phillips-mechanism permits long-term effects on employment, due to hysteresis.

However, in the short run the spill-over effects are affected by the alternative assumptions. Table 3.2 depicts them for the regions' real output. For all possible combinations of wage rigidities and Phillips mechanisms, the qualitative (signs) deviations from the reference situation (Table 3.1, p 14) are presented. Thereby, the indications R, N, ST and W stand for Real wage rigidity, Nominal wage rigidity, Standard and Weak version of the Phillips-mechanism respectively.

3) As changes in the labour supply are not taken into consideration here, the two options with respect to the weak Phillips mechanism in literature, i.e. the change in the unemployment rate and the rate of change in employment, do coincide.
Table 3.2 Short-term deviations from the reference situation (Table 3.1), due to alternative assumptions with respect to wage formation

<table>
<thead>
<tr>
<th>Europe</th>
<th>U.S.</th>
<th>$b_{h1}$</th>
<th>$e_{d2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$y_1$</td>
<td>$y_2$</td>
</tr>
<tr>
<td>R/ST</td>
<td>R/ST</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/ST</td>
<td>R/W</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/W</td>
<td>R/ST</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/W</td>
<td>R/W</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/ST</td>
<td>N/W</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/W</td>
<td>N/ST</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>R/W</td>
<td>N/W</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>N/ST</td>
<td>N/ST</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>N/W</td>
<td>N/ST</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>N/W</td>
<td>N/W</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Inspection of Table 3.2 learns, that the type of wage rigidity is predominant; the type of the Phillips-mechanism does not matter. In case of a financial crisis, the U.S' real output shows a fall instead of a rise, if real instead of nominal wage rigidity prevails in the U.S.. The reason is, that the real depreciation of the dollar increases the CPI, causing the U.S.' producers' wage to rise. A cut in U.S' government spending decreases instead of increases European real output, if nominal instead of real wage rigidity prevails in Europe. For, the choking off of the increase in CPI, due to the real appreciation of the ECU, will then not be passed through in the money wage.
3.5. CONCLUDING REMARKS

It is shown that the U.S.'twin-debt can immediately and continually reduced by a fiscal contraction. In terms of real output, consumption and employment, this measure proves to be a 'beggar-thyself policy' in the short run. In the long run the model does not permit any effect on employment, while in terms of real output as well as real consumption, the cut in government expenditure is a 'beggar-thy-neighbour policy'.

A passive 'policy', resulting in a financial crisis in the form of a preference shift against U.S. bonds, will not bring about a simultaneous reduction of both debt positions in the short or medium run. The best that can be accomplished is a reduction in the external debt at the cost of an increasing government debt. Furthermore, the price of this irresolution is less real consumption for a long time. Only in the long run a simultaneous reduction of the twin-debt will be attained.

Our conclusions with respect to the elimination of the twin-debt are in line with those reached by Van de Klundert (1991). This suggests, that the type of wage rigidity is not of overriding importance, at least as far as the twin-debt problem is concerned. Gordon (1988), Garretsen and Lensink (1989) and Van der Ploeg (1992) cast some doubt on whether from 1982 on, European wage formation can be characterized by real rather than nominal wage rigidity. This raises the question of whether the above conclusion of wage formation being of minor importance, stretches to the situation of nominal wage rigidity in both regions. We showed, that such is the case. The same holds for a two-sided real wage rigidity and a one- or two-sided weak Phillips mechanism for that matter. This means, that the financial markets dynamics are predominant.

The above results apply within the boundaries, given by the sensitivity analysis of Appendix 3.11. This analysis proves the above conclusions to be fairly robust. The system shows a relative sensitivity to the elasticity of substitution between home and foreign produced consumption goods. In case of a cut in U.S. government expenditure, the long-run zone between the lower boundary and the reference value of this parameter is relatively narrow. A value of this elasticity below its critical value, creates a situation, in which for a large number of years the effect of the real dollar depreciation dominates the effect of the
trade flows. The U.S., therefore, run a current account deficit, raising their external debt.

An interesting extension of the analysis would be a disaggregation of the model, by allowing for a tradables and a non-tradables sector. There are reasons to presume, that such a disaggregation would make a difference (see De Groof and Schaling, 1991, and De Groof and Van Tuijl, 1991). One obvious but probably not the only reason is that in a meso model, the notion 'fiscal contraction' requires further specification. For, a fiscal contraction may fall on tradables or nontradables, triggering different transmission mechanisms, which may lead to different macroeconomic (spill-over) effects. Another point for further research is the extension of the asset menu of the portfolio by allowing for (partial) financing capital investment by the issue of equities.

REFERENCES


Van der Ploeg, F. (1992), 'Fiscal Stabilisation and Monetary Integration in Europe: a Short-Run Analysis', *De Economist*, vol. 140, pp. 16-44.


APPENDIX 3.1  NUMERICAL ASSUMPTIONS

Parameter values for the reference situation

*Partial demand elasticities:*

\[
\begin{align*}
\varepsilon_{m^rj} &= 0.3 & \text{interest-elasticity of real cash balances} \\
\varepsilon_{b^{jv}} &= 0.0833 & \text{income elasticity of domestic bonds} \\
\varepsilon_{b^{jr}^j} &= 0.05 & \text{elasticity of domestic bonds held by residents with} \\
& & \text{respect to the domestic nominal interest rate} \\
\varepsilon_{b^{jr}^k} &= 0.05 & \text{elasticity of domestic bonds held by residents with} \\
& & \text{respect to the expected yield on foreign bonds} \\
\varepsilon_{b^{jr}^k} &= 0.10 & \text{elasticity of foreign bonds held by residents with} \\
& & \text{respect to the domestic nominal interest rate} \\
\varepsilon_{b^{jk}^k} &= 0.2 & \text{elasticity of foreign bonds held by residents with} \\
& & \text{respect to the expected yield on foreign bonds} \\
\varepsilon_{cy} &= 0.8 & \text{elasticity of private consumption with respect to the} \\
& & \text{purchasing power of nominal output} \\
\varepsilon_{cr} &= 0.225 & \text{interest-elasticity of private consumption} \\
\varepsilon_{cw} &= 0.1 & \text{(real) wealth-elasticity of private consumption}
\end{align*}
\]

Elasticities of substitution:

\[
\begin{align*}
\varphi_{hm} &= 2.5 & \text{between home and foreign produced consumption goods} \\
\varphi_{kl} &= 0.55 & \text{between capital and labour}
\end{align*}
\]

*Other behavioural parameters:*

\[
\begin{align*}
\alpha &= 0.125 & \text{acceleration coefficient} \\
\beta &= 0.5 & \text{tax rule feedback coefficient} \\
\gamma_1 &= 0.999 & \text{real wage inertia coefficient for Europe} \\
\gamma_2 &= 0.001 & \text{real wage inertia coefficient for the U.S.} \\
\eta &= 0.1 & \text{Phillips coefficient}
\end{align*}
\]
Initial steady-state ratio of:

\[ y_{kb} = 0.8 \quad \text{bonds issued by firms to total supply of bonds} \]
\[ y_{my} = 0.25 \quad \text{real cash balances to real output in terms of consumption goods} \]
\[ y_{bjb} = 0.8 \quad \text{holdings of domestic bonds to total bonds holdings of residents} \]
\[ y_{bh} = 0.1333 \quad \text{private sector imports to output} \]
\[ y_{bg} = 0.0267 \quad \text{government imports to output} \]
\[ y_{ch} = 0.5333 \quad \text{private consumption of home produced goods by residents to output} \]
\[ y_{gh} = 0.14 \quad \text{government expenditure on home produced goods government output} \]
\[ y_i = 0.1667 \quad \text{gross capital investment to output} \]
\[ y_{hc} = 0.8 \quad \text{consumption of home produced goods to total consumption} \]
\[ y_{dy} = 0.75 \quad \text{government debt to real output in terms of consumption goods} \]
\[ y_{mwe} = 0.0625 \quad \text{real cash balances to real wealth} \]
\[ y_{wey} = 4 \quad \text{real wealth to real output in terms of consumption goods} \]

Other non-behavioural parameters

\[ \delta = 0.0556 \quad \text{rate of technical obsolescence} \]
\[ \kappa = 3 \quad \text{capital-output ratio} \]
\[ \lambda = 0.7 \quad \text{wage share} \]
\[ r = 0.0444 \quad \text{real interest rate in the initial steady state} \]
APPENDIX 3.II  SENSITIVITY ANALYSIS

Table AII.1 presents the intervals of robustness of the behavioural parameters with respect to the signs of the U.S.' external and government debt. The sensitivity analysis with respect to the signs of the spill-over effects in terms of real output, gives almost the same intervals of robustness.

Table AII.1 Intervals of robustness regarding U.S.' twin-debt

<table>
<thead>
<tr>
<th>parameter</th>
<th>value in the reference situation</th>
<th>( t=1 )</th>
<th>( t=\infty )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \phi_{kl} )</td>
<td>0.55</td>
<td>0.01 - 1</td>
<td>0.01 - 1</td>
</tr>
<tr>
<td>( \phi_{hm} )</td>
<td>2.5</td>
<td>1 - 1000</td>
<td>2 - 1000</td>
</tr>
<tr>
<td>( \varepsilon_{cy} )</td>
<td>0.8</td>
<td>0.6 - 1</td>
<td>0.6 - 1</td>
</tr>
<tr>
<td>( \varepsilon_{cw} )</td>
<td>0.1</td>
<td>0 - 0.4</td>
<td>0 - 0.225</td>
</tr>
<tr>
<td>( \varepsilon_{cr} )</td>
<td>0.225</td>
<td>0.12 - 0.5</td>
<td>0.12 - 0.4</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>0.125</td>
<td>0.01 - 0.2</td>
<td>0.01 - 0.2</td>
</tr>
<tr>
<td>( \beta )</td>
<td>0.5</td>
<td>0.1 - 1.33</td>
<td>0.1 - 1.33</td>
</tr>
<tr>
<td>( \eta )</td>
<td>0.1</td>
<td>0.02 - ( \infty )</td>
<td>0.02 - ( \infty )</td>
</tr>
<tr>
<td>( \gamma_1 )</td>
<td>0.999</td>
<td>0 - 1</td>
<td>0 - 1</td>
</tr>
<tr>
<td>( \gamma_2 )</td>
<td>0.001</td>
<td>0 - 1</td>
<td>0 - 1</td>
</tr>
<tr>
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<td>0.6 - 1.2</td>
<td>0.6 - 1.2</td>
</tr>
<tr>
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<td>0.05 - 0.6</td>
<td>0.05 - 0.6</td>
</tr>
<tr>
<td>( \varepsilon_{b_{jj}r_j} )</td>
<td>0.05</td>
<td>0.03 - 0.25</td>
<td>0.03 - 0.25</td>
</tr>
<tr>
<td>( \varepsilon_{b_{jk}r_k} )</td>
<td>0.2</td>
<td>0.04 - 0.8</td>
<td>0.04 - 0.8</td>
</tr>
</tbody>
</table>

*) With corresponding changes in \( \varepsilon_{b_{jk}r_j} \) or \( \varepsilon_{b_{jj}r_k} \), obeying the adding-up constraints
Figure 1a Effects of $b_{h_1} = 10$ on U.S. government debt

Figure 1b Effects of $b_{h_1} = 10$ on U.S. external debt
Figure 1c Effects of $b_{h_1} = 10$ on the real exchange rate

Figure 2a Effects of $g_{d_2} = -10$ on U.S. government debt
Figure 2b Effects of $g_{d_2} = -10$ on U.S. external debt

Figure 2c Effects of $g_{d_2} = -10$ on the real exchange rate
CHAPTER 4  FINANCIAL INTEGRATION AND FISCAL POLICY IN INTERDEPENDENT TWO-SECTOR ECONOMIES WITH REAL AND NOMINAL WAGE RIGIDITY.

This chapter is an extended version of the article with same title, which appeared in *European Journal of Political Economy*, vol. 9, no. 2, pp. 209-232. It was co-authored by Dr. R.J. de Groof.

4.1. INTRODUCTION

Economic integration is one of the central issues of contemporary and, probably, future economics. On the occasion of the Centenary of *THE ECONOMIC JOURNAL*, a number of distinguished economists expressed their views on the prospects for economics in the next hundred years. Several authors (Bhagwati, Malinvaud, Schmalensee, Turnovsky) point at integration as a key topic in economic theorizing.

Van der Ploeg (1991a), in describing the various phases in the process of European integration, suggests that the financial, goods and labour markets are integrating at different speeds. Low factor mobility is expected to be rather persistent, due to impeding factors like language, culture and tradition. On the contrary, there seems to be a strong tendency towards a high degree of international financial capital mobility, thanks to, amongst others, virtual absence of transportation costs. Integration of goods markets is considered to take a position somewhere in between. If this sequence applies to the European integration process, there is no obvious reason, why it would not apply to the process of global integration. This would be an argument to give priority to financial integration. Therefore, it is hardly surprising, that precisely this phenomenon receives most attention.

There is a reasonable amount of *prima facie* evidence in favour of the hypothesis of increased integration of financial markets (e.g. Frankel, 1989, Keuzenkamp and Van der Ploeg, 1990). The process of financial integration can be observed from enhanced substitutability of assets and a growing interdependence of yields.

This chapter examines the consequences of financial integration for the effects and spill-over effects of fiscal policy. For that purpose, a
two-country-two-sector perfect foresight model, allowing for intertemporal
government budget constraints, current account dynamics, wealth effects,
capital accumulation, imperfect substitutability between home and foreign
bonds, floating exchange rates, imperfect substitution between home and
foreign tradables, international labour and intersectoral capital
immobility, real wage rigidity at home and nominal wage rigidity abroad is
formulated.

There is a considerable amount of literature on international
interdependent macroeconomics using a portfolio balance framework (e.g.
Tobin and De Macedo, 1980, Branson and Henderson, 1985, Ribe and Beeman,
1986, Van de Klundert, 1991). On the other hand, some work has been done
on international interdependent two-sector economies, without or with at
best an elementary financial sector (Corden and Turnovsky, 1983, Obstfeld,

The dominant feature of the present model is the combination of these
two frameworks. The portfolio balance approach enables a careful modelling
of stock-flow relationships. The distinction between tradables and
nontradables opens the possibility of investigating the influence of the
composition of a change in government expenditure. In doing so, we try to
meet the apparent need for disaggregation, as expressed by, for instance,

The main findings, applying within certain boundaries of the crucial
parameters, are as follows. Looking at real disposable income as a measure
of the regions' spending power, financial integration appears to have no
influence on the qualitative effects and spill-over effects of fiscal
policy. This is not the case, if total real output, as a measure of the
regions' productive efforts, is taken into account. Then financial
integration turns out to be relevant, especially in the long run. However,
this only applies to a fiscal expansion falling on tradables, which
implies, that these long-run (spill-over) effects depend on the commodity
composition of the policy pursued.

This chapter is organized as follows. In section 4.2 the model is
presented. Appendix 4.1 contains the linearized simulations version of the
model, along with the numerical assumptions with respect to the initial
steady state. Section 4.3 presents an overview of the effects and spill-
over effects of unilateral fiscal expansions for the reference situation.
Section 4.4 considers the influence of financial integration. For that purpose we compare, in qualitative terms, the policy multipliers for the reference situation, characterized by a low degree of financial integration, with those applying for a situation with a high degree of financial integration. For the short run, the latter case reflects the Mundell-Fleming assumption of uncovered interest parity. In the medium and long run, however, stock-flow effects drive a wedge between home and foreign interest rates. The sensitivity analysis is reported in Appendix 4.II. In Appendix 4.III some figures are presented, which may be of help to understand the dynamics of the system. Section 4.5 concludes the chapter.

4.2. A TWO-COUNTRY-TWO-SECTOR MODEL WITH IMPERFECT SUBSTITUTABILITY WITH RESPECT TO TRADABLES AND FINANCIAL ASSETS.

Following Van de Klundert (1991), we divide the model into subsystems. We distinguish a portfolio, a commodity, a labour and a dynamic subsystem, as well as a subsystem of definitional equations. Apart from nominal wage formation, the two countries are identical. Lower-case letters refer to real variables, variables expressed as rates are denoted with a 'tilde', while exogenous variables are barred. The subscript \( i \) \((i = h, n)\) refers to the home tradables sector and the non-tradables sector, respectively, while the subscripts \( j \) and \( k \) \((j = 1, 2 \quad k = 1, 2, \ j \neq k)\) refer to countries: country 1 stands for Europe and country 2 for the U.S.. The superscript 'e' refers to expectational variables. In order to save space we present nominal and real exchange rates as country-specific variables.

The portfolio subsystem

The portfolio subsystem heavily draws on Van de Klundert (1991). Agents spread their real non-human wealth \( (we) \) over real cash balances \( (m) \), domestic bonds \((b_{j})\) and foreign bonds \((b_{jk})\). Asset demand decisions depend on the rates of return on bonds, which are determined by the nominal interest rate \( (r_{n}) \) and the expected change in the nominal exchange
The real interest rate ($r_j$) equals the difference between the nominal interest rate ($r_{nj}$) and the expected rate of CPI inflation ($p_{cj}^e$)

$$r_j = r_{nj} - p_{cj}^e$$ (1) - (2)

The real value of bonds is assumed to be fixed within a period (Haas and Masson, 1986). Bonds are indexed to the CPI, thus constituting sure claims on given amounts of future consumption goods. Expectations are assumed to be rational. Furthermore, stochastic components are absent. Agents therefore have perfect foresight.

Transactions demand for real cash balances is supposed to be related to real disposable income of the private sector ($y_{dj};$ see, for instance, Goodhart 1989, pp. 269-270). Moreover, we ignore currency substitution (McKinnon, 1990). Under these assumptions the asset demand functions read

$$m_j = m_j (y_{dj}, \, \omega, \, r_{nj}, \, r_{nk} + e_j)$$ (3) - (4)

$$b_{jj} = b_{jj} (y_{dj}, \, \omega, \, r_{nj}, \, r_{nk} + e_j)$$ (5) - (6)

$$q_{cj} b_{jk} = q_{cj} b_{jk} (y_{dj}, \, \omega, \, r_{nj}, \, r_{nk} + e_j)$$ (7) - (8)

where $q_{cj}$ is the real (consumption) exchange rate applying to country $j$.

The bold signs above variables denote the signs of the partial derivatives. From Appendix 4.1 it can be verified, that the numerical assumptions are compatible with the familiar adding-up constraints (Turnovsky 1977).

The supply of real cash balances equals the exogenous money stock ($M$) divided by the CPI

$$m_j = \frac{M_j}{p_{cj}}$$ (9) - (10)
Net investment of firms is completely financed by bonds issues. It is assumed that all transactions are paid for at the beginning of the period. So, investment goods are bought against today's prices. As a result, the amount of bonds supplied by firms is determined by the real value, in terms of consumption goods, of capital equipment at the beginning of the next period, including net investment of the present period. The supply of government bonds equals outstanding government debt \((d)\), also in terms of consumption goods, comprising this period's budget deficit as well. For simplicity, it is assumed that bonds issued by firms and the government are perfect substitutes. Therefore, total supply of domestic bonds \((b)\) reads

\[
\begin{align*}
\sum_{j} b_j &= \frac{k_{hj} + p_{nj} + k_{nj} + p_{nj}}{p_{cj}} + d_j \\
\end{align*}
\]

(11) - (12)

Equilibrium in the international bonds markets is stated by

\[
\begin{align*}
\sum_{j} b_j &= \sum_{j} b_{jj} + \sum_{k} b_{kj} \\
\end{align*}
\]

(13) - (14)

Finally, real wealth of domestic households consists of real domestic assets and net foreign claims \((f)\):

\[
\begin{align*}
\text{we}_j &= m_j + b_j + f_j \\
\end{align*}
\]

(15) - (16)

The commodity subsystem

The micro-underpinnings of those equations concerning the portfolio subsystem are no more than rudimentary. In this respect, the commodity expenditure equations show close resemblance, as they lack explicit microfoundations in the form of intertemporal choices made by households and firms as well (as, for example, in Van der Ploeg, 1991b). As Van de Klundert (1991) observes, a thorough microeconomic foundation of macroeconomics requires an integration of saving, investment and portfolio decisions. Research in this field is still in its infancy (e.g. Rankin, 1991, Bovenberg and Goulder, 1991). Moreover, we agree with Allen (1991, p
who argues, that optimizing models can not avoid ad hoc qualities either, be it of a different nature from those in non-optimizing models.

Total private consumption \( (c) \) is split up between consumption of nontradable \( (c_n) \) and tradable \( (c_t) \) goods. The latter, in turn, is subdivided into home \( (c_h) \) and foreign produced \( (c_m) \) goods. The complex decision problem with respect to consumption is supposed to be separable (cf. Deaton and Muellbauer, 1980). First, consumers decide upon total consumption expenditure according to

\[
c_j = c_j (y_{dj}, we_j, r_{nj} - p_{c_j})
\]  

(17) - (18)

Thus, total consumption is positively related to real disposable income \( (y_d) \) and real non-human wealth of the private sector \( (we) \), whereas it depends negatively on the real interest rate \( (r_n - p_e) \). Assuming consumption to depend on real disposable income implies ascribing naive expectations concerning human wealth to households. Alternatively, one may assume that households are liquidity constrained.

Next, given total consumption demand, consumers choose between tradables and nontradables by maximizing a (CES) utility function. Consumer expenditure on (non-)tradables depends positively on total consumption expenditure, but negatively on the ratio of the price of (non-)tradables to the CPI. Hence, sectoral consumption functions read as

\[
c_j = c_j (c_j, p_{t_j})
\]  

(19) - (20)

\[
c_j = c_j (c_j, p_{n_j})
\]  

(21) - (22)

Taking the empirical observations of Deardorff and Stern (1986) into account, home and foreign produced tradables are imperfect substitutes. Having decided upon total demand for tradable consumption goods and services, consumers choose between home and foreign produced tradables by maximizing another (CES) utility function.
where $p_h$ denotes the price of home produced tradables.

Entrepreneurs only gradually adapt the stock of capital equipment ($k_i$) to its desired level ($k_i^d$). Consequently, net investment is a fraction of the gap between the desired and actual stock of capital. The depreciation rate of capital is exponential at a rate $\delta$, which is uniform across sectors. Thus, the functions with respect to gross investment are

$$i_{ij}^d = i_{ij} (k_{ij}^d, k_{ij})$$

The sign of the partial derivative of $k_i$ is ambiguous, depending on the ratio of the accelerator coefficient to the rate of technical obsolescence.

The desired stock of capital equipment in any sector follows from the equality of the nominal interest rate ($r_n$) and the sector's net marginal physical product of capital plus the expected increase in the value of the sector's capital goods ($\frac{\partial y_i}{\partial k_i} - \delta + p_{ij}$. The latter equals the expected increase in the sectoral producers' price, since we assume the sector's investment outlays to fall entirely on the goods produced by the sector itself. Allowing for the intersectoral and international trade in new capital goods, would probably not alter the results substantially (Pasinetti 1981, De Groof and Van Tuijl, 1991). Therefore, the relation for the desired stock of capital equipment can be written as

$$k_{ij}^d = \frac{1}{a} (y_{ij} + r_{nj}^* - p_{ij})$$
Sectoral outputs \( y_i \) follow from linear homogeneous (CES) production functions, using inputs of labour \( l_i \) and sector-specific capital \( k_i \). Thus,

\[
y_i = y_i \left( l_i, k_i \right)
\]

where the upper bold signs reflect the signs of the second partial derivatives.

Equilibrium in tradables and nontradables markets is stated by

\[
y_h = c_{h, j} + i_{h, j} + g_{h, k} + c_{m, k} + g_{m, k}
\]

\[
y_n = c_{n, j} + i_{n, j} + g_{n, j}
\]

Here \( g_h \) and \( g_m \) denote exogenous exhaustive government spending on home and foreign produced tradables respectively, while \( g_n \) indicates exogenous government expenditure on nontradables.

Macroeconomic real output is defined as

\[
y_j = \frac{y_h p_h + y_n p_n}{p_y}
\]

in which \( p_y \) represents the macroeconomic producers' price index (PPI).

**The labour subsystem**

Nominal wages are uniform across both sectors, owing to the assumption of the homogeneity of labour. However, the labour markets are segmented internationally. Furthermore, they do not clear in the short run, due to rigidity of either nominal wages or real consumers' wages. Empirical evidence points, at least for the short and medium term, in the direction of a relatively high degree of nominal wage rigidity in the U.S. and real wage rigidity in Europe (Van der Ploeg, 1988). For expositional purposes we assume inertia causing (almost) perfect short-run nominal and
real wage rigidity in the U.S. and Europe, respectively. Empirical evidence does not reject the existence of an error-correction mechanism in the wage relation, ensuring consumers' wages to return to their long-run equilibrium value. We assume a stylized version of this mechanism to apply, so that nominal wages adapt gradually to the labour market situation (Phillips mechanism), as well as to the development of the CPI. So, in the long run unemployment is at its natural rate.

Assuming country-specific labour supply to be exogenous, these conditions imply

\[ \Delta w_j = \Delta w_j (\Delta p_{C_j} , l_j) \]  

(45) - (46)

in which \( w \) and \( l \) denote money wage and macroeconomic employment respectively.

Profit maximizing firms equate the marginal product of labour \( \frac{\partial y_i}{\partial l_i} \) and the real producers' wage \( \frac{w}{p_i} \), with the stock of capital equipment given at each point in time. This results in the following relation for labour demand

\[ l_{ij} = l_{ij} (y_{ij}, \frac{w_j}{p_{ij}}) \]  

(47) - (50)

Macroeconomic employment is defined as

\[ l_j = l_{hj} + l_{nj} \]  

(51) - (52)

The dynamic subsystem

Capital accumulation reads as

\[ \Delta k_{ij} = i_{ij} - \delta k_{ij} \]  

(53) - (56)
Government outlays, total real government expenditure \((g)\) plus interest payments on outstanding debt \((r_d)\), are financed by lump-sum taxes \((t)\), the issuance of bonds, or by means of the 'printing press' \((\Delta M)\). The selling of bonds raises government debt, which immediately becomes clear from writing the government budget identity (Buiter 1986) as

\[
\Delta d_j = r_j d_{j-1} + g_j - t_j - \frac{\Delta M_j}{p_{c_j}} \tag{57} - (58)
\]

In order to prevent government debt from escalation, a feedback rule for taxes is specified, since we intend to reserve exhaustive government spending as a policy instrument. A sensible tax rule was introduced by Buiter (1987). Here, it takes the form

\[
t_j = t_j (d_j) \tag{59} - (60)
\]

A region's real current account surplus by definition equals the sum of its balance of trade surplus and its capital income account surplus. Under flexible exchange rates, this sum equals the capital account deficit. Consequently, the increase in Europe's net real foreign asset position \((\Delta f_j)\) reads

\[
\Delta f_j = \frac{c_{m_k} p_{h_j} - c_{m_j} p_{h_{j-1}} e_j + g_{m_k} p_{h_j} - g_{m_j} p_{h_{j-1}} e_{j-1}}{p_{c_j}} + r_k q_{c_j} b_{jk-1} - r_j b_{kj-1} + b_{jk-1} \Delta q_{c_j} \tag{61} - (62)
\]

It can easily be verified that \(f_j = -\frac{r_j}{q_{c_j}}\).

**Definitional equations**

Real disposable income of the private sector in terms of baskets of consumption goods equals the sum of net value added of firms, interest payments by the domestic government, the capital income account surplus including real-exchange-rate-induced gains on foreign bonds holdings, and
the (relative) price-induced wealth effects on physical capital, minus lump-sum as well as inflation taxes. So,

\[ y_d = (y - \delta_k) p_y / p_{c_j} + r_d - \sum \Delta q_{c_j} \]

\[ + r_{k_j} b_{j-k} - r_{j-k} b_{j-k-1} + b_{j-k} \Delta q_{c_j} \]

\[ + k_{h_j} \Delta p_{c_j} + k_{n_j} \Delta p_{c_j} - t_j + M_{j-1} / p_{c_j} - M_{j-1} / p_{c_j-1} \]  

(63)-(64)

The PPI is defined as

\[ p_y = y_h p_h + (1-y_h) p_{n_j} \]  

(65) - (66)

where \( y_h \) is the share of output of home produced tradables in total output.

The 'ideal' price index of tradables consumption can be written as

\[ p = y_h^{t} p_{h_j} + (1-y_h^{t}) p_{n_j} \]  

(67)-(68)

where \( y_h^{t} \) denotes the optimal (utility maximizing) share of home produced tradables in total consumption of tradables and \( \varphi_{hm} \) indicates the elasticity of substitution between home and foreign produced tradables.

Analogously, the (ideal) CPI reads as

\[ p_{c_j} = y_c^{t} p_{c_j} + (1-y_c^{t}) p_{n_j} \]  

(69) - (70)

where \( y_c^{t} \) is the optimal share of consumption of tradables in total consumption expenditure and \( \varphi_{tn} \) indicates the elasticity of substitution between tradables and nontradables consumption.
The macroeconomic real (consumption) exchange rate by definition equals

\[ q_{c_j} = \frac{e_j p_{c_k}}{p_{c_j}} \]  \hspace{1cm} (71)

In the context of a two-sector model, we have to consider a real exchange rate concerning the tradables sector as well

\[ q_{h_j} = \frac{e_j p_{h_k}}{p_{h_j}} \]  \hspace{1cm} (72)

Of course, \( q_h \) by definition equals the inverse of the terms of trade. Evidently,

\[ e_k = e_j^{-1} \]  \hspace{1cm} (73)

\[ q_{c_k} = q_{c_j}^{-1} \]  \hspace{1cm} (74)

\[ q_{h_k} = q_{h_j}^{-1} \]  \hspace{1cm} (75)

The system is completed by definitional equations for the macroeconomic stock of capital equipment,

\[ k_{j} = \frac{k_{h_j} p_{h_j} + k_{n_j} p_{n_j}}{p_{y_j}} \]  \hspace{1cm} (76) - (77)

and real government expenditure, respectively,

\[ g_{j} = \frac{g_{h_j} p_{h_j} + g_{n_j} p_{n_j} + g_{m_j} p_{h_k} e_j}{p_{c_j}} \]  \hspace{1cm} (78) - (79)

There are 79 equations in 78 endogenous variables, viz. \( \hat{r}_n, \hat{r}, m, b_{jj}, b_{jk}, b_{kj}, b, we, c, c_t, c_n, c_h, c_m, i_h, i_n, k_{h}, k_{n}, y_{h}, y_{n}, y, w, l_{h}, l, l_{k}, k_{n}, d, g, t, f, y_{d}, p_{h}, p_{n}, p_{c}, p_t, p_y, e, q_c, q_h, k. \)
Invoking Walras' law, one of the equilibrium equations is redundant. As a result, equation (14), which is the condition for equilibrium in the market for foreign assets, can be eliminated.

The model contains ten backward-looking state variables viz. $k_h$, $k_n$, $w$, $d$ and $f$, since they are constrained by their history. The five remaining state variables, $p_h$, $p_n$ and $e_1$ are unconstrained by their past and are forward-looking. For saddlepoint stability to hold, one should therefore have ten stable roots and five unstable roots.

4.3. INTERNATIONAL AND INTERSECTORAL EFFECTS AND SPILL-OVER EFFECTS OF FISCAL SHOCKS.

In this section, the international and intersectoral transmission effects of unanticipated once and for all (sector-specific) fiscal expansions will be studied, by passing in review the qualitative results of numerical exercises. The computations have been carried out with the PSREM package developed by Van der Ploeg and Markink (1991). The simulations version of the model, along with the numerical assumptions is presented in Appendix 4.1. It should be stressed that, in the context of a linearized model, the symbols now denote relative deviations from the steady state.

The qualitative short- and-long-term effects and spill-over effects, of the unilateral policy measures mentioned above, are shown in Table 4.1. They will be explained concisely. Thereby we will focus on the the variable $y_d$. This variable, which will henceforth be referred to as disposable income, indicates the private sector's spending power. However, total real output, which measures the region's productive efforts, should be taken into consideration as well. To be sure, macroeconomic employment deserves as much attention. However, the short-term qualifications for total real output also apply to employment, while in the long run the Phillips mechanism invariably restores equilibrium in the labour market. The macroeconomic characterisations of the various policies pursued, will, as usual, be indicated by: 'LOC' (locomotive), 'BLOC' (backward locomotive), 'BTN' (beggar-thy-neighbour) and 'BTS' (beggar-thyself).

In the short run, a European fiscal expansion on home produced tradables raises both the nominal and real interest rate in Europe. In the
U.S., the real interest rate increases, while the nominal interest rate decreases. Evidently, the rise in real interest rates in Europe is more pronounced than in the U.S., which is the main factor accounting for Europe's capital income account deficit. Europe also runs a trade balance deficit, making its current account deficit substantial. This causes the ECU to depreciate, despite the capital inflow arising from the positive yield differential. Meanwhile, the European macroeconomic real exchange rate rises, since the (CPI) inflation differential is dominated by the depreciation of the ECU.

As for the supply side, in the short run sectoral supply solely depends on the sector's real producers' wage. The rise in government spending on domestic tradables causes an (ex ante) excess demand for European tradables, exerting an upward pressure on their price. This induces European consumers to shift their expenditure towards U.S. tradables and nontradables. This leads to an increase in prices in these sectors, too.

The price of U.S.' nontradables slightly falls, which on balance results from U.S.' consumers shifting expenditure towards this type of goods, and a reduction in U.S.' total consumption, including nontradables. In the U.S., changes in producers' prices cause opposite changes in the real producers' wages, since in the short run money wages hardly respond to the increase in the CPI. As a result, a shift in demand is largely met by a corresponding change in output. This explains the moderate changes in the U.S.' producers' prices. In Europe the nominal wage rate moves in line with the CPI. Consequently, the real producers' wage in the tradables sector falls only slightly, whereas it increases in the nontradables sector.

Therefore, the tradables production shows only a small rise, while nontradables output drops significantly. So, in Europe, the main outlet for ex ante excess demand or supply are price mutations. It is worthwhile noting, that the European terms of trade \((-q_n)\) increase, while the tradables-nontradables price ratio \((p_t - p_n)\) rises in both regions.

European disposable income falls for several reasons. Firstly, taxes are raised, as the government wants to prevent 'runaway debt' (Tobin, 1986). Secondly, real cash balances are eroded by inflation. Thirdly, as mentioned above, Europe runs a capital income account deficit. These
TABLE 4.1 reference situation
Effects and spill-over effects of fiscal shocks

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<th>( g_{n1}=1 )</th>
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<td>- -</td>
<td>+ +</td>
</tr>
<tr>
<td>( y_{d2} )</td>
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<td>+ +</td>
<td>- -</td>
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<td>+ +</td>
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<td>( q_{c} )</td>
<td>+ -</td>
<td>+ -</td>
<td>- -</td>
<td>+ +</td>
</tr>
<tr>
<td>( p_{t1} - p_{n1} )</td>
<td>+ +</td>
<td>+ +</td>
<td>- +</td>
<td>- +</td>
</tr>
<tr>
<td>( p_{t2} - p_{n2} )</td>
<td>+ +</td>
<td>+ +</td>
<td>- +</td>
<td>- +</td>
</tr>
</tbody>
</table>
factors dominate a moderate increase in total European production in terms of (baskets of) consumption goods. To be sure, European total real output in terms of (baskets of) home produced goods \( (y_1) \) decreases. However, the rise in the European external terms of trade causes the purchasing power of real output \( (y + p_y - p_c) \) to rise. U.S.' disposable income also falls, mainly due to the combined effect of lower total output in terms of consumption goods and the erosion of real cash balances. As a consequence, in the short run a European fiscal expansion on home produced tradables is a BLOC policy.

The understanding of the dynamics of the model may be served by the description of the developments in the medium term, for which we arbitrarily take the third period. It should be noted that, when describing effects and spill-over effects of policy measures in later years \((t>1)\), it is convenient to distinguish carefully between the level and the movement of a variable. The level is represented by the relative deviation of a variable from its initial steady-state value, while the movement is the period-to-period change of the level. At this point it should be stressed, that the signs in Table 4.1 indicate levels.

In the present case, the medium-term picture shows close resemblance to the short-run picture. At least BLOC is still the correct label. European output in terms of of consumption goods has fallen, mainly attributable to a decline in nontradables production, arising from a crowding-out of capital investment in the preceding periods. This comes on top of higher taxes, an erosion of real cash balances and a capital income account deficit. The capital income account deficit follows from a sustained current account deficit, which reinforces the U.S.' position as a net creditor. This causes the ECU to depreciate even further. The European macroeconomic real exchange rate now rises as well, despite European inflation still being comparatively severe. Disposable income of the U.S. is now higher than in the short run, owing to an increase in the value of the U.S.' capital stock, arising from an increase in the ratio of the price of home tradables to the nontradables price. Here it should be remembered, that the production of tradable goods is assumed to be relatively capital intensive. Yet U.S.' disposable income income remains below its initial steady-state level, mainly due to a fall in the purchasing power of real total output.
In the long run European disposable income gradually declines to a new steady-state level. This must be attributed to higher taxes and a higher capital income account deficit. The erosion of real cash balances has come to a complete stop, inflation being absent in the long run. On the contrary, U.S.' long-run disposable income gets above its initial steady-state level, which must be ascribed to both a higher capital income account surplus and a rise in the real value of European bonds held by U.S.' residents. The latter is induced by a decrease in the real exchange rate, caused by the depreciation of the ECU being dominated by the positive inflation rate differential between Europe and the U.S. in the past. So, in the long run a European fiscal expansion on domestic tradables is a BTS policy.

It should be noted, that in the long run Europe's terms of trade has fallen, turning its balance of trade into a surplus, which is necessary to cover Europe's increased debt service requirements. Real wealth in Europe declines, as the increase in domestic bonds, following from a considerable build-up of government debt, falls short of the combined effect of real cash balances erosion and foreign debt accumulation. On the contrary, U.S.' long-term real wealth exceeds its initial steady-state level, owing to an increase in all of its components.

A rise in European government expenditure on nontradables is a BTS policy in the short run. Now lower government interest payments form an additional factor underlying the decline in European disposable income. The decrease in government interest payments results from a drop in the real interest rate. Logically, the present shock exerts impact pressure on domestic markets. Hence, in the short run inflation in Europe is considerable, causing a severe decline in real cash balances. This, in turn, affects real disposable income. The latter causes an even stronger fall in the transactions demand for real cash balances, which underlies the somewhat counter-intuitive fall in both the nominal and the real interest rate.

In the U.S., production decreases in both sectors, since both capital investment and exports fall. Another striking difference with the case of a European fiscal expansion on domestic tradables, is the decrease in the value of the U.S.' capital stock, since now the ratio of the price of
U.S.' tradables to nontradables decreases. Nevertheless U.S.' disposable income rises, mainly due to a considerable capital income account surplus.

In the long run, a European expansion on nontradables is a BTS policy. European disposable income has declined even further. Total real output as well as the demand for tradables have fallen. The latter stems from reduced total consumption, arising from both decreased disposable income and from declined real wealth. An improvement of the capital income account is the main factor underlying the rise in the U.S.' disposable income.

Initially, the real exchange rate undershoots its long-term steady state value. A substantial depreciation of the nominal exchange rate, outweighing the inflation gap between the U.S. and Europe, features the movement towards its equilibrium value.

A rise in U.S.' exhaustive government spending on domestic tradables turns out to be a BTN policy in the short run. Remember that the corresponding European fiscal expansion is a BLOC policy. One should keep in mind, that any discrepancy with the corresponding European demand shock originates from differences in wage formation.

The present shock leads to an ex ante excess demand for U.S.' tradables, which drives up their price. As a result, consumers in both regions shift their expenditure away from U.S.' tradables towards European tradables as well as nontradables. The price of U.S.' nontradables rises as well. In the U.S., real producers' wages drop in both sectors. The rise in demand is to a great extent met by higher output, thereby attenuating the increase in prices. In Europe, the real producers' wage slightly drops in the tradables sector, whereas it rises in the nontradables sector. Consequently, tradable output shows a moderate increase, while nontradables production decreases. Total real output declines. The increase in the CPI lowers real cash balances, but also contributes to a decrease in the real value of U.S.' bonds held by Europeans. These are the factors underlying the decrease in disposable income in Europe.

As explained above, if the NWR-country raises its government expenditure on domestic tradables, it experiences a relatively large increase in output and a relatively moderate inflation, causing only a small decline in real cash balances. So, disposable income rises, reverse to the former case, in which the active country was characterized by RWR.
Logically, the long term picture is a mirror image of the one discussed before (the RWR-NWR case). In this respect, the type of short-(and medium-)term wage rigidity is irrelevant, since, by virtue of the Phillips-mechanism, unemployment returns to its natural rate. Hence, BTS policy is the correct label.

In case of a U.S. fiscal expansion falling on nontradables, BTS suits as a short-term characterization. American workers are locked into nominal wage contracts. This time prices tend to go up considerably, as the fiscal shock is directed at the sheltered sector. This implies a strong cut in real producers' wages and, hence, a substantial increase in output. However, high inflation affects disposable income in two ways. Firstly, with the nominal money stock given, a decline in real cash balances is inevitable. Secondly, the real exchange rate rises, causing the real value of European bonds in hands of U.S.' residents to drop. Moreover, taxes are raised, as the government has to keep its debt under control. These three factors combined, dominate the increase in total real output. Therefore, U.S.' real disposable income falls.

In Europe, the real producers' wages decrease in both sectors, since the drop in producers' prices falls short of the cut in money wages, which move in line with the CPI. A substantial appreciation of the ECU is the main underlying factor. Of course, the level of total real output rises. In the medium run, U.S.' disposable income increases, as U.S.' residents receive more interest payments from their own government. As a result, they enjoy a level of spending power that exceeds its initial steady-state level. In the long run, however, this type of policy recaptures its status as a BTS policy. As mentioned above, the Phillips mechanism restores the natural rate of unemployment. This time the U.S. suffer from severe production losses in the tradables sector. On balance, total real output shows a substantial decline. This explains to a great extent the decrease in disposable income. Europe keeps benefitting from this policy, owing to a capital income account surplus.

A closer look at Table 4.1 reveals, that disaggregation matters, at least in the short run. For, the short-term outcomes prove to hinge on the sector to which the shock is administered. On the contrary, in the long run a fiscal expansion invariably turns out to be a BTS policy. Then the
stock-flow interactions, notably the state of the capital income account, arising from the net foreign asset position, dominate the picture.

4.4. THE ROLE OF FINANCIAL INTEGRATION

This section discusses the consequences of financial integration. Following Feldman (1986), we consider the process of financial integration to have proceeded further, the larger capital flows will be provoked by given changes in yield differentials. Alternatively, certain impulses will trigger larger capital flows, attenuating yield differentials, the higher the degree of financial integration. So, the international capital movements, resulting from given changes in yield differentials, depend on the elasticity of substitution between home and foreign bonds. The higher the value of this elasticity, the further the process of financial integration has proceeded. In order to track down the influence of financial integration on the (spill-over) effects of fiscal policy, we compare the results of the reference situation, in which this elasticity is low, with those, in which this parameter takes a high value. In the latter case, one obtains a situation in which any yield differential is absent, at least in the short run. Thus, then the Mundell-Fleming assumption of uncovered interest parity, appropriate indeed for short term only, applies. However, later on, a wedge between the domestic and the expectations-corrected foreign nominal interest rate emerges, since investors are only willing to absorb an increasing supply of bonds from the initiating country in their portfolios, if the corresponding interest rate is higher.

The results, if different from those in Table 4.1, are presented in Table 4.2. The outcomes concerning real disposable income are perfectly identical to those in the above case of a low degree of financial integration. With respect to total output in terms of home produced goods the results do differ. In the short run, a European fiscal expansion falling on domestic tradables generates a LOC instead of a BTS policy, and a U.S.' fiscal expansion on nontradables is a BTN instead of a BLOC policy.

The first difference is caused by a relatively small decrease in European nontradables output. A high degree of financial integration
implies an intensified capital inflow into Europe. Now Europe can afford a larger balance of trade deficit and, therefore, a larger increase in its terms of trade. This implies a relatively small increase of the tradables-nontradables price ratio. Consequently, the difference between the increase in the CPI and therefore the nominal wage rate on the one hand, and the increase in the price of nontradables on the other hand, is relatively small. Therefore, the real producers' wage in the nontradables sector shows a relatively small increase, which explains the comparatively small decrease in the output of nontradables.

The second difference can be explained in a similar way. The main factor underlying this outcome, is a decrease (instead of an increase) in European nontradables output. A high degree of financial integration implies an influx of capital from Europe into the U.S.. Now a European trade balance surplus is required, since the higher capital account deficit outweighs the improvement of Europe's capital income account. This is compatible with a fall in Europe's external terms of trade. Meanwhile, the tradables-nontradables price ratio increases, despite the rise in the price of nontradables. The latter follows from a shift of consumer expenditure towards this category. Consequently, the rise in the price of nontradables falls short of the increase in the CPI and, therefore, money wages. Thus, the real producers' wage rises, implying a decline of nontradables output.

As stated before, in the long run stock-flow interactions dominate the scene. Therefore, divergent long-term outcomes deserve great attention. A fiscal expansion on tradables turns out to be a BTN-policy instead of a BLOC-policy, if macroeconomic output is taken into account. A high degree of financial integration implies intensified capital outflows from the passive country. Hence, in the long run the initiating country is confronted with a relatively large net foreign debt. As a result, its capital income account shows a relatively large deficit. In the long run, the current account is in equilibrium, necessitating a (relatively) large balance of trade surplus. Hence, the active country's tradables-output rises, causing total output in terms of home produced goods to increase.

Meanwhile, the passive country's tradables-output sharply declines, due to a mitigation of the rise in private consumption of home produced tradables (as compared to the reference situation). Yet, consumption of
TABLE 4.2 The role of financial integration

Deviations from Table 4.1, due to a high degree of financial integration

<table>
<thead>
<tr>
<th>Type of shock</th>
<th>$g_{h1}^{=1}$</th>
<th>$g_{h2}^{=1}$</th>
<th>$g_{n1}^{=1}$</th>
<th>$g_{n2}^{=1}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>$+$</td>
<td>$+$</td>
<td>$+$</td>
<td>$+$</td>
</tr>
<tr>
<td>$y_{d1}$</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>$y_{d2}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$y_{h1}$</td>
<td></td>
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<tr>
<td>$y_{n1}$</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>$y_{h2}$</td>
<td></td>
<td></td>
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<tr>
<td>$y_{n2}$</td>
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<tr>
<td>$r_{n1}$</td>
<td></td>
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</tr>
<tr>
<td>$r_{n2}$</td>
<td></td>
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</tr>
<tr>
<td>$r_1$</td>
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</tr>
<tr>
<td>$r_2$</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$e_1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$q_h$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$q_c$</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>$p_{t1} - p_{n1}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$p_{t2} - p_{n2}$</td>
<td></td>
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</tr>
</tbody>
</table>
tradables increases considerably, higher imports filling the gap. In short, the driving force behind the observed departures is the fact, that a high degree of financial integration leads to a comparatively pronounced ultimate net debtor (rentier) position of the active (passive) country.

However, it should be stressed, that the above observations only apply to the tradables impulses. The long-run outcome concerning total real output of a fiscal expansion on nontradables is still a BLOC policy. Under a high degree of capital mobility, the gap between real interest rates is narrowed. Consequently, (crowding out of) capital investment and, therefore, especially the capital intensive production of tradables converge. So, as compared to a fiscal expansion on tradables, the present shock causes the initiating country to produce less tradables in the long run, which explains it to remain a BLOC policy. Nevertheless, in the initiating country, the rise of exports and the decline of imports is relatively steep, which is caused by a relatively large increase of the real exchange rate with respect to traded goods. Thus, in the present case the balance of trade surplus, necessary to finance its debt service requirements, can be brought about with a relative small divergence in tradables output.

4.5. CONCLUDING REMARKS

The central question in this chapter is, to what extent financial integration influences the (spill-over) effects of fiscal policy. This question is dealt with, by focusing on the qualitative effects and spill-over effects of the various policy measures. These (spill-over) effects are measured in terms of real disposable income as well as total real output, serving as indicators of the regions' spending power and productive efforts, respectively.

Using the first measure, it is shown that, within certain boundaries of the behavioural parameters of the model, financial integration does not influence the qualitative (spill-over) effects of fiscal policy. If total real output is used to characterize the configuration of these (spill-over) effects, financial integration turns out to be relevant for the outcomes of fiscal policy. Especially in the long run, it causes fiscal expansion spent on tradables to generate divergent configurations.
Financial integration proves to enlarge the long run net foreign debt of
the active country and, therefore, to reinforce the rentier position of
the passive country.

Such a divergence is absent, if the fiscal expansion falls on
nontradables, which is only one out of many indications emerging from this
analysis, that disaggregation matters. Sectors are a fact of life and so
are governments, buying tradables as well as nontradables. Therefore, if
disaggregation causes fiscal policy to generate different (spill-over)
effects depending on the sector on which it falls, pure macroeconomic
policy recommendations are not unconditionally reliable. This raises the
intriguing problem of the degree of disaggregation, which would indeed
permit robust policy statements.

Sensitivity analysis shows, that the above results depend on the
relative factor intensity. Obstfeld (1988) reaches the same conclusion,
although in our analysis its role is not as crucial as in his study.
Moreover, the relative size of the industries involved, also influences
the results to some extent.

Financial markets, goods markets and labour markets integration are
considered to be successive phases in the process towards full economic
integration. The analysis of the latter two phases can be accomplished
within the framework of the model used in this study.

In a substantial number of cases, the results with respect to total
output are compounds of opposite results for the sectors involved. A
crucial condition here is, that the assumed excess supply of labour in one
sector can be transferred costlessly to the other. This raises the
question of what happens, if labour, qualified for work in the expanding
sector, may become a bottle-neck. This would be due to labour being
sector-specific, at least temporary. Such an assumption could prevent
unemployed workers to move from the contracting sector towards the work
available in the prosperous sector. The existence of imperfect
intersectoral labour mobility may force a country to undergo a costly
reallocation process with employment and output losses. Allowing for
temporary sector specificity of labour, therefore, is another possible
extension of the present analysis.
REFERENCES


APPENDIX 4.1. THE LINEAR MODEL AND THE NUMERICAL ASSUMPTIONS

The model presented in section 4.2 is linearized around a symmetrical steady state solution. Now, variables are expressed as relative deviations. However, for the rates absolute instead of relative deviations are taken in case no tilde is used. This means that a tilded variable still refers to its initial steady-state value. The numbers of equations correspond with the numbers given in section 4.2. All coefficients are positively defined. Their numerical values are given below.

Portfolio subsystem

\[ r_{nj} = r_j + \Delta p^e_{cj} \]  \hfill (A1)-(A2)

\[ m_j = \varepsilon_m y_d^j + we_j - \varepsilon m_j r_j \left( \frac{r_{nj}}{r} \right) \]  \hfill (A3)-(A4)

\[ b_{jj} = -\varepsilon b_{jj} y_d^j + we_j + \varepsilon b_{jj} r_j \left( \frac{r_{nj}}{r} \right) - \varepsilon b_{jj} r_k \left( \frac{r_{nk} + \Delta e^e_j}{r} \right) \]  \hfill (A5)-(A6)
\[ b_{jk} + q_{c_j} = \varepsilon_{b_{jk}} r_j \left( \frac{r_{n_j}}{r} \right) + \varepsilon_{b_{jk}} r_k \left( \frac{r_{n_k} + \Delta e_j^e}{r} \right) \] (A7)-(A8)

\[ m_j = -p_{c_j} \] (A9)-(A10)

\[ b_j = y_{k_u} \{ y_{h_y} x_n (k_{h+1} + p_h) + (1 - y_{h_y}) x_n (k_{n+1} + p_n) \} - x p_{c_j} + (1 - y_{k_u}) d_j \] (A11)-(A12)

\[ b_j = y_{b_{jju}} b_{jj} + (1 - y_{b_{jju}}) b_{kj} \] (A13)-(A14)

\[ w_{e_j} = \Omega m_j + (1 - \Omega) b_j + \omega f_{e_j}, \Omega = \gamma_{m_y} / \omega, \omega = k + \gamma_{d_y} + \gamma_{m_y} \] (A15)-(A16)

The initial steady-state value of the net foreign asset position, \( f_j \), equals zero. The relative deviation is defined as \( \frac{df_j}{y p_y / p_c} \).

The commodity subsystem

\[ c_j = \varepsilon_{c_y} d_j + \varepsilon_{c_w} w_{e_j} - \varepsilon_{c_r} \left( \frac{r_{n_j} - \Delta e_j^e}{r} \right) \] (A17)-(A18)

\[ c_{t_j} = c_j - \gamma p_{t_j} \left( p_{t_j} - p_{c_j} \right) \] (A19)-(A20)

\[ c_{n_j} = c_j - \gamma_{p_{t_j}} \left( p_{n_j} - p_{c_j} \right) \] (A21)-(A22)

\[ c_{h_j} = c_{t_j} - \gamma_{p_{t_j}} \left( p_{h_j} - p_{t_j} \right) \] (A23)-(A24)

\[ c_{m_j} = c_{t_j} - \gamma_{p_{t_j}} \left( p_{m_j} + e_j - p_{t_j} \right) \] (A25)-(A26)

\[ i_{d_i} = k_{i_j} + \alpha \left( k_{i_j} - k_{i_j} \right) \] (A27)-(A30)
\[
\begin{align*}
\frac{d r_{k_1}}{d t} &= y_{i_j} - \frac{\varphi_{k_1}}{r + \delta} (r_{n_j} - \Delta p_{i_j}) \\
y_{i_j} &= \lambda_{i_j} l_{i_j} + (1 - \lambda_{i_j}) k_{i_j} \\
y_{h_j} &= \gamma_{c_{h_j}} c_{h_j} + \gamma_{n_{h_j}} n_{h_j} + \gamma_{g_{h_j}} g_{h_j} + \gamma_{b_{h_j}} b_{h_j} + \gamma_{e_{h_j}} e_{h_j} \\
y_{n_j} &= \gamma_{c_{n_j}} c_{n_j} + \gamma_{n_{n_j}} n_{n_j} + \gamma_{g_{n_j}} g_{n_j} \\
y_{j} &= y_{h_j} y_{h_j} + (1 - y_{h_j}) y_{n_j} \\
\Delta w_j &= (1 - \xi_j) \Delta w_{j-1} + \xi_j \Delta p_{c_j} + \eta_{l_j} - \eta (1 - \xi_j) l_{j-1} \\
l_{j} &= y_{i_j} - \varphi_{k_1} (w_j - p_{i_j}) \\
l_{j} &= \frac{y_{h_j} \lambda_{h_j}}{\lambda} l_{h_j} + \frac{(1 - y_{h_j}) \lambda_{n_j}}{\lambda} l_{n_j} \\
\Delta k_{i_j} &= \delta (l_{i_j} - k_{i_j}) \\
d_j &= (1 + r_j) d_{j-1} + r_j + \gamma_{d_j}^{-1} (g_j - t_j) \\
t_j &= \gamma_{d_j} \beta j_d \\
\end{align*}
\]

The labour subsystem

The dynamic subsystem

it should be noted that changes in taxes are expressed as a percentage of
output \( t_j = \frac{\text{dt}_j}{y_j p_{y_j} p_{c_j}} \), where \( t \) denotes the steady state value of lump-sum taxes).

\[
\Delta f_j = \phi \left( r_k - r_j + \Delta q_{c_j} \right) + r \phi \left( q_{c_j} + b_{jk-1} - b_{kj-1} \right) \\
+ T \left( c_{mk} - c_{mj} - q_h \right) + \psi \left( e_{mk} - e_{mj} - q_h \right),
\]

\[
\phi = (1 - \chi_{b_{jju}}) (x + \chi_{d_j}), \quad T = \gamma_{h} \gamma_{m}, \quad \psi = \gamma_{h} \gamma_{b} \gamma_{g_{h}}
\]

**Definitional equations**

\[
y_{d_j} = \Theta \left\{ y_{j} + p_{y_j} - p_{c_j} + y_{d_j} \left( r_j - r_{j-1} \right) + \phi \left( r_k - r_j + \Delta q_{c_j} \right) \right. \\
+ r \phi \left( b_{jk-1} + q_{c_j} - b_{kj-1} \right) - \Delta x \left( k_j + p_{y_j} - p_{c_j} \right) - t_j \\
+ \chi_{h} \Delta p_{h_j} + \left( 1 - \chi_{h} \right) \chi_{n_j} \Delta p_{n_j} - \left( x + \chi_{m} \right) \Delta p_{c_j},
\]

\[
\Theta = (1 - 6 \chi - \gamma_{t_y} + r \gamma_{d_y})^{-1}
\]

\[
p_{y_j} = \gamma_{h} p_{h_j} + \left( 1 - \gamma_{h} \right) P_{n_j}
\]

\[
p_{t_j} = \gamma_{h} p_{h_j} + \left( 1 - \gamma_{h} \right) \left( P_{h_k} + e_j \right)
\]

\[
p_{c_j} = \gamma_{t_c} p_{t_j} + \left( 1 - \gamma_{t} \right) P_{n_j}
\]

\[
q_{c_j} = e_j + p_{c_k} - p_{c_j}
\]

\[
q_{h_j} = e_j + p_{h_k} - p_{h_j}
\]

\[
e_{k} = - e_j
\]
Parameter values for the reference situation/situation of a high degree of financial integration

Partial demand elasticities:

\[ \varepsilon_{\text{my}}^d = 1.0 \]  (disposable) income-elasticity of real cash balances

\[ \varepsilon_{\text{m}r}^j = 0.3 \]  interest-elasticity of real cash balances

\[ \varepsilon_{\text{b}yj}^d = 0.083 \]  (disposable) income elasticity of home bonds

\[ \varepsilon_{\text{b}rj}^j = 0.22/2.687 \]  elasticity of home bonds held by residents with respect to the domestic nominal interest rate

\[ \varepsilon_{\text{b}rj}^k = 0.2/2.667 \]  elasticity of home bonds held by residents with respect to the expected yield on foreign bonds

\[ \varepsilon_{\text{b}jk}^r = 0.78/10.647 \]  elasticity of foreign bonds held by residents with respect to the domestic nominal interest rate
\( \varepsilon_{b_{jk}} = 0.8/10.667 \) \( \varepsilon_{cr} = 0.225 \) \( \varepsilon_{cw} = 0.1 \)

elasticity of foreign bonds held by residents with respect to the expected yield on foreign bonds
(disposable) income-elasticity of private consumption
interest-elasticity of private consumption
(real) wealth-elasticity of private consumption

Elasticity of substitution:

\( \varphi_{tn} = 1.5 \) between tradable and nontradable consumption goods
\( \varphi_{hm} = 5.0 \) between 'home produced' and 'foreign produced' tradable consumption goods
\( \varphi_{klh} = 0.55 \) between capital and labour in the tradables-sector
\( \varphi_{kln} = 0.55 \) between capital and labour in the nontradables-sector

Other behavioural parameters:

\( \alpha = 0.08 \) acceleration coefficient
\( \beta = 0.5 \) tax rule feedback coefficient
\( \zeta_1 = 0.999 \) real wage inertia coefficient for Europe
\( \zeta_2 = 0.001 \) real wage inertia coefficient for the U.S.
\( \eta = 0.1 \) Phillips coefficient

Initial steady state ratio of:

\( y_{ku} = 0.8 \) bonds issued by firms to total supply of bonds
\( y_{my} = 0.25 \) real cash balances to output
\( y_{bjb} = 0.8 \) domestic bonds holdings to total bonds issued by domestic firms and home government

\( y_{mh} = 0.2667 \) private sector's imports (exports) to tradables-output

\( y_{mg_h} = 0.0533 \) government imports to tradables output

\( y_{ch} = 0.4 \) private consumption of 'home produced' tradables by residents to tradables output

\( y_{cn} = 0.6667 \) private consumption of nontradables to nontradables output

\( y_{gh} = 0.08 \) government expenditure on 'home produced' tradables by the domestic government to tradables output

\( y_{gn} = 0.2 \) government expenditure on nontradables to nontradables output

\( y_{ih} = 0.2 \) gross capital investment to tradables output

\( y_{in} = 0.1333 \) gross capital investment to nontradables output

\( y_{hy} = 0.5 \) tradables output to total output

\( y_{tc} = 0.5 \) consumption of tradables to total private consumption

\( y_{ht} = 0.6 \) consumption of 'home produced' tradables to total tradables consumption

\( y_{ty} = 0.2 \) lump sum taxes to total output

\( y_{dy} = 0.75 \) government debt to total output

Other non-behavioural parameters

\( \delta = 0.0556 \) rate of technical obsolescence
\[
\begin{align*}
\kappa_h &= 3.6 \quad \text{capital-output ratio in the tradables sector} \\
\kappa_n &= 2.4 \quad \text{capital-output ratio in the nontradable sector} \\
\lambda_h &= 0.6 \quad \text{wage share in the tradables sector} \\
\lambda_n &= 0.7333 \quad \text{wage share in the nontradables sector} \\
\bar{r} &= 0.0444 \quad \text{real interest rate}
\end{align*}
\]

APPENDIX 4.II. SENSITIVITY ANALYSIS

Tables AII 1 through AII 3 summarize the results of the sensitivity analysis. Table AII 1 presents the intervals of robustness of the behavioural parameters with respect to short- and long-run disposable income. They are given for both the reference situation and the situation of a high degree of financial integration.

Tables AII 2a and 2b reveal, only for the variables \( y_{d_j} \) and \( y_j \), the deviations from the reference situation (Table 4.1) and the situation of a high degree of financial integration (Table 4.2), due to a reversal of the sectors' factor intensities (\( \kappa_h < \kappa_n \) instead of \( \kappa_h > \kappa_n \)). Tables AII 3a and 3b depict, again for the variables \( y_{d_j} \) and \( y_j \), the deviations from the reference situation (Table 4.1) and the situation of a high degree of financial integration (Table 4.2), due to a variation in the sector structure (\( \gamma_{h_y} = 0.9 \) instead of \( \gamma_{h_y} = 0.5 \)).

1) Experiments with a comparatively small tradables sector (\( \gamma_{h_y} = 0.4 \) instead of \( \gamma_{h_y} = 0.5 \)) in the reference situation and in the situation of a high degree of financial integration, proved to influence the results only in one case. Namely, under a high degree of financial integration, a European fiscal expansion on tradables is a BTS instead of a LOC policy, as far as real output is concerned.
<table>
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<td>1 - 0</td>
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<td>0.3 - 0.4</td>
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<td>0.2 - 0.3</td>
<td>0.2 - 0.3</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The table shows the intervals of a high degree of functional interaction (HDPI) and the intervals of a high degree of functional interaction (HDPI).

Table A1: Intervals of robustness: Reference situation (RS)
The role of technology

Table AII 2a
Deviations from the reference situation (Table 4.1), due to a reversal of the sectoral factor intensities (\( x_h < x_n \))

<table>
<thead>
<tr>
<th>Type of shock</th>
<th>( g_{h1} = 1 )</th>
<th>( g_{h2} = 1 )</th>
<th>( g_{n1} = 1 )</th>
<th>( g_{n2} = 1 )</th>
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<tbody>
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<tr>
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<td></td>
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</tr>
<tr>
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<td></td>
<td>+</td>
</tr>
<tr>
<td>( y_1 )</td>
<td>+</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>( y_2 )</td>
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</tbody>
</table>

Table AII 2b
Deviations from the situation of a high degree of financial integration (Table 4.2), due to a reversal of the sectoral factor intensities (\( x_h < x_n \))

<table>
<thead>
<tr>
<th>Type of shock</th>
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<th>( g_{h2} = 1 )</th>
<th>( g_{n1} = 1 )</th>
<th>( g_{n2} = 1 )</th>
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<tbody>
<tr>
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<td>1 =</td>
<td>1 =</td>
</tr>
<tr>
<td>( y_{d1} )</td>
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</tr>
<tr>
<td>( y_{d2} )</td>
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<td>+</td>
</tr>
<tr>
<td>( y_1 )</td>
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<td>( y_2 )</td>
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<td>-</td>
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</tbody>
</table>
The role of the sector structure

Table AII 3a
Deviations from the reference situation (Table 4.1),
due to a comparatively large tradables sector ($y_{hy} = 0.9$)

<table>
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<td>$y_{d2}$</td>
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<tr>
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<tr>
<td>$y_{2}$</td>
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</tbody>
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Table AII 3b
Deviations from the situation of
a high degree of financial integration (Table 4.2),
due to a comparatively large tradables sector ($y_{hy} = 0.9$)

<table>
<thead>
<tr>
<th>Type of shock</th>
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<tr>
<td>$y_{1}$</td>
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<td>$+$</td>
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</tr>
<tr>
<td>$y_{2}$</td>
<td></td>
<td>$+$</td>
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<td></td>
</tr>
</tbody>
</table>
APPENDIX 4.III  FIGURES

Figure A 1a  Effects of $g_{h_1} = 1$ in case of a low degree of financial integration

Figure A 1b  Effects of $g_{h_1} = 1$ in case of a high degree of financial integration
Figure A 2a Effects of $g_{n1} = 1$ in case of a low degree of financial integration

Figure A 2b Effects of $g_{n1} = 1$ in case of a high degree of financial integration
Figure A 3a  Effects of $g_{h_2} = 1$ in case of a
low degree of financial integration

Figure A 3b  Effects of $g_{h_2} = 1$ in case of a
high degree of financial integration
Figure A 4a Effects of $g_{n_2} = 1$ in case of a low degree of financial integration.

Figure A 4b Effects of $g_{n_2} = 1$ in case of a high degree of financial integration.
CHAPTER 5
GOODS MARKETS INTEGRATION AND FISCAL POLICY IN
INTERDEPENDENT, FINANCIALLY INTEGRATED TWO-SECTOR
ECONOMIES WITH REAL AND NOMINAL WAGE RIGIDITY

This chapter is based on Goods Markets Integration and Fiscal Policy; A Two-Country Two-Sector Analysis, *Economic Modelling*, vol. 10, no. 2, pp. 150-162. It was co-authored by Dr. R.J. de Groof.

5.1. INTRODUCTION

In the preceding chapter, the consequences of financial integration for the effectiveness of fiscal policy have been studied.

There is less empirical evidence for the second phase in the process, i.e., goods markets integration (GMI). Neven and Röller (1991) tentatively conclude that GMI within Europe has proceeded alongside integration between Europe and the rest of the world (except for the food industry).

The present chapter examines the consequences of GMI for the effects and spill-over effects of fiscal policy, while assuming that the process of financial integration has been completed. For that purpose, the framework of the preceding chapter is made use of. Within the context of this model, firstly the effects and spill-over effects of various types of fiscal policy are established for the reference situation. Next, these are compared with those, generated by the same model, when tradables are supposed to be perfect substitutes. For, it will be argued, that the process of GMI can be observed from enhanced substitutability of tradable goods and an increased interdependence of prices.

The empirical support for Purchasing Power Parity (PPP) or the Law of One Price (LOP) holding for an economy as a whole, is flimsy (Visser, 1989). One possible reason is the existence of nontradable goods. So, if GMI is modelled by letting tradable goods obey the LOP, this should be done within the context of a two-sector model, allowing for a tradables and a nontradables sector.

The main findings are as follows. Looking at real disposable income as a measure of the regions' spending power, GMI appears to influence the outcome of a European fiscal contraction, in that it constitutes a beggar-thy-neighbour policy instead of a locomotive policy, which is the
characterization in the phase before GMI has taken place. However, this only applies to a fiscal contraction falling on tradables, which implies, that these (spill-over) effects depend on the commodity composition of government purchases.

This chapter is organized as follows. In section 5.2 a remark is made with respect to the model. Of course, the complete model can be found in section 4.2. Appendix 5.1 contains some remarks with respect to the linearized simulations version of the model and the numerical assumptions with respect to the initial steady-state situation. Section 5.3 presents an overview of the effects and spill-over effects of unilateral fiscal expansions for the reference situation. Section 5.4 considers the influence of GMI. For that purpose we compare, in qualitative terms, the policy multipliers for the reference situation, characterized by a low degree of GMI, with those applying for a situation with highly integrated goods markets. The latter situation is modelled by applying the LOP to tradables. Remember, that in the reference situation the process of financial integration is supposed to have been completed. This implies, that for the short run the Mundell-Fleming proposition of uncovered interest parity holds. In the medium and long run, however, stock-flow effects drive a wedge between home and foreign interest rates. The sensitivity analysis can be found in Appendix 5.II. In Appendix 5.III a number of figures is presented, which may be of some help to understand the dynamics of the system. Section 5.5 concludes the chapter.

5.2. A TWO-COUNTRY-TWO-SECTOR MODEL WITH IMPERFECT TRADABLES SUBSTITUTION

The model is identical to that of chapter 4. It should be noted that in this chapter home and foreign produced tradables are only imperfectly substitutable in the reference situation (equations (23)-(26)).

5.3 EFFECTS AND SPILL-OVER EFFECTS OF FISCAL POLICY.

In this section, the international and intersectoral transmission effects of unanticipated once and for all sector-specific fiscal contractions will be studied, by passing in review the qualitative results
of numerical exercises. The computations have been carried out with the PSREM package developed by Van der Ploeg and Markink (1991). Some remarks on the simulations version of the model, viz. on the numerical assumptions are made in Appendix 5.1.

The model is solved in a linearized form. Simulation of non-linear dynamic models with rational expectations generally takes a lot of computing time. We have experimented with the full non-linear model, using the SIMPC-package developed by Don (1990). It was found to have the same properties as the linear version of the model. To avoid potential computing constraints we chose to use the linear version of the model. It should be stressed that, in the context of a linearized model, the symbols now denote relative deviations from a steady-state solution.

The qualitative short-and-long-term effects and spill-over effects, of the unilateral policy measures indicated above, are shown in Table 5.1. They will be explained concisely. As in the preceding chapter, we will focus on the private sector's real disposable income, as a measure of the private sectors' spending powers. However, total real output, as a measure of the regions' productive efforts, will be taken into consideration as well. To be sure, macroeconomic employment deserves as much attention. However, the short-term qualifications for total real output also apply to employment, while in the long run the Phillips-mechanism invariably restores labour market equilibrium.

The macroeconomic characterizations of the various policies pursued, will, analogously to the previous chapter, be indicated by: 'LOC', 'BLOC', 'BTN' and 'BTS', respectively.

In the short run, a European fiscal contraction on home produced tradables lowers both the nominal and real interest rate in Europe. In the U.S., the real interest rate decreases, while the nominal interest rate rises. Evidently, the fall in the real interest rate in Europe is more pronounced than in the U.S., which is the main factor accounting for Europe's capital income account surplus. Europe also runs a trade balance surplus, making its current account surplus substantial. This causes the ECU to appreciate, despite the capital outflow arising from the negative yield differential. Meanwhile, as can also be verified from figure A 1a, the European macroeconomic real exchange rate rises, since the (CPI) deflation differential dominates the appreciation of the ECU.
In the short run sectoral supply solely depends on the sector's real producers' wage. The reduction in government spending on domestic tradables causes an \textit{ex ante} excess supply of European tradables, exerting a downward pressure on their price. This induces European consumers to shift their expenditure towards this type of goods and, therefore, away from both nontradables and U.S. tradables. As a result, prices in these sectors drop as well. On the other hand, the price of U.S.' nontradables rises slightly, which results from a rise in U.S.' total consumption, dominating the effect of U.S.' consumers shifting expenditure away from this type of goods. In the U.S., changes in producers' prices cause opposite changes in the real producers' wages, since in the short run money wages hardly respond to the CPI. As a result, a shift in demand is largely met by a corresponding shift in output. This explains the moderate changes in the U.S.' producers' prices. In Europe nominal wages move in line with CPI. Consequently, the real producers' wage in the tradables sector rises only slightly, whereas it falls in the nontradables sector. Therefore, the tradables production shows only a small drop, while nontradables output increases. So, in Europe, the main outlet for \textit{(ex ante)} excess supply or demand are price mutations. It is worthwhile noting that the European terms of trade \((-q_h)\) decrease (see figure A.1a), while the tradables-nontradables price ratio \((p_t - p_n)\) falls in both regions.

European disposable income rises for several reasons. Firstly, taxes are lowered, as the government has less reason to fear a 'runaway debt'. Secondly, real cash balances are increased by deflation. Thirdly, as mentioned above, Europe runs a capital income account surplus. These factors dominate a moderate decrease in total European production in terms of (baskets of) consumption goods. The latter is due to both a drop in European output \((y_1)\) and a rise in the real (consumption) exchange rate. U.S.' disposable income also rises, mainly due to the combined effect of higher total output in terms of consumption goods and the increase in real cash balances. As a consequence, in the short run a European fiscal contraction on home produced tradables is a \textit{LOC policy}.

The understanding of the dynamics of the model may be served by the description of the developments in the medium term, for which we arbitrarily take the third period. In the present case, the medium-term picture shows close resemblance to the short-run picture. At least \textit{LOC} is still
### TABLE 5.1 Reference situation

Effects and spill-over effects of fiscal contractions

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</table>
the correct label. European output in terms of consumption goods has risen, which is attributable to an increase in nontradables production, arising from a crowding-in of capital investment in the preceding periods. This comes on top of lower taxes, higher real cash balances and a capital income account surplus. The capital income account surplus follows from a sustained current account surplus, which reinforces Europe's position as a net creditor. This causes the ECU to appreciate even further. The European macroeconomic real exchange rate now falls as well (see figure A 1a), despite European deflation still being comparatively strong. Disposable income of the U.S. is now lower than in the short run, due to a real cash balance erosion for one reason. The other reason is that, contrary to the first period, the value of the U.S.' capital stock falls. Such an increase arises from a decrease in the ratio of the price of home tradables to the nontradables price. Here it should be remembered, that the production of tradable goods is assumed to be relatively capital intensive. Yet U.S.' disposable income still exceeds its initial steady-state level.

Later on, European disposable income gradually increases to a new steady-state level. This must be attributed to lower taxes and a higher capital income account surplus. The increase in real cash balances has come to a complete stop, deflation being absent in the long run \((t \rightarrow \infty)\). On the contrary, U.S.' long-run disposable income gets below its initial steady-state level, due to a higher capital income account deficit. So, in the long run a European fiscal contraction on domestic tradables is a BTN policy.

It should be noted, that in the long run Europe's terms of trade has risen (figure A 1a), turning its trade balance into a deficit, which is compatible with the U.S.' increased debt service requirements. Real wealth in Europe has increased, as the decrease in domestic bonds, following from a considerable reduction of government debt, falls short of the combined effect of the increased value of real cash balances and foreign debt accumulation. On the other hand, U.S.' long-term real wealth falls short of its initial steady-state level, due to a decrease in real cash balances and net foreign asset holdings.

A cut in European government expenditure on nontradables is a BTN policy in the short run. Now higher government interest payments form an additional factor underlying the increase in European disposable income.
The increase in government interest payments results from a rise in the real interest rate. Logically, the present shock exerts on impact pressure on domestic goods markets. Hence, in the short run deflation in Europe is considerable, causing a substantial increase in real cash balances. This, in turn, boosts real disposable income. The latter causes an even stronger increase in the transactions demand for real cash balances, which underlies the somewhat counter-intuitive rise in both the nominal and the real interest rate. In the U.S., production increases in both sectors, since both capital investment and exports increase. Nevertheless, U.S.' disposable income falls, mainly due to a considerable capital income account deficit.

In the long run, a European contraction on nontradables can also be characterized as a BTN policy. European disposable income has increased even further. Total real output as well as the demand for tradables have risen. The latter mainly stems from higher total consumption, originating from an increase in both disposable income and real wealth. A worsened capital income account is the main factor underlying the fall in the U.S.' disposable income.

Initially, the real exchange rate overshoots its long-term steady-state value (figure A 2a). A substantial appreciation of the nominal exchange rate, outweighing the deflation gap between the U.S. and Europe, features the movement towards its equilibrium value. A cut in U.S.' exhaustive government spending on domestic tradables turns out to be a BTS policy in the short run. Remember that the corresponding European fiscal contraction is a LOC policy. One should keep in mind, that any discrepancy with the corresponding European demand shock originates from differences in wage formation.

The present shock leads to an ex ante excess supply of U.S. tradables, which depresses their price. As a result, consumers in both regions shift their expenditure towards U.S.' tradables, away from European tradables as well as nontradables. The price of U.S' nontradables falls as well. In the U.S., real producers' wages rise in both sectors. The fall in demand is to a great extent attended by lower output, thereby attenuating the decrease in prices. In Europe, the real producers' wage slightly rises in the tradables sector, whereas it drops in the nontradables sector. Consequently, tradables output shows a moderate
decrease, while nontradables production increases. Total real output grows on balance. The decrease in the CPI causes an increase in real cash balances, but also contributes to an increase in the real value of U.S.' bonds held by Europeans. These are the factors underlying the increase in disposable income in Europe.

As explained above, if the U.S. reduce their government expenditure on domestic tradables, it experiences a relatively large decrease in output and a relatively moderate deflation, causing only a small increase in real cash balances. So, disposable income falls, reverse to the former case, in which the active country was characterized by real wage rigidity.

Logically, the long term picture is a mirror-image of the one discussed before, the RWR-NWR case. In this respect, the type of short- and medium-term wage rigidity is of no importance, since, by virtue of the Phillips-mechanism, unemployment returns to its natural rate. Hence, BTN policy is the correct label.

In case of a U.S.' fiscal contraction falling on nontradables, BTN suits as a short-term characterization. U.S.' workers are locked into nominal wage contracts. This time prices tend to go down considerably, as the fiscal shock is directed at the sheltered sector. This implies a strong rise in real producers' wages and, hence, a substantial decrease in output. However, high deflation affects disposable income in two ways. Firstly, with the nominal money stock given, real cash balances increase. Secondly, the real depreciation of the dollar (figure A 4a) causes the real value of European bonds in hands of U.S.' residents to rise. Moreover, the U.S.' government can afford to cut taxes, without losing control of its debt. These three factors combined, dominate the increase in total real output. Therefore, U.S.' real disposable income rises.

In Europe, the real producers' wage increases in the tradables sector, since the rise in the tradables producers' price falls short of the increase in money wages, which move in line with CPI. A substantial depreciation of the ECU is the main factor underlying CPI inflation. On balance, the level of total real output rises. In the medium run, U.S.' disposable income decreases, as U.S.' residents receive less interest payments from their own government. As a result, their spending power is lower than in the initial steady state. In the long run, however, this measure recaptures its status as a BTN policy. As mentioned above, the
Phillips-mechanism restores the natural rate of unemployment. This time the U.S.' tradables production is boosted. On balance, total real output shows a substantial increase. This explains to a great extent the rise in disposable income. Due to a capital income account deficit, Europe continues to be harmed from this policy.

A closer look at Table 5.1 reveals that disaggregation matters, at least in the short run. Short-term outcomes hinge on whether the government cuts tradables or nontradables expenditure. On the other hand, in the long run a fiscal contraction invariably turns out to be a BTN policy. Then the stock-flow interactions, notably the state of the capital income account, arising from the net foreign asset position, dominate the picture.

5.4. THE ROLE OF GMI

This section discusses the consequences of the integration of the markets for tradable goods. Following Van der Ploeg (1989), we consider the process of GMI to have proceeded further, the larger trade flows are provoked by given changes in the terms of trade. Alternatively, certain impulses trigger larger trade flows, attenuating changes in the terms of trade, the higher the degree of GMI. Thus, GMI is supposed to lead to more uniform conditions in a global tradables market. Demand and supply impulses affect the world to a greater extent in a way, that keeps tradables' prices equalized.

So, the international trade flows, resulting from given changes in price differentials, depend on the elasticity of substitution between home and foreign produced tradables ($\varphi_{hm}$). In order to track down the influence of GMI on the (spill-over) effects of fiscal policy, we compare the results of the reference situation in which $\varphi_{hm}$ is relatively low ($\varphi_{hm} = 5$), with those obtained by letting $\varphi_{hm}$ take such a high value ($\varphi_{hm} = 1000$), that home and foreign produced tradables are virtually perfect substitutes. Thus, then the conditions for the LOP to hold, are practically met.

Modelling GMI by increasing the elasticity of substitution between tradables and nontradables not only captures the idea, that the two types of tradables become closer substitutes. It also encapsulates the
intuition, that the 'rate of Local Good Preference' (LGP) should decrease, as the process of GMI proceeds. This is illustrated in Figure 5.1. The initial equilibrium is represented by point A, where the budget line is tangent to the indifference curve $I_0$. The LGP, analogous to the well known 'rate of Time Preference', is determined by the marginal rate of substitution between home and foreign produced tradables, measured at the intersection of the bisecting line from the origin and $I_0$. To be more exact: \[ \text{LGP} = \tan \alpha - 1. \] The indifference curve $I_1$ compared to $I_0$, indicates that GMI has taken place to a certain degree. In this situation, \[ \text{LGP} = \tan \beta < \tan \alpha, \] which confirms the notion that GMI implies a decrease in LGP.

Figure 5.1. GMI and the rate of Local Good Preference.

1) The slope of the budget line equals $-\tan 45^\circ$, due to the initial prices equalling unity.
## TABLE 5.2 The role of GMI

Deviations from Table 5.1, due to a high degree of GMI

<table>
<thead>
<tr>
<th>Type of shock</th>
<th>$\xi_{h1} &lt; 0$</th>
<th>$\xi_{h2} &lt; 0$</th>
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<td>$p_{t2} - p_{n2}$</td>
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</tbody>
</table>
The results, with respect to the abovementioned comparison, are presented in Table 5.2. Only the differences with Table 5.1 are presented. Full integration of the tradable goods markets proves to yield some different macroeconomic outcomes. As far as disposable income is concerned, in the short run, a European contraction falling on home produced tradables now generates a BTN instead of a LOC policy.

This divergent result is caused by a real depreciation of the dollar instead of an appreciation, as is the case in the reference situation (figures A 1a and A 1b). In the first place, this affects the purchasing power of the U.S.' nominal output. Secondly, the decrease in the U.S.' CPI is smaller now. This leads to a lower increase in real cash balances. The real dollar depreciation (figure A 1b), in turn, is caused by a fierce nominal depreciation, which can be explained as follows. A high degree of GMI implies invariant terms of trade \(q_h = 0\), see Table 5.2). In the reference situation the U.S.' terms of trade increase. In both situations the producers' prices of U.S. and European tradables react in about the same way. So, comparing the situation of a high degree of GMI with the reference situation, the increase of the U.S.' real exchange rate must be brought about by an extra nominal depreciation of the dollar.

5.5 CONCLUDING REMARKS

The central question in this chapter is, to what extent GMI influences the (spill-over) effects of fiscal policy. This question is dealt with, by focusing on the qualitative effects and spill-over effects of the various policy measures. These (spill-over) effects are measured in terms of real disposable income, serving as an indicator of the regions' spending power. It is shown that, within certain boundaries of the behavioural parameters of the model, GMI influences the qualitative (spill-over) effects of fiscal policy. Especially, a European contraction falling on home produced tradables then generates a BTN instead of a LOC policy in the short run as far as disposable income is concerned. Looking at short-run real output and employment, however, this measure constitutes a BTN instead of a BLOC policy.

Such a divergence is absent, if fiscal contraction falls on European nontradables, which is only one out of many indications, that
disaggregation matters. Sectors are a fact of life and so are governments, buying tradables as well as nontradables. Therefore, pure macroeconomic policy recommendations are not unconditionally reliable. This raises the intriguing problem of the degree of disaggregation, which would indeed permit robust policy statements.

Sensitivity analysis (Tables All 1 - All 2 3b) proves the conclusions to be fairly robust, except for the real wage inertia coefficients in the reference situation. This finding is in accordance with Oudiz and Sachs (1984), who point to the sensitivity of the spill-over effects of monetary and fiscal shocks to the degree of nominal wage rigidity. We find this sensitivity to be considerably lower in a situation of a high degree of GMI, in which the tradables' prices show only moderate fluctuations. Sensitivity analysis also shows that the above results depend on the relative factor intensity. Obstfeld (1989), reaches the same conclusion, although in our analysis its role is not as crucial as in his study. Moreover, the relative size of the industries involved, also influences the results to some extent.

Financial markets, goods markets and labour markets integration are considered to be successive phases in the process towards full economic integration. The analysis of the first two phases has been performed now, the last one can be accomplished within the present framework. In a substantial number of cases, the results with respect to total output are compounds of opposite results for the sectors involved. A crucial condition here is, that the assumed excess supply of labour in one sector can be transferred costlessly to the other. This raises the question of what happens, if labour, qualified for work in the expanding sector, may become a bottleneck. This would be due to labour being sector-specific, at least temporary. Such an assumption could prevent unemployed workers to move from the contracting sector towards the work available in the prosperous sector. The existence of imperfect intersectoral labour mobility may force a country to undergo a costly reallocation process with employment and output losses. Allowing for temporary sector specificity of labour, therefore, is another possible extension of the present analysis.
REFERENCES


APPENDIX 5.1 THE LINEAR MODEL AND THE NUMERICAL ASSUMPTIONS

Partial demand elasticities

\[ \epsilon_{bjrj} = 2.687 \]  
elasticity of home bonds held by residents with respect to the domestic nominal interest rate

\[ \epsilon_{bjrk} = 2.667 \]  
elasticity of home bonds held by residents with respect to the expected yield on foreign bonds

\[ \epsilon_{bjrj} = 10.647 \]  
elasticity of foreign bonds held by residents with respect to the domestic nominal interest rate

\[ \epsilon_{bjrk} = 10.667 \]  
elasticity of foreign bonds held by residents with respect to the expected yield on foreign bonds

Elasticities of substitution

\[ \theta_{hm} = 5/1000 \]  
between 'home produced' and 'foreign produced' tradable consumption goods
APPENDIX 5.II  SENSITIVITY ANALYSIS

Tables All 1 through All 3 summarize the results of the sensitivity analysis. Table All 1 presents the intervals of robustness of the behavioural parameters with respect to short- and long-run disposable income. They are given for both the reference situation and the situation of a high degree of GMI.

Tables All 2a and 2b reveal, for the variables $y_{d_j}$ and $y_{j}$, the deviations from the reference situation (Table 5.1) and the situation of a high degree of GMI (Table 5.2), due to a reversal of the sectors' factor intensities ($x_h < x_n$ instead of $x_h > x_n$). Tables All 3a and 3b depict, again for the variables $y_{d_j}$ and $y_{j}$, the deviations from the reference situation (Table 5.1) and the situation of a high degree of GMI (Table 5.2), due to a variation in the sector structure ($y_{h_y} = 0.9$ instead of $y_{h_y} = 0.5$). 2)

2) Experiments with a comparatively small tradables sector ($y_{h_y} = 0.4$ instead of $y_{h_y} = 0.5$) in the reference situation and in the situation of a high degree of financial integration, proved to influence the results only in one case. Namely, under a high degree of financial integration, a European fiscal expansion on tradables is a BTS instead of a LOC policy, as far as real output is concerned.
Table 1. Intervals of robustness: reference situation (RS) and the situation of a high degree of CML (HCCI)

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The role of technology

Table AII 2a
Deviations from the reference situation (Table 5.1), due to a reversal of the sectoral factor intensities ($\kappa_h < \kappa_n$)

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Table AII 2b
Deviations from the situation of a high degree of GMI (Table 5.2), due to a reversal of the sectoral factor intensities ($\kappa_h < \kappa_n$)

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The role of the sector structure

Table AII 3a
Deviations from the reference situation (Table 5.1),
due to a comparatively large tradables sector ($y_{hy} = 0.9$)

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Table AII 3b
Deviations from the situation of
a high degree of GMI (Table 5.2),
due to a comparatively large tradables sector ($y_{hy} = 0.9$)

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Figure A 1a Effects of $g_{h_1} = -1$ in case of a low degree of GMI

Figure A 1b Effects of $g_{h_1} = -1$ in case of a high degree of GMI
Figure A 2a  Effects of $g_{n_1} = -1$ in case of a low degree of GMI

Figure A 2b  Effects of $g_{n_1} = -1$ in case of a high degree of GMI
Figure A 3a Effects of $g_{h_2} = -1$ in case of a low degree of GMI

Figure A 3b Effects of $g_{h_2} = -1$ in case of a high degree of GMI
Figure A 4a Effects of $g_{n_2} = -1$ in case of a low degree of GMI

Figure A 4b Effects of $g_{n_2} = -1$ in case of a high degree of GMI
CHAPTER 6  ASPECTS OF GOODS MARKET INTEGRATION
A TWO-COUNTRY-TWO-SECTOR ANALYSIS

This chapter is forthcoming as CentER Discussion Paper. It was co-authored by Dr. R.J. de Groof.

6.1. INTRODUCTION

The integration of international goods markets is an increasingly important phenomenon in this era. In scanning the future of economics, Bhagwati (1992) expresses the view, that the growing integration of the world will lead to a shift in the nature of the questions posed. He, therefore, foresees the closed economy models to become increasingly unfruitful abstractions. Precisely for the same reason, growing integration, Turnovsky (1992) conjectures the world to become one big global economy, making international economics obsolete in favour of the macroeconomics of the closed economy. Turnovsky may have a point in the situation, in which the process of economic integration has been completed. For a long time to come, Bhagwati seems to hold the more realistic view.

Economic interdependence among nations seems to have increased in the last two decades. There are several indications that suggest closer integration of markets of goods and services, which we henceforth will refer to as goods markets integration (GMI). Bhagwati (1992) points to an increased openness of the world's markets and the globalisation of world production through direct foreign investment, underlying the substantial increase of trade-to-GNP ratios. Neven and Röller (1991) tentatively conclude, that GMI within Europe has proceeded alongside integration between Europe and the rest of the world.

The present chapter examines the various ways in which GMI can be modelled. Besides, the consequences of GMI for the outcomes of fiscal policy will be studied. For those purposes, a two-country-two-sector general equilibrium model with imperfectly substitutable domestic and foreign bonds, optimizing agents, finite lives, intertemporal budget constraints for the governments and private sectors, capital accumulation, current account dynamics and floating exchange rates is formulated. Within
the context of this model, firstly the effects and spill-over effects of various types of fiscal policy are established for the reference situation, in which there is a low degree of GMI. Next, these are compared with those, generated by the same model, but now in the case of a high degree of GMI.

There is a considerable amount of literature on macroeconomic two-country optimizing models (e.g. Buiter, 1987, Giovannini, 1988, Van de Klundert and Van der Ploeg, 1989, Van der Ploeg, 1991 and Van de Klundert, 1993). On the other hand, some work has been done on 'ad hoc' interdependent two-sector economies (Corden and Turnovsky, 1983, De Groof and Schaling, 1991, De Groof and Van Tuijl, 1993a and 1993b). However, two-country-two-sector optimizing models are sparse (Obstfeld, 1989). The distinction between tradables and nontradables implies, that the effects of a change in the composition of government expenditure, can be studied (cf. Frenkel and Razin, 1987 and Blanchard and Fischer, 1989). Moreover, we agree with Allen (1991), that there is an apparent need for disaggregation. But the most important reason to resort to an interdependent two-sector model is, that one possible way to model GMI is to let only tradables obey the 'Law of One Price' (LOP). For, empirical evidence in favour of purchasing power parity holding at the macroeconomic level is flimsy (Visser, 1989). The existence of nontradable goods is often mentioned as one of the reasons. So, if a high degree of GMI is modelled in the abovementioned way, it should at least be done within the context of a two-sector model, allowing for tradables and nontradables. Our model differs from Obstfeld's (1989) in at least two important ways. In contrast with his study, we do not assume the LOP to hold throughout the analysis. Secondly, we assume international immobility of productive factors and intersectoral immobility of capital goods. According to Obstfeld, assuming sector-specific productive factors as well as home and foreign produced tradables to be imperfect substitutes would be more in line with reality. In his view, this may be most relevant to the model's short-term behaviour (and would probably necessitate numerical solution procedures).

The main findings are as follows. The influence of GMI on the outcomes of fiscal policy depends on the way GMI is modelled, as well as on the type of the fiscal shock the government chooses to administer. The
latter implies, that *disaggregation matters*, in that the effects of fiscal policy depend on the commodity composition of government purchases.

This chapter is organized as follows. Section 6.2 discusses four alternatives in modelling GMI. In section 6.3 the model is presented. Appendix 6.1. gives the linearized (simulations) version of the model, along with the numerical assumptions with respect to the initial steady state. Section 6.4 presents an overview of the effects and spill-over effects of unilateral fiscal expansions for the reference situation. Section 6.5 considers the influence on the outcomes of economic policies, of GMI modelled in the various ways. The effects of GMI are studied by comparing the results for the reference situation, with those in the situation of a high degree of GMI. The sensitivity analysis is reported in appendix 6.11. Section 6.6 offers some concluding remarks.

6.2. ON MODELLING GOODS MARKETS INTEGRATION

There are at least four ways, in which GMI can be modelled. Firstly, one can consider the process of GMI to have proceeded further, the larger trade flows are provoked by given changes in the terms of trade. GMI modelled in this way reflects more uniform conditions in a global tradables' market. As a consequence, demand and supply impulses will to a greater extent affect the world in a way, that keeps tradables' prices equalized.

International trade flows resulting from given changes in price differentials, depend on the elasticity of substitution between home and foreign produced tradables, in the model referred to as \( \varphi_{hm} \). So in the reference situation, in which the degree of GMI is supposed to be low, \( \varphi_{hm} \) takes a relatively low value, while a high degree of GMI is reflected by letting \( \varphi_{hm} \) take such a high value, that home and foreign produced tradables are virtually perfect substitutes (cf. Van der Ploeg, 1989). Thus, then the conditions for the LOP to hold, are practically met.

Modelling GMI in this way not only captures the idea, that the two types of tradables become closer substitutes. It also reflects the intuition, that the 'rate of Local Good Preference' (LOP) should decrease, as the process of GMI proceeds. This is illustrated in figure 6.1, panel A. The initial equilibrium is represented by point A, where the budget
line is tangent to the indifference curve $I_0$. In the initial situation all prices are assumed to equal unity. The position of point A reflects the natural assumption, that at the outset the consumption of home produced tradables takes the lion's share in tradables' consumption. The concept of LGP is analogous to the well-known concept of the 'rate of Time Preference'. It is determined by the marginal rate of substitution between home produced goods and imports, measured at the intersection of an indifference curve, $I_0$ in this case, and the bisecting line from the origin. To be more exact, in the initial situation, $LGP = \tan \alpha - 1$. For the purpose of exposition, GMI in panel A is supposed to have taken place only to a certain degree, represented by indifference curve $I_1$. In this situation, $LGP = \tan \beta < \tan \alpha$, which confirms the notion, that GMI implies a decrease in LGP.

Insert Figure 6.1.

Panel A of figure 6.1 illustrates that in the absence of any impulse, GMI modelled in the way as described above, in itself does not generate any effect at all. For, there is no incentive for anyone to revise its dispositions.

Assuming a higher value of the share in foreign produced tradables in total tradables consumption ($1 - \gamma_{ht}$ in the model), could also be considered as a way of modelling GMI. For, the removal of institutional frictions will foster international trade and therewith eventually will increase the share of imports in total tradables consumption. We will not explore this proposition. It more or less reflects the same events as in the case discussed above. For instance, increasing the share of imports in total tradables' consumption, also lowers the LGP. This is shown in panel B of figure 6.1. Here, the indifference curve $I_1$ has shifted as compared to $I_0$, instead of flattened, as is the case in panel A. It seems that panel B needs no further explanation. It can easily be seen, that a compository shift in favour of imports at the cost of home produced tradables, is the only effect of this symmetrical ceteris paribus decrease in $\gamma_{ht}$. The levels of output or any other variable will remain unaffected.

The bilateral removal or lowering of tariffs, $z$ in equation (9) of the model, is yet another way of modelling GMI. Here one can think of, for
instance, the Gatt-sponsored reduction in tariffs. In the context of our two-country model, there is neither room for trade diversion nor for trade modification, only for trade creation. The assumption of a perfectly symmetrical world, does not allow this symmetrical shock to cause any change in the exchange rates and the net foreign asset positions either. As in the former case, the levels of output remain unchanged. In the present case, however, the compository shift is more complex. Again, home produced tradables will partly be ousted from the markets by imported tradables. However, apart from this intrasectoral shift, there will be an intersectoral shift in favour of the tradables' sectors at the cost of the nontradables' sectors.

Finally, GMI can be modelled by means of a bilateral positive productivity shock, since the existence of non-tariff barriers in itself hampers productivity. The Commission of the European Communities (1990) points out, that the direct efficiency gains of integration, which is the increase in output with given endowments of factors of production, prompts the capital stock to respond to the initial increase in the marginal productivity of capital. As this induced effect arises over time, it is referred to as the medium-run growth bonus. Nielsen et al. (1991) term the initial and the induced effect the Emerson and the Baldwin effect respectively. For, Emerson et al. (1988) estimated the direct gains of the formation of the internal European market, while Baldwin (1989) analyzed the induced growth effect. Logically, in the context of our model, the bilateral productivity shock should be restricted to the tradables' sectors. Again, symmetry rules out any change in exchange rates and net foreign asset positions. In this case, however, the results are not as straightforward as in the cases discussed so far, as some experimentation revealed.

A bilateral productivity shock, which increases labour and capital productivity in the tradables sectors, causes the tradables' sectors to expand more than the nontradables' sectors. The latter show no contraction, at least in the short and medium run. This is due to the increase in human (as well as non-human) wealth, boosting total consumption and therewith the consumption of nontradables as well. In the long run, however, nontradables become too expensive to maintain their share in total
consumption. Therefore, in the long run the nontradables sectors will even be smaller than in the initial steady state.

6.3. A TWO-COUNTRY-TWO-SECTOR MODEL WITH IMPERFECT TRADABLES SUBSTITUTION

The present model, serving as a 'workhorse' (Buijter, 1988) to carry the various forms of GMI, is basically a disaggregation of the model used by Van de Klundert (1983). As far as the macroeconomic aspects of the model are concerned, we can be brief, referring to his elaboration. Because the two countries have identical structures, the model can be formulated for the 'home' country only. Variables related to the 'foreign' country are marked with an asterisk.

Consumers face a three-stage decision problem. Firstly, they decide upon total consumption. The macroeconomic consumption function is of the Blanchard (1985) type, more or less made standard by Blanchard and Fischer (1989). Consumers are assumed to be identical, having a constant probability of death ($\beta$) and a constant pure rate of time preference ($\alpha$). In absence of an intergenerational bequest motive and to avoid unintended bequest, consumers buy a life insurance from fair insurance companies. Moreover, it is assumed that the individual labour supply is inelastic. For simplicity, the intertemporal elasticity of substitution is assumed to be unity. Population is constant, non-human wealth of newly born individuals equals zero. Ponzi games are excluded. Dropping the time index, let $C$, $W$, $H$, $L$, $P_{L}$, $T$, $R$, denote consumption, non-human wealth, human wealth, labour, real wage rate, lump-sum tax, and the average return on domestic and foreign bond holdings$^{1}$, at any moment in time, aggregate

\[ R = \left( \gamma_{b_{h_{k}}} R(1 - \rho_{b}) + (1 - \gamma_{b_{h_{k}}}) (R + E/E)(1 - \rho_{b}) \right) \frac{1}{(1 - \rho_{b})}, \]

where $E$ and $\gamma_{b_{h_{k}}}$ denote the share of domestic bonds in total bonds holdings of residents and the real exchange rate, while $\rho_{b}$ denotes the elasticity of substitution between home and foreign bonds.

$^{1}$ The average rate of return is the weighted average of the rate of return on domestic and foreign bonds:

\[ R = \left( \gamma_{b_{h_{k}}} R(1 - \rho_{b}) + (1 - \gamma_{b_{h_{k}}}) (R + E/E)(1 - \rho_{b}) \right) \frac{1}{(1 - \rho_{b})}, \]
consumption and the behaviour of non-human and human wealth can be written as

\[ C = (\alpha + \beta)(W + H) \]  
\[ \dot{W} = R W + L P_L - T - C \]  
\[ \dot{H} = (R + \beta)H - (L P_L - T) \]

where \( \frac{d}{dt} \) is denoted by a dot.

Total private consumption is split up between consumption of nontradable \( (C_n) \) and tradable \( (C_t) \) goods. The latter is subdivided into home \( (C_h) \) and foreign produced \( (C_m) \) goods. The complex decision problem with respect to consumption is supposed to be separable (cf. Deaton and Muellbauer, 1980). So, given total consumption demand, consumers choose between tradables and nontradables by maximizing a CES utility function. Consumer expenditure on (non-)tradables depends positively on total consumption expenditure, but negatively on the ratio of the price of (non-)tradables to the CPI. Hence, sectoral consumption functions read as

\[ C_t = \chi_t C(\frac{P_t}{P_c})^{-\varphi_{tn}} \]  
\[ C_n = (1 - \chi_t) C(\frac{P_n}{P_c})^{-\varphi_{tn}} \]

where \( P_t, P_n \) and \( P_c \) denote the price of tradables, nontradables and the CPI, respectively, while \( \chi_t \) is the utility-maximizing share of consumption of tradables in total consumption expenditure and \( \varphi_{tn} \) is the elasticity of substitution between tradables and nontradables consumption.

Having decided upon total demand for tradable consumption goods and services, consumers choose between home and foreign produced tradables by maximizing another CES utility function. So,
\[ C_h = \gamma_h C_t \left( \frac{P_h}{P_t} \right)^{-\varphi_{hm}} \tag{6} \]

\[ C_m = (1 - \gamma_h) C_t \left( \frac{P_h^* E + I}{P_t} \right)^{-\varphi_{hm}} \tag{7} \]

where \( P_h, P_h^*, E \) and \( I \) denote the producers' price of home and foreign produced tradables, the exchange rate and an exogenously given tariff, respectively. As for the latter, the countries have identical structures. The foreign country's variables are denoted by an asterisk. The ideal CPI can be written as

\[ P_c = \left[ \gamma_{t,c} P_t^{(1-\varphi_{tn})} + (1-\gamma_{t,c}) P_n^{(1-\varphi_{tn})} \right] \frac{1}{1-\varphi_{tn}} \tag{8} \]

Analogously, the ideal price index of tradables consumption can be written as

\[ P_t = \left[ \gamma_h P_h^{(1-\varphi_{hm})} + (1-\gamma_h) (P_h^* E + I)^{(1-\varphi_{hm})} \right] \frac{1}{1-\varphi_{hm}} \tag{9} \]

where \( \gamma_h \) is the optimal share of home produced tradables in total consumption of tradables and \( \varphi_{hm} \) indicates the elasticity of substitution between home and foreign produced tradables.

The producers' price index is constructed as an arithmetic weighted average of the prices of home produced tradables and nontradables

\[ P_y = \gamma_y P_h + (1 - \gamma_y) P_n \tag{10} \]

where \( \gamma_y \) is the share of output of home produced tradables in total output. Because we abstract from money, aggregate output functions as the numéraire.

Firms in sector \( i \), in which \( i = h, n \) refers to the home tradables and the nontradables sector, produce under perfect foresight, maximizing the
present value of the cash flow, $V_i$, subject to constant returns to scale (CES) production functions

$$Y_i = f_i(K_i, L_i, H_i, H_L),$$  \(11\)

where $Y$, $K$, $L$, $H_K$, $H_L$ denote production, capital and labour input and the productivity indices of capital and labour, respectively.

The capital stock depreciates exponentially at rate $\delta$. The accumulation function is

$$K_i = I_i - \delta K_i,$$  \(12\)

where $I$ is investment. To derive a well-behaved investment function it is necessary to introduce installation costs with respect to newly installed capital (e.g. Hayashi, 1982). The function for the opportunity costs of investment, $J$, consisting of the purchase and installation costs, can be written as

$$J_i = g_i(I_i, K_i), \quad g_I > 0, \quad g_K < 0, \quad g_{II} > 0,$$  \(13\)

The present value of the cash flow of the representative firms in both sectors can now be formulated as

$$V_i = \int_{t}^{\nu} \left[(f_i P_i - L_i, P_i - J_i P_i) \exp(-\int_{t}^{\nu} Rdu)\right]du$$  \(14\)

where $P_i$ and $R$ denote the macroeconomic wage and the interest rate. Equation (14) reflects the simplifying assumption, that a sector's investment outlays fall entirely on its own output. Moreover, it is assumed that firms finance their investment outlays on the domestic market for loans. The decision problem for the representative firms in the various sectors is the maximization of (14) with respect to $L$ and $I$, subject to the constraints (11), (12) and (13). Denoting the co-state variable associated with the capital stock by $Q$ (Tobin's marginal is
average \( Q \) and applying the maximum principle, results in the first order conditions

\[
J_L = \frac{P_L}{P_i} \tag{15}
\]

\[
g^*(I, K_i) = Q_i \tag{16}
\]

\[
Q_i = (R - \frac{P_L}{P_i} + \delta)Q_i - f_{K_i} + g_{K_i}(I, K) \tag{17}
\]

Besides, the transversality condition

\[
\lim_{\nu \to \infty} \exp \left(- \int_t^{\nu} R \, ds \right) Q_i K_i = 0 \tag{18}
\]

must hold.

The equation for labour market equilibrium reads

\[
L = L_h + L_n \tag{19}
\]

where \( L \) is the exogenously given labour supply. A flexible wage rate \( (P_L) \), which is uniform across sectors, equates total labour demand and supply.

Equilibrium in tradables and nontradables markets is stated by

\[
y_h = C_h + J_h + C_m + G_h + G \tag{20}
\]

\[
y_n = C_n + J_n + G_n \tag{21}
\]

where \( G_h \), \( G_m \) and \( G_n \) denote exogenous government expenditure on home produced tradables, foreign produced tradables and nontradables, respectively.

Macroeconomic real output is defined as

\[
y = y_h P_i + y_n P_n \tag{22}
\]
where $P_y = 1$ as numéraire is left out.

Agents spread their real non-human wealth, $W$, over domestic assets, $B_h$, and imperfectly substitutable foreign assets, $B_m$. The latter are expressed in baskets of foreign goods. Asset demand decisions are assumed to depend on the relative rate of return

$$\frac{B_h}{W} = h_1(R - R - \frac{E}{E}) \quad h_1 > 0$$  \hspace{1cm} (23)$$

$$\frac{B_m}{W} = h_2(R - R - \frac{E}{E}) \quad h_2 < 0$$  \hspace{1cm} (24)$$

where the term $E/E$ represents the exchange rate expectation.

Equilibrium in the market for domestic assets is stated by

$$K_h P_h Q_h + K_n P_n Q_n + D = B_h + B_m$$  \hspace{1cm} (25)$$

Domestic non-human wealth is given by the supply of domestic assets plus the net foreign assets position, $F = E B_m - B_m$

$$W = K_h P_h Q_h + K_n P_n Q_n + D + F$$  \hspace{1cm} (26)$$

Equilibrium in the market for foreign assets and foreign non-human wealth are given by

$$K_h P_h Q_h + K_n P_n Q_n + D = B_h + B_m$$  \hspace{1cm} (27)$$

$$W = K_h P_h Q_h + K_n P_n Q_n + D - F/E$$  \hspace{1cm} (28)$$

The change in the domestic net foreign assets position equals the current account surplus, consisting of the surpluses on the balance of trade and the capital income account

$$F = (R + E/E) E B_m - R B_m + C_m - C_mE_h$$  \hspace{1cm} (29)$$

where $E_h$ denotes the exchange rate with respect to tradables.
The government pays interest on outstanding debt, \( D \), buys nontradables and home as well as foreign produced tradables and levies lump-sum taxes. The resulting deficit is financed by the issuance of bonds, leading to an increase in government debt, as becomes clear from the government budget identity (Buiter, 1986)

\[
D = R D + G_h P_h + G_n P_n + G_m P_h E^* - T
\]  

(31)

Tax revenues behave according to the following relationship

\[
T = T + \xi D + \xi C_m \frac{P_h E^*}{P_h}
\]  

(32)

The second term of equation (32) reflects a feedback rule on taxation (cf. Buiter, 1987) aimed at obeying the solvency (no-Ponzi-games) condition.

6.4. FISCAL POLICY IN THE REFERENCE SITUATION.

In this section, the international and intersectoral transmission effects of unanticipated once and for all sector-specific fiscal expansions will be studied by passing in review the results of numerical exercises. These results relate to the reference situation, in which the degree of GMI is assumed to be low. The fiscal expansions take the form of an increase in government spending on home produced tradables, nontradables and foreign produced tradables, respectively.

The computations have been carried out with the PSREM package developed by Van der Ploeg and Markink (1991). The simulations version of the model, along with the numerical assumptions is presented in Appendix 6.1. The model is solved in a linearized form. Simulation of nonlinear dynamic models with rational expectations of future events generally takes a lot of computing time. We have experimented with the full nonlinear model, using the SIMPC package developed by Don (1990). It was found to
have the same properties as the linear version of the model. To avoid potential computing constraints we chose to use the linear version.

It should be stressed that, in the context of the linearized model, the lower-case letters denote relative deviations from the steady-state solution of the corresponding variables indicated by the upper-case letters used in the model described in the preceding section. The consequences of the unilateral policy measures mentioned above, all of the size of 1% of total output (GNP) in the reference situation, are shown in Table 6.1. It is assumed, that these measures are taken by the home country, indicated as country 1.

The first column summarizes the effects and spill-over effects of a fiscal expansion on home produced tradables. In the short run, this shock leads to crowding out of aggregate consumption \((c)\) in the home country. This is mainly due to a substantial decrease in human wealth \((h)\), reflecting a correctly foreseen future rise in taxation. This consumption smoothing results in less consumption of both tradables \((c_t)\) and nontradables \((c_n)\). A decline in investment in the nontradables sector and a worsened international competitiveness, leading to less exports \((c^*_m)\), also form a part of the crowding-out. The deterioration of international competitiveness follows from the fall in the exchange rate with respect to tradables \((e_h)\), due to a substantial increase in the price of home produced tradables. On the contrary, the home currency depreciates \((e > 0)\), due to the home country's current account deficit.

Aggregate output \((y)\) is fixed in the short run. So, the fiscal expansion on home produced tradables leads to a reallocation of production and employment from the nontradables to the tradables sector. The same is true for the foreign country, be it in a much less vigorous way. Total consumption decreases as human and non-human wealth \((w^*)\) are reduced. The fall in human wealth is the consequence of the negative spill-over effects on output and increased taxation, for many years to come. The tradables sector of the passive country benefits by its improved external competitiveness, inducing its residents to shift towards domestic tradables.

For the long run, the development of the foreign debt positions is important. Country 1 accumulates an external debt \((-f)\), which has to be serviced by means of a trade balance surplus \((c^*_m - e_h - c^*_m)\). This is
### TABLE 6.1 reference situation

Effects and spill-over effects of fiscal expansions

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<th>Shock</th>
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<th>$g_{n1} = 1%$ GNP</th>
<th>$g_{m1} = 1%$ GNP</th>
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<tr>
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</tr>
</tbody>
</table>
achieved by an improvement of its external competitiveness ($e_h$). In country 2, a higher non-human wealth contributes to a higher aggregate consumption, spreading itself over the consumption of both tradables and nontradables. Nevertheless, as compared with the short ($t = 1$) and medium ($t = 4$) run, the output of tradables ($Y_h^*$) has declined, due to decreased net exports. On balance, long-run total output in country 2 is somewhat above the initial steady-state level. The same holds for the home country's total output, which is due to the continued expansion of the tradables sector. The reallocation process set in motion from the start proceeds.

The results of a fiscal expansion on nontradables ($g_n = 5$) are given in the second column of Table 6.1. Let us first take a look at the short run. Aggregate consumption is crowded out for the same reason as described in the former case. Herewith, all components of aggregate consumption are affected. The present policy shock boosts investment in the nontradables ($i_n$) sector, while investment in the tradables sector ($i_h$) suffers from crowding out. Contrary to the former case, net exports do not contribute to this process. The main reason is, that in the present situation the home country's external competitiveness is only slightly affected. Its trade balance shows a surplus in this case. This contributes to a real appreciation of the home currency. Since, again, aggregate output does not change in the short run, economic activity is redistributed between sectors. Logically, in the present situation the nontradables sector is favoured. The same holds for the foreign country. However, just like in the former case, these shifts are quite small. The foreign tradables sector is affected by diminished export opportunities, only partly compensated by an increase in the consumption of home produced tradables. The latter, together with an increase in nontradables' consumption, is owing to a rise in human and non-human wealth induced by a favourable development of the real interest rates.

In the long run, the decline in the home country's tradables consumption, including imports, proceeds. The latter underlies the home country's trade balance surplus, which is required to service its long-run external debt. In the present situation, the continued decline in tradables' output outweighs the increase in nontradables' output, so that aggregate output falls below its initial steady-state level. Long-run
foreign aggregate output slightly exceeds its initial steady-state level for the same reason as in the case of a fiscal expansion on home produced tradables.

The last column summarizes the effects and spill-over effects of a fiscal expansion on imports. This shock boosts the tradables production in both regions. As to the foreign country, this is the direct consequence of the orders placed by the home country's government. As to the home country, the reason is its improved external competitiveness, inducing consumers from both regions to shift their tradables consumption towards home produced tradables. Thus, the redistribution of economic activity in both regions is in favour of the tradables sectors.

The continued improvement of its external competitiveness enables the home country to develop such a trade balance surplus, that its long-term debt can be serviced. So, the home tradables sector continues to expand at the cost of its foreign counterpart. A proceeding crowding-out of aggregate consumption in the home country explains the gradual decrease in nontradables output to a lower steady-state level. On balance, long-run aggregate output is somewhat above its initial level. The opposite is true for the foreign country. Here the decreased tradables output is outweighed by the increased nontradables output. The latter is due to risen nontradables' consumption, induced by increased non-human wealth, boosting aggregate consumption.

A comparison of the macroeconomic outcomes of the various fiscal policy measures reveals that, looking at total output, a fiscal expansion on home produced tradables, nontradables and foreign produced tradables represent, respectively, a beggar-thy-neighbour policy, a beggar-thyself and a beggar-thy-neighbour policy in the medium run. For the long run, the triplet is locomotive, beggar-thyself and beggar-thy-neighbour.\(^2\) A key element underlying these results is the relative factor-intensity of the sectors. This can best be explained by starting with the long run. The foreign country's total output shows an on balance increase, in case of a fiscal expansion on home produced tradables as well

---

2) In the short run total output is fixed, as capital formation is yet absent and total employment is constant. This can easily be checked from equations (A.11), (A.14) and (A.26), taking into account that \(k_t = 0\), \(\tilde{h}_t = 0\) and \(\tilde{k}_t = 0\).
as on nontradables. In the first case, however, the home country's total output increases, while in the second case it decreases. As can be verified from Appendix 6.1., the results of Table 6.1 are obtained under the assumption, that the tradables are produced in a relatively capital-intensive way. As explained earlier, a fiscal expansion on home produced (non)tradables favours the home country's (non)tradables sector at the expense of the other sector. If the tradables sector expands at the cost of the labour-intensive nontradables sector, labour becomes extra abundant. 3) This leads to substantially lower producers' wages, accelerating the expansion of the tradables sector, while slowing down the contraction of the nontradables sector. On the contrary, an expansion of the labour intensive nontradables sector at the expense of the tradables sector, implies a reallocation effect, which in itself increases the scarcity of labour. Therefore, the decrease in the producers' wages is less substantial than in the former case. This explains why the first fiscal expansion is a locomotive policy and the second one is a beggar-thyself policy. So, the sectors' relative factor intensities, along with the type of fiscal shock, play a dominant role in determining the macroeconomic character of fiscal policy. In case of a fiscal expansion on imports, the story runs yet differently. As Table 6.1 reveals, this shock turns out to be a beggar-thy-neighbour policy in the long run. As explained above, an improved external competitiveness causes the home tradables sector to expand at the cost of the foreign tradables sector. For, the home country has to service a relatively large external debt by means of a trade balance surplus. This causes total output of the home country to increase and the foreign country to decrease.

As far as the medium run is concerned, the line of reasoning is analogous. The outcomes for the foreign country are on balance results of the sectoral developments explained above. For the home country the results hinge again on the relative factor intensity of the sectors. In case of a fiscal expansion on home as well as on foreign produced tradables, this implies an expansion (contraction) of the labour extensive

3) This reallocation effect comes on top of labour becoming relatively abundant, due to crowding out effects. The active country invariably experiences a higher interest rate, which in itself is a crowding out factor.
(intensive) (non)tradables sector. The reallocation of labour in these cases in itself decreases producers' wages, which contributes to the expansion of the tradables sector and therewith of total output. In case of a fiscal expansion on nontradables, the expansion (contraction) of the nontradables (tradables) sector is hampered (accelerated) by higher producers' wages. This, on balance, results in a negative outcome with respect to total output at home. In this section it is demonstrated, that disaggregation matters, in that the macroeconomic result of fiscal policy depends on the sectoral composition of the fiscal impulse.

6.5. GOODS MARKETS INTEGRATION AND FISCAL POLICY

In this section we will discuss the role of GMI on the efficacy of economic policy. As to the bilateral removal or lowering of tariffs and the bilateral productivity shock GMI takes the form of a shock, the effects of which were discussed in section 6.3. Therefore, in the present cases, the influence of GMI on the effectiveness of fiscal policy is completely described by the effects of the pertinent shocks.

This leaves us with the remaining alternative of modelling GMI, namely to impose a high value on the elasticity of substitution between home and foreign produced tradables. In order to trace the influence of GMI on the (spill-over) effects of fiscal policy modelled in this way, we compare the results of the reference situation with those, in which the pertinent parameter takes a value in accordance with a high degree of GMI.

The results with respect to a high value of $\phi_{hm}$ are given in Table 6.2. They are presented as differences with the numbers given in Table 6.1. If the LOP is in force, any tendency of the terms of trade to change is choked off by trade flows. In the event of a fiscal expansion on home produced tradables, these come at the cost of the domestic and foreign consumption of home produced tradables, that tend to become more expensive. Therefore, in the short and medium run the nontradables sector is less affected than in the reference situation. The on-balance-result in the medium run is a somewhat higher aggregate output. So, GMI modelled in the present way leads to a larger medium-run multiplier of government spending on home produced tradables with respect to total output. The same is true for the long-term multiplier. The mechanism underlying this result
is, that an even worse long-term external debt position has to be serviced. Consequently, the home country has to make an extra effort, in the form of higher net exports, to meet its liabilities.

If the fiscal expansion falls on nontradables, the home tradables sector is less affected in the situation of perfect substitutability of tradables as compared with the reference situation. For the short and medium run, larger net exports are the main cause. For, home produced tradables have become relatively cheap, due to a demand deficiency arising from the process of crowding out. For the medium run this results in a lower aggregate output. So, the medium-run multiplier of government expenditure on nontradables is decreased by the introduction of the LOP. The long-term multiplier increases, for the same reason as mentioned in the case of a fiscal expansion on home produced tradables.

If the home country spends its fiscal expansion on imports, home tradables production is boosted in the short and medium run by improved external competitiveness. This effect is reinforced in case the LOP holds, because an upward pressure on $e_h$ now triggers a larger trade flow. On the other hand, nontradables consumption and output experience a stronger influence, due to a relatively unfavourable development of the nontradables-tradables price ratio. On balance, aggregate output in the medium run is lower as compared with the reference situation. Consequently, the medium-run multiplier of government expenditure on imports with respect to aggregate output is lower, making this type of fiscal policy less effective. This also holds for the long run. The impulse causes an upward pressure on the foreign tradables price. High substitutability of tradables implies a larger induced trade flow towards the home country, resulting in a more favourable trade balance position year after year. Therefore, the home country accumulates less foreign debt. So less effort is required to service the country's external debt. This implies lower home tradables output.

The macroeconomic effects and spill-over effects of the various fiscal shocks are the same as in the reference situation, with one exception. A fiscal expansion on foreign produced tradables is in the long run a locomotive policy if the LOP is in force, instead of a beggar-thy-neighbour policy in the situation of a low degree of GMI. If the LOP prevails, the deterioriation of the terms of trade, which in the reference
TABLE 6.2 The role of the substitutability between tradables

Deviations from Table 6.1, due to a high value of $\eta_{hm}$

<table>
<thead>
<tr>
<th>Shock</th>
<th>$\xi_{h1} = 1%$ GNP</th>
<th>$\xi_{n1} = 1%$ GNP</th>
<th>$\xi_{m1} = 1%$ GNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>1</td>
<td>4</td>
<td>=</td>
</tr>
<tr>
<td>$c$</td>
<td>0.01</td>
<td>-0.00</td>
<td>-0.02</td>
</tr>
<tr>
<td>$c_t$</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.04</td>
</tr>
<tr>
<td>$c_h$</td>
<td>-0.07</td>
<td>-0.06</td>
<td>-0.02</td>
</tr>
<tr>
<td>$c_n$</td>
<td>0.03</td>
<td>0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td>$c_m$</td>
<td>0.15</td>
<td>0.015</td>
<td>-0.13</td>
</tr>
<tr>
<td>$y_h$</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>$y_n$</td>
<td>+0.00</td>
<td>0.05</td>
<td>-0.01</td>
</tr>
<tr>
<td>$y$</td>
<td>0</td>
<td>+0.00</td>
<td>+0.00</td>
</tr>
<tr>
<td>$h$</td>
<td>0.07</td>
<td>0.05</td>
<td>-0.00</td>
</tr>
<tr>
<td>$w$</td>
<td>0.03</td>
<td>-0.01</td>
<td>-0.03</td>
</tr>
<tr>
<td>$c_t$</td>
<td>-0.01</td>
<td>+0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>$c_h$</td>
<td>0.02</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>$c_n$</td>
<td>0.07</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>$c_m$</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>$y_h$</td>
<td>-0.15</td>
<td>-0.02</td>
<td>0.13</td>
</tr>
<tr>
<td>$y_n$</td>
<td>0.03</td>
<td>0.01</td>
<td>-0.01</td>
</tr>
<tr>
<td>$y$</td>
<td>-0.07</td>
<td>-0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>$h$</td>
<td>0</td>
<td>-0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td>$w$</td>
<td>-0.07</td>
<td>-0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>$e_h$</td>
<td>-0.03</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>$e$</td>
<td>0.46</td>
<td>0.41</td>
<td>0.12</td>
</tr>
<tr>
<td>$f$</td>
<td>0.41</td>
<td>0.37</td>
<td>0.06</td>
</tr>
<tr>
<td>$f$</td>
<td>0</td>
<td>-0.13</td>
<td>-0.11</td>
</tr>
</tbody>
</table>
situation contributes to the trade balance deficit, is absent. So, if the LOP applies, the home country has to service a relatively low debt, which decreases the necessity to oust foreign tradables from the world market. This explains, why on balance total foreign output is positive, making this shock a locomotive policy.

6.6. CONCLUDING REMARKS

The influence of GMI on the effectiveness of fiscal policy on the macroeconomic level cannot be established unambiguously. In the first place it depends on the way GMI is modelled. Neither the bilateral removal or lowering of tariffs, nor the bilateral productivity shock affects fiscal policy. The lowering or removal of tariffs as such, only influences the sectoral composition, not the level of aggregate output. There is no reason, why this type of GMI would alter the fiscal policy multipliers. The effects of fiscal policy measures, simply come on top of the effects of the shock caused by GMI. The same is true for the bilateral productivity shock in the tradables sectors. Here these sectors expand at the cost of the nontradables sectors. The results with respect to the substitutability of tradables depend on the type of the fiscal shock. Looking at aggregate output, GMI modelled as the LOP applying, increases the medium- and long-run multipliers of fiscal expansion on domestic goods, tradables and nontradables. In case of a fiscal expansion on imports, the medium- and long-run multipliers are decreased.

As far as the macroeconomic effects and spill-over effects of fiscal policy is concerned, these depend on at least three factors. Firstly they depend on whether the fiscal shock is on home produced tradables, nontradable or foreign produced tradables. They also depend to some extend on the degree of GMI. Finally, the relative factor intensity of the sectors play an important role.

The finding, that the macroeconomic results of fiscal policy depend on the composition of any change in government expenditure, indicating that disaggregation matters, seems to call for qualifications of pure macroeconomic policy recommendations. For, sectors are a fact of life and so are governments buying tradables as well as nontradables. This raises
the problem of which degree of disaggregation will indeed permit robust policy statements.

Admittedly, the bilateral productivity shock in the tradables sectors represents an ad hoc way of modelling GMI. A search for more micro-founded way of modelling this process would be worth while (Smulders and Van de Klundert, 1992). For instance, one could insert imported inputs into the production function. GMI then facilitates producers to attain a productivity maximizing input mix, increasing total factor productivity (cf. Grossman and Helpman, 1991). In the majority of cases, the (spill-over) effects with respect to aggregate output are compounds of opposite effects for the sectors involved. Throughout the analysis it was assumed, that labour can instantaneously and costlessly be reallocated across sectors. Once we drop this assumption, countries could be forced to undergo costly reallocation processes with employment and output losses (cf. Lilien, 1982, and Casson, 1983). Allowing for temporary sector specificity of labour, therefore, is another possible extension of the present analysis. Finally, a promising contribution may come from the introduction of a monetary sector, so that the influence of GMI on monetary policy can be studied (cf. Van der Ploeg, 1991).

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APPENDIX 6.1. THE LINEAR MODEL AND THE NUMERICAL ASSUMPTIONS

The model presented in section 2 is linearized around a symmetrical steady-state solution. Lower case-letters denote percentage deviations from the steady-state solutions of the corresponding variables written in capital letters. Exceptions are the net foreign asset position and lump-sum taxes, which are expressed as a percentage of initial output, and the interest rates, which are absolute deviations (* 100%) from the initial steady state. The coefficients and parameters are defined below, along with the numerical values assigned to them. Exogenous variables are underlined. A bar over a variable refers to its initial steady-state value.

Aggregate consumption

\[ c = \gamma_{wh} w + (1 - \gamma_{wh}) h - \bar{p}_c \]  
(A. 1)

Private consumption of tradables

\[ c_t = c - \varphi_{tn} (p_t - \bar{p}_c) \]  
(A. 2)

Private consumption of nontradables

\[ c_n = c - \varphi_{tn} (p_n - \bar{p}_c) \]  
(A. 3)

Consumers' price index

\[ p_c = \gamma_{tc} p_t + (1 - \gamma_{tc}) p_n \]  
(A. 4)

Price index of tradables consumption

\[ p_t = \gamma_{ht} p_h + (1 - \gamma_{ht}) \left( p_h \ast (1 - \bar{\tau}) e + \bar{\tau} x \right) \]  
(A. 5)
Private consumption of home produced tradables
\[ c_h = c_t - \varphi_{hm} (p_h - p_t) \]  (A. 6)

Private consumption of imported tradables
\[ c_m = c_t - \varphi_{hm} \{ p_h + (1 - \tau) e + \tau (1 - p_t) \} \]  (A. 7)

Producers' price index
\[ p_y = \gamma_y p_h + (1 - \gamma_y) p_n \]  (A. 8)

Numéraire
\[ p_y = 0 \]  (A. 9)

Gross capital investment in sector i
\[ i_i = k_i + \psi / \delta q_i, \ i = h, n \]  (A. 10)

Production in sector i
\[ y_i = \lambda_i (i_i + \frac{\lambda_i}{1 - \lambda_i}) + (1 - \lambda_i) (k_i + \frac{\lambda_i}{1 - \lambda_i}) \]  (A. 11)

Equilibrium in the tradables market
\[ y_h = \gamma_{c_h} c_h + \gamma_{i_h} i_h + \gamma_{mc_h} c_m + \gamma_{m_g h} g_h + \gamma_{m_g m} g_m \]  (A. 12)

Equilibrium in the nontradables market
\[ y_n = \gamma_{c_n} c_n + \gamma_{i_n} i_n + \gamma_{m_g n} g_n \]  (A. 13)

Macroeconomic output
\[ y = \gamma_y y_h + (1 - \gamma_y) y_n \]  (A. 14)
Demand for domestic bonds

\[ b_h = \omega + \frac{\varphi}{\gamma_{dhw}} (r - \gamma - \varepsilon) \]  
(A. 15)

Demand for foreign bonds

\[ b_m + \varepsilon = \omega - \frac{\varphi}{(1 - \gamma_{dhw}) (r - \gamma - \varepsilon)} \]  
(A. 16)

Non-human wealth

\[ \omega = \gamma_n \frac{\kappa h}{(x + \gamma_d)} (k_h + p_h + q_n) + \\
(1 - \gamma_n) \frac{\kappa n}{(x + \gamma_d)} (k_n + p_n + q_n) + \\
\gamma_d \frac{1}{(x + \gamma_d)} d + 1/(x + \gamma_d) f \]  
(A. 17)

Equilibrium bonds market

\[ \gamma_n \frac{\kappa h}{(x + \gamma_d)} (k_h + p_h + q_n) + (1 - \gamma_n) \frac{\kappa n}{(x + \gamma_d)} (k_n + p_n + q_n) + \\
\gamma_d \frac{1}{(x + \gamma_d)} d = \gamma_{dhw} b_h + (1 - \gamma_{dhw}) b_m \]  
(A. 18)

Human wealth

\[ \dot{h} = (R + \beta) h + \gamma_{dhw} \gamma_d \gamma_y r + (1 - \gamma_{dhw}) (r + \varepsilon) - \\
\lambda (R + \beta)/(\lambda - \gamma_y) [(l + p) + 1/\lambda t] \]  
(A. 19)
Tobin's q in sector i

\[ q_i = (\bar{R} + \delta) q_i + r + \gamma_y (e_y + p_y) - (\bar{R} + \delta)/\varphi_{KL} (y_i - k_i) + \]

\[ (1 - \varphi_{KL}) (\bar{R} + \delta)/\varphi_{KL} \eta_{KL} \]

(A. 20)

Capital accumulation in sector i

\[ \dot{k}_i = \delta (i_i - k_i) \]  

(A. 21)

Government budget identity

\[ d = R \dot{d} + r + \gamma_y d_y [\gamma_h \gamma_y (G_h + p_h) + \gamma_h \gamma_{mg} (G_m + p_m + e) + \]

\[ (1 - \gamma_h) \gamma_q (q_n + p_n)] - \gamma_y d_t \]

(A. 22)

Tax feed-back rule

\[ t = \tau y_{dm} d + \tau y_{cm} c_m \gamma_y \gamma_{cm} + \tau y_{cm} \gamma_{ym} \]

(A. 23)

Net foreign assets

\[ f = \bar{R} f + (1 - \gamma_{by}) (x + \gamma_{by}) (r - r + e) + \]

\[ \gamma_y \gamma_{cm} (c^* + p_m - c_m - p_h - e) + \]

\[ \gamma_y \gamma_{mg} (g_m + p_m - g_m - p_h - e) \]

(A. 24)

Employment in sector i

\[ l_i = y_i - \varphi_{KL} (p_i - \dot{h}_i - \dot{h}_i) - \dot{h}_i \]

(A. 25)
Labour market equilibrium

\[ y_h \lambda_h \frac{(1 - y_h)}{\lambda} \lambda_n + \frac{y_h}{\lambda} \lambda_n = 0 \]  
(A. 26)

To ensure initial steady state prices to be unity, the initial import tariffs are assumed to be offset by export subsidies. Also it is assumed, that the initial net foreign asset position of the regions equal zero. The derivation of the equations (A. 10) and (A. 20), explaining gross capital investment and Tobin's q, is based on an investment expenditure function, with quadratic cost of adjustment in net investment

\[ J = I + (I - 6K)^2/2 \psi K \]

and a CES production function

\[ Y = A \left\{ B(L H_L) \frac{(1 - \varphi_{kl})}{\varphi_{kl}} + (1 - B)(K H_K) \frac{-\varphi_{kl}}{(1 - \varphi_{kl})} \right\} \]

The equations applying for the foreign country are mutatis mutandis identical to (A. 1) - (A. 26). Since by definition \( \dot{f} = -f \) and \( \dot{e} = -e \), the variables \( f \) and \( e \) can be omitted. So, the model contains 60 variables, (viz. \( c, w, h, p_c, c_t, p_t, c_n, p_n, p_h, c_h, c_m, p_y, t_h, t_n, k_h, k_n, q_h, q_n, y_h, y_n, l_h, l_n, y, b_h, b_n, d, p_y, t \) for both countries and \( e \) and \( f \) in 61 equations 4). Invoking Walras' law, one of the equilibrium equations is redundant. As a result, the equation reflecting equilibrium on the market for foreign assets is eliminated. There are 7 forward-looking state variables (viz. \( q_h, q_n, h \) for both countries and \( e \)) and 7 backward-looking state variables (viz. \( k_h, k_n, d \) for both countries and \( f \)).

4) In principle each of the equations in the Appendix represent two equations, one for each country. However, each of the equations (A.10), (A.11), (A.20), (A.21) and (A. 25) represent four equations, one for each sector per country. Finally, equation (A. 24) is single.
Parameter values for the reference situation/situation of a high degree of goods markets integration

Our numerical examples are based on the following not implausible parameter values.

**Elasticity of substitution:**

\[ \varphi_{tn} = 1.5 \] 

between tradable and nontradable consumption goods

\[ \varphi_{hm} = 5/1000 \] 

between 'home produced' and 'foreign produced' tradable consumption goods

\[ \varphi_{kl} = 0.55 \] 

between capital and labour

**Behavioural parameters:**

\[ \nu = 0.08 \] 

acceleration coefficient

\[ \xi = 0.5 \] 

tax rule feedback coefficient

\[ \rho = 5 \] 

preference coefficient with respect to the demand for bonds

\[ \tau = 0.1 \] 

tariff

**Non-behavioural parameters**

\[ \beta = 0.022 \] 

probability of death

\[ \delta = 0.0556 \] 

rate of technical obsolescence

\[ \kappa_h = 3.6 \] 

capital-output ratio in the tradables sector

\[ \kappa_n = 2.4 \] 

capital-output ratio in the nontradables sector

\[ \kappa = 3 \] 

macroeconomic capital-output ratio

\[ \lambda_h = 0.6 \] 

wage share in the tradables sector

\[ \lambda_n = 0.7333 \] 

wage share in the nontradables sector

\[ \tilde{R} = 0.0444 \] 

real interest rate
Initial steady-state ratio of:

\[ \gamma_{\nu,wh} = 0.3333 \]
non-human wealth to total wealth

\[ \gamma_{b,n,w} = 0.8 \]
holdings of domestic bonds to total bonds

\[ \gamma_{mc,n} = 0.1067 \]
holdings of residents

\[ \gamma_{mc,n} = 0.0533 \]
private sector's imports (exports) to tradables-output

\[ \gamma_{mg,n} = 0.0533 \]
government imports to tradables output

\[ \gamma_{c,n} = 0.4267 \]
private consumption of home produced tradables by residents to tradables output

\[ \gamma_{c,n} = 0.8 \]
private consumption of nontradables to nontradables output

\[ \gamma_{g,n} = 0.2133 \]
government expenditure on 'home produced' tradables to tradables output

\[ \gamma_{g,n} = 0.0667 \]
government expenditure on nontradables to nontradables output

\[ \gamma_{i,n} = 0.2 \]
gross capital investment to tradables output

\[ \gamma_{i,n} = 0.1333 \]
gross capital investment to nontradables output

\[ \gamma_{n,y} = 0.5 \]
tradables output to total output

\[ \gamma_{t,c} = 0.5 \]
consumption of tradables to total private consumption

\[ \gamma_{h,t} = 0.8 \]
consumption of 'home produced' tradables to total tradables consumption
\[ \gamma_y = 0.2 \quad \text{taxes to total output} \]

\[ \gamma_d = \frac{1}{\gamma_y} = 0.75 \quad \text{government debt to total output} \]

**APPENDIX 6.1.1 SENSITIVITY ANALYSIS**

Tables AII.1 and AII.2 summarize the results of the sensitivity analysis. They present the intervals of robustness of the behaviourable parameters. Within these intervals, the signs of effects and spill-over effects with respect to medium- and long-run aggregate output, remain unchanged. The analysis shows, that the results are fairly robust. In the reference situation and the cases of unilateral shocks, the system is relatively sensitive with respect to the elasticity of substitution between domestic and foreign bonds, however only in the long run.

**Table AII.1 Intervals of robustness with respect to the reference situation**

<table>
<thead>
<tr>
<th>parameter</th>
<th>reference value</th>
<th>( t=4 )</th>
<th>( t=\infty )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( p_{kl} )</td>
<td>0.55</td>
<td>0.1 - 1</td>
<td>0.4 - 1</td>
</tr>
<tr>
<td>( p_{hm} )</td>
<td>5</td>
<td>2.5 -</td>
<td>2 - 10</td>
</tr>
<tr>
<td>( p_{tn} )</td>
<td>1.5</td>
<td>1 - 5</td>
<td>1 - 2.5</td>
</tr>
<tr>
<td>( \rho )</td>
<td>5</td>
<td>3.5 -</td>
<td>3.5 - 6</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>0.08</td>
<td>0.02 - 0.2</td>
<td>0.01 - 0.2</td>
</tr>
<tr>
<td>( \xi )</td>
<td>0.5</td>
<td>0.1 - 1</td>
<td>0.2 - 0.8</td>
</tr>
</tbody>
</table>
In case the LOP prevails, the long-run results prove to be relatively sensitive with respect to the elasticity of substitution between capital and labour and with respect to the elasticity of substitution between tradables and nontradables.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reference Value</th>
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<th>$t\to\infty$</th>
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<td>$p_{tn}$</td>
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<td>1 - 5</td>
<td>1 - 10</td>
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<td>$p$</td>
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CHAPTER 7  
FISCAL POLICY AND PUBLIC CAPITAL 
IN INTERDEPENDENT ECONOMIES

7.1. INTRODUCTION

Nowadays, world-wide governments' budgetary policies are contractionary, aimed at reducing government debt ratios. In the past, public investment was lowered, even although total government outlays increased. Tanzi and Lutz (1990) provide empirical evidence that the share of general government investment spending has dropped in a substantial number of OECD countries during the period 1970-1987. Moreover, they find that interest payments on government debt and spending on public capital formation are negatively correlated. This type of 'crowding-out' (Van Ewijk, 1985) may be attributed to public choice considerations (Van de Klundert, 1993). Strong constituencies to protect public investment are absent. Furthermore, the political value of such expenditure is relatively low, as the benefits accrue only in the long run. Therefore, the present high levels of government debt might be expected to lead to higher taxes, but also to a shift in the composition of government spending, with government investment being squeezed out by increasing interest payments.

However, it seems that the tide has turned, since the opinion has gained ground that both human capital and public infrastructure are essential for economic growth (Schouten and Donders, 1988 and Stern, 1992). This revived interest may be attributed to the fact that the neglect of these issues during the last few decades has turned them into bottle-necks (Aschauer, 1990 and Albert, 1991).

In 1991, the U.S.' Congress passed a surface-transportation bill designed to boost federal outlays by $85 billion over the period 1991-1996. Last year, President-to-be Clinton promised to stimulate the economy by raising investment in highways, bridges, airports and other public works. However, at this point it should be remarked that in 1993 real outlays for public construction are running 6% below the level of 1992, state and local governments' budgetary woes forcing them to cut spending on infrastructure. In addition, public concern about the budget deficit as well as coming tax hikes are leading the Clinton-Administration and the
Figure 6.1 Goods market integration and the rate of local goods preference
Congress to make efforts to curtail most forms of discretionary spending, including highways. Some commentators now even fear that economic sluggishness might be intensified by a shortage of infrastructure spending.

Most European governments have no other choice than to conduct a restrictive fiscal policy, as they strive for meeting the requirements of the Maastricht treaty of 1991. However, at the same time, the Commission of the European Communities plans to stimulate the stagnating European economy by providing additional funds from the E.C. budget, directed at raising expenditure on public capital formation. Meanwhile, some individual member-countries - notably the Netherlands - combine an, on balance, contractionary fiscal policy with a reorientation of government spending priorities in favour of public investment.

Before the Myazawa-cabinet had to resign, it proposed to foster economic growth by an increase in public investment (airports, roads, bridges, subways, sewerage and telecommunication) and by raising the budgets of the universities' research centers. These proposals amounted to $120 billion, making the Myazawa-programme one of very ambitious size. It was seven times as large as the Clinton-plan, while the Japanese economy is only half the size of the U.S.' economy, as measured by the Gross National Product. However, it is doubtful whether this size of the programme could have been maintained, as in Spring of 1993 the Japanese government was struck by a collapse of tax receipts.

In spite of these recent set-backs experienced in Japan and the U.S., it seems useful, from a theoretical point of view, to trace the short- and long-run consequences of an increase in government investment. These problems will be discussed by using a two-country model. A feature of the present model is imperfect substitution of financial assets both within and across countries. Studies on international asset yields do not support the notion of perfect international asset substitutability (Van Gemert and Gruijters, 1992 and De Haan, Siermann and Wijnants, 1993). The model also supposes imperfect commodity substitution across countries. In this respect, we follow the so-called Armington tradition, since empirical evidence pointing at the Law of One Price holding at the macroeconomic level, i.e. Purchasing Power Parity, is scarce (Visser, 1989).
Furthermore, the model takes account of static expectations, classical assumptions on consumption and saving, the q-theory of investment, capital accumulation, government budget and current account dynamics, floating exchange rates, international factor immobility, real wage rigidity (henceforth RWR) in Europe and nominal wage rigidity (henceforth NWR) in the U.S.

The model shows some resemblance to a certain type of two-country models (Schouten, 1987, Ter Horst, 1990 and Meulendijks, 1992). However, it differs from these models in a number of ways.

Firstly, the questions raised inevitably require an explicit distinction between material government consumption and government investment. It is supposed that government investment leads to accumulation of public capital. This stock of public capital equipment ceteris paribus positively influences the productivity of both factors of production in the market sector, viz. private capital and labour.

Secondly, only the Classical case of flexible prices in the goods markets is considered, alternatively referred to as supply theory (Schouten, 1980). For, output is set by a supply condition, as prices fluctuate immediately to keep aggregate demand equal to potential output. We ignore the Keynesian case, alternatively indicated as demand theory (Schouten, op. cit.), in which output is determined by aggregate demand, due to price inertia. The reason underlying this choice is that we study measures directed at improving the structural properties of the economy; 'demand-management' is outside of our scope.

Thirdly, the wage share is not supposed to remain constant in both countries. Nominal wages are not of the 'properly' indexed type, following both the producers' price level and labour productivity (Schouten and Meulendijks, 1988). Instead, we allow for short- and medium-run RWR in Europe (and Japan) as well as short- and medium-term NWR in the U.S. Furthermore, the workings of the well-known Phillips-mechanism are taken into account.

Fourthly, monetary financing of the government deficit is excluded by assumption. Only one monetary aggregate is considered, which shows some similarity to M2.
Finally, the tax rate on wages and gross social benefits is set in such a way that, firstly, a budget-neutral financing of civil servants' salaries and transfer payments is maintained, and, secondly, 'runaway government debt' (Tobin, 1986) is prevented.

The main findings are as follows. In the short run the results are similar to those obtained from a traditional Mundell-Fleming two-country model. A fiscal expansion in Europe, characterized by RWR, stimulates output in both regions. However, an expansionary fiscal policy conducted by the U.S. fosters this region's output, while decreasing European production. In the long run both regions benefit from a fiscal expansion in either one. The active region's production rises considerably, whereas the passive region's benefits take the form of gains in the terms of trade and a surplus on the capital income account.

The plan of this chapter is as follows. In Section 7.2 the model is presented in some detail. The linearized simulations version of the model along with the underlying numerical assumptions can be found in Appendix 7.1. A comprehensive set of simulations is carried out, which will be discussed in Section 7.3. The sensitivity analysis is reported in Appendix II. Section 7.4 concludes the chapter.

7.2. THE MODEL

In this section we present a two-country model by focusing on the equations of the country j (j = 1, 2); the variables concerning the foreign country are indicated by the subscript k (k=1, 2, j ≠ k). Country 1 stands for Europe (and Japan), while country 2 represents the U.S.. Except for nominal wage formation, the two regions are identical. Exogenous variables are barred, all coefficients are defined positively.

The model is divided into subsystems; following Kolnaar (1985), we distinguish eight of them. In the first one, attention is paid to the supply side. The second subsystem is devoted to the labour market. In the third one the relations with respect to prices are presented. Subsystem IV shows variables concerning real (disposable) remunerations. Next, there is a subsystem describing the distribution of income. Subsystem VI focuses on the markets for financial assets. In the seventh subsystem aggregate
demand is studied. Finally, a subsystem is reserved for private and government savings as well as the balance of payments accounts.

I Supply side

Private capital accumulation (Δk) depends on gross investment in the preceding period (i_{-1}) and on the rate of technical obsolescence of the private capital stock (δ):

\[ \Delta k_j = i_{j-1} - \delta k_{j-1} \]  

(1)-(2)

In the reference situation, the ratio of net investment to the stock of private capital equipment is equal to the natural (steady) growth rate (g_n), the sum of Harrod-neutral productivity growth (ρ_l) and population growth (m). On the basis of this property and equations (1)-(2), the linear expression for the rate of accumulation ((A1)-(A2), p. 205) can be derived (see Van de Klundert, 1982).

Output follows from a linear homogeneous CES production function

\[ y_j = h_{g_j} \left( \alpha \left( l_j h_l \right)^{-\frac{1-\rho_{kl}}{\rho_{kl}}} + (1-\alpha) (k_j h_k)^{-\frac{1-\rho_{kl}}{\rho_{kl}}} \right)^{-\frac{1-\rho_{kl}}{1-\rho_{kl}}} \]  

(3)-(4)

where \( y \) denotes production of the market sector, \( l \) stands for employment in the market sector, while \( h_l \) and \( h_k \) refer to the quality indices of private capital and labour in the market sector, respectively. The symbol \( \rho_{kl} \) stands for the elasticity of factor substitution. Finally, the symbol \( h_g \) refers to the index of multifactor productivity, which can be explained as follows

\[ h_g = A_h \left( \frac{1}{k} \right)^{\xi} \]  

(5)-(6)

where \( k_{\text{inf}} \) stands for the stock of public capital, in the present context limited to 'core infrastructure', such as highways, mass transit, airports, electrical and gas facilities, water works and sewers. The symbol \( A_h \) denotes a parameter of scale, \( \xi \) represents the elasticity of
the index of multifactor productivity with respect to the ratio of public to private capital, while \( 1-\lambda \) refers to the 'direct' production elasticity of capital.

At this point, two things should be noticed. Firstly, maintaining a constant level of multifactor productivity, as is the case in the reference situation, implies that public capital formation keeps pace with private capital formation. This is in accordance with the findings of Deno (1988). Secondly, the value of \( g \) lies between 0 and \( 1-\lambda \). On the one hand, this reflects the assumption of diminishing returns with respect to the ratio of public to private capital. This appeals to the intuition that sluggishness of infrastructural investment as compared to private capital formation will cause bottlenecks to an increasing extent. On the other hand, thus a positive marginal productivity of private capital is ensured, as can be verified from equations (A3) through (A6)\(^1\).

The accumulation of public capital is analogous to the accumulation of private capital

\[
\frac{d}{dt}k_{\text{inf}j} = (1-\delta_{\text{inf}j})k_{\text{inf}j-1} + ig_{-1}
\]

where \( \delta_{\text{inf}} \) symbolizes the depreciation rate with respect to public capital, while \( i_g \) denotes the volume of government investment.

The above way of taking government investment into account shows some congeniality with the 'production function' approach on which Aschauer (1989a, 1990) has founded his empirical work. At this point, it must be admitted that empirical evidence in this field is not unambiguous (Aschauer, op.cit., Munnell, 1990, Ford and Poret, 1991, Toen-Gout and Jongeling, 1993a and 1993b, Hakfoort, De Haan and Sturm, 1993). Moreover, empirical research encounters some major problems. Firstly, there is the oft-cited criticism of reverse causation, whereby rapid output growth and high productivity lead to greater public investment rather than public capital investment causing greater output per hour. Secondly, severe measurement problems arise from the fact that 'public capital does not pass any market test in which productivity is balanced against a market

\[\text{---}
\]

\(^1\) Product exhaustion requires that capitalists receive the total income generated by public infrastructure.
measure' (Aaron, 1990, see also Winston and Bosworth, 1992 and McKibbin and Bagnoli, 1993).

II Labour market

Profit maximizing firms equate the marginal product of labour \( \frac{\partial y}{\partial \lambda} \) and the real producers' wage \( \frac{p_y}{p_y} \), with the stock of capital equipment and the index of multifactor productivity \( h_g \) given at each point in time. This results in the following relationship for labour demand in the market sector

\[
\hat{l}_j = \hat{l}_j \left( \frac{p_y}{p_y}, \frac{h_g}{h_g}, \frac{h}{h} \right)
\]

Here \( p_y \) denotes the nominal wage, while \( p_y \) stands for the producers' price level. The upper bold signs reflect the signs of the partial derivatives. The latter are negative with respect to \( h_g \) and \( h \), following from the natural assumption of an elasticity of factor substitution lower than unity (Schouten, 1986; see also equations (A9)-(A10)).

The number of income-earners chargeable to the government sector (civil servants plus social beneficiaries) is, by definition, equal to the total population \( \hat{l}_T \) minus the number of workers of firms \( \hat{l}_j \)

\[
\hat{l}_g = \hat{l}_T - \hat{l}_j
\]

It should be noted that in the reference situation all these variables grow at a rate \( \pi \). The labour force participation rate is assumed to remain constant. Therefore, the - exogenous - labour supply \( \hat{l}_s \) also grows at a rate \( \pi \).

Labour is immobile across regions. Furthermore, labour markets do not clear in the short- and medium-run, due to either NWR or RWR. According to empirical evidence, Europe (except from the U.K.) and Japan are featured

2) These equations are included in the model to simplify the relations (26)-(27), concerning the tax rate on wages.
by RWR, while the U.S. (and the U.K.) display a significant degree of NWR (Van der Ploeg, 1988). For the sake of exposition, it is assumed that inertia causing almost perfect short-run nominal and real wage rigidity characterizes the U.S. and Europe (and Japan), respectively. Empirical evidence (Attenasio, Manasse and Van der Ploeg 1987) does not reject the existence of an error-correction mechanism in the wage relation, ensuring wages to return to their long-run equilibrium value. Here, it is assumed that a stylized version of this mechanism applies, so that nominal wages adapt gradually to the labour market situation. In the long run this so-called 'strong' variant of the Phillips-mechanism restores the equality of actual and natural unemployment. Furthermore, money wages adjust in time to the development of both the price of (consumer) expenditure ($p_x$) and labour productivity. On the contrary, we ignore the forward shifting of taxes into wages as well as the so-called 'weak' variant of the Phillips-mechanism. These characteristics imply

\[
\dot{p}_j = (1-\gamma_j) \dot{p}_{j-1} + \gamma_j \dot{p}_x j + \gamma_j (\dot{y}_j - \lambda_j ) \\
\quad + \eta_\lambda \left( \frac{\dot{\lambda}_j - \dot{\lambda}_{s_j}}{\dot{\lambda}_{s_j}} + u \right) - \eta_\lambda \left( 1-\gamma_j \right) \left( \frac{\dot{\lambda}_{j-1} - \dot{\lambda}_{s_{j-1}}}{\dot{\lambda}_{s_{j-1}}} + u \right)
\]

where $u$ stands for the - constant - natural rate of unemployment (see footnote \ref{footnote:unemployment}). The symbol $\gamma$ denotes the real wage inertia coefficient, which is close to zero for the U.S., but close to unity for Europe. Finally, $\eta_\lambda$ refers to the Phillips-coefficient.

\footnote{On the reference path labour productivity grows at a rate $p_f$. Constant unit labour costs then imply that money wages grow at this rate as well.}

\footnote{Hence, we abstract from the influence of the change in the unemployment level on the change in the money wage. This simplifying assumption is made because the presence of the 'strong' Phillips mechanism rules out hysteresis-effects, implying a constant natural rate of unemployment ($u$).}
III Prices

The expenditure price index is an arithmetic weighted average of the producers' price level and the price of imports, expressed in home currency (Sachs and Larrain, 1993, p. 389). Thus,

\[ p_{x_j} = \frac{1}{1+\mu} p_{y_j} + \frac{\mu}{1+\mu} (p_{x_k} p_w) \]  \hspace{1cm} (15)-(16)

where \( \mu \) is the ratio of imports (as well as exports) to gross value added of the market sector, while \( p_w \) stands for the nominal exchange rate. As can be verified from Appendix 7.1, the value of \( \mu \) implies a considerable degree of 'Local Good Preference'.

The terms of trade \( (P) \) by definition equal the ratio of the producers' price level to the expenditure price index

\[ \frac{p_{y_j}}{p_{x_j}} \]  \hspace{1cm} (17)-(18)

The nominal exchange rate is flexible. Consequently, the balance of payments \( (S_u) \) is permanently in equilibrium

\[ S_u = 0 \]  \hspace{1cm} (19)

In the reference situation, both civil servants' salaries and social benefits \( (p'_{l_g}) \) are linked to nominal wages in the market sector. However, the government possesses the discretionary power to decouple government employees' wages as well as transfer payments from the wages of the workers in the market sector \( (p'_{l_g} \neq 0) \). Following Kolnaar (1985), we obtain

\[ p'_{l_g_j} = p_{l_j} + \frac{P_{l_g}}{p_{l_j}} p'_{e_g_j} \]  \hspace{1cm} (20)-(21)

where \( p_{l_j} \) denotes the nominal wage on the reference path.
The simplifying assumption is adopted that every new unit of physical capital is financed by the issuance of one share, at the beginning of the period. As a consequence, the price of capital equity \( (P_k) \) is equal to the ratio of the market value of total equity \( (K^*) \) to the stock of capital equipment, at the end of the period. So,

\[
P_k = \frac{K^*}{k_{j+1}}
\]

At this point it should be noted that the bond price remains constant, since bonds are supposed to be of the floating-rate-note type (De Jong, 1983 and Visser, 1989).

IV Real factor remunerations

Real disposable income per worker in the market sector \( (\omega_d) \) is given by

\[
\omega_d = (1 - \tau_\ell) \frac{p_{\ell}}{p_x}
\]

where \( \tau_\ell \) is the tax rate on wages.

In the reference situation, taxes paid by workers in enterprises, \( \tau_\ell p_{\ell} \), equal net public salaries and social benefits, \( (1 - \tau_\ell) \). As stated before, the government also uses this tax rate as an instrument to keep the government debt ratio \( \epsilon_\ell \) within limits. Finally, the tax rate on wages may be used as a policy instrument \( (\nu_\ell) \). Hence

\[
\tau_\ell = (\frac{\ell g_j p_{\ell} g_j}{\ell j p_{\ell} + \ell g_j p_{\ell} g_j}) (\frac{0_{j-1}}{y_\ell p_y}) \epsilon_\ell \omega + \nu_\ell
\]
where $0$ is the stock of government bonds at the end of the period, $\varepsilon_{\tau \lambda\omega}$ is the elasticity of the tax rate on wages with respect to the government debt ratio, while $\varpi$ stands for the government debt ratio in the reference situation.

There are no retained profits; profits are entirely distributed to the shareholders. Therefore, the following relationship holds for net return on equity ($r_i$)

$$
\frac{y_{r_n} p_{x_j}}{r_i} = \frac{y_{r_n}}{k_j}
$$

(28)-(29)

where $y_{r_n}$ represents net real profits.

V  Income distribution

The wage share ($w'_y$) in the market sector by definition equals the ratio of the wage-bill ($l p_x$) to nominal gross value added ($y p_y$).

$$
\frac{l_p_x}{y p_y} = \frac{w'_y}{y p_y}
$$

(30)-(31)

Gross nominal profits equal the residual between nominal gross value added and the wage-bill. Subtraction of capital depreciation ($\delta k p_x$) yields net nominal profits. Deflation by the price of (investment) expenditure gives net real profits.

$$
\frac{y_p_y - l_p_x - \delta k_p_x}{y p_y} = \frac{y_{r_n} p_{x_j}}{p_{x_j}}
$$

(32)-(33)

Interest payments by the domestic government equal the product of the government debt at the end of the previous period and last period's interest rate on government bonds ($r_{o-1}$).
Total nominal dividend and rentier income earned by domestic residents \( \dot{Y}_{r_{t, j}} \) amounts to

\[
\dot{Y}_{r_{t, j}} = \dot{Y}_{r_{n_{t, j}}} + \dot{Y}_{r_{o_{t, j}}} + S_{r_{j}}
\]

where \( S_{r_{j}} \) indicates the capital income account surplus.

VI  Financial assets

The supply of money \( \dot{E}_j \) is equal to the product of the standard textbook monetary base multiplier \( \text{mbm} \) and the - exogenous - amount of base money \( \dot{E}_{b_j} \). The latter exclusively originates from loans of the Central Bank to private banks. The monetary base multiplier is assumed to be constant. Consequently, the monetary authorities have complete control over the money supply.

\[
\dot{E}_j = \text{mbm} \dot{E}_{b_j}
\]

Total money demand \( \dot{E}_{d_j} \) consists of transactions demand for money \( \dot{E}_{T_j} \) and speculative demand for money \( \dot{E}_{S_j} \)

\[
\dot{E}_{d_j} = \dot{E}_{T_j} + \dot{E}_{S_j}
\]

Transactions demand for money is supposed to move in line with nominal output of the market sector

\[
\dot{E}_{T_j} = \dot{Y}_{T_j} \dot{P}_{Y_j}
\]

5) In the reference situation the Central Bank allows these loans to private banks to grow by \( 100^\ast (\pi^* \rho_t) \% \) each year in order to keep the liquidity ratio constant.
Money market equilibrium implies

\[ E_j = E_{d_j} \]  (44)-(45)

Agents in financial markets face a two-stage choice problem, which is assumed to be separable. Firstly, they spread their funds available for portfolio investment over capital equity, government bonds and speculative money balances. From equations (38)-(39) through (40)-(41) and (44)-(45) it follows that money balances available for speculative purposes equal the residual between the supply of money and transactionary money demand. Evidently, in the reference situation, portfolios remain unchanged, total demand by residents for capital equity \( K_{Pd} \) and for government bonds \( O_{Pd} \) moving in line with speculative money balances. However, in the event of any kind of transition, the average returns on domestic and foreign capital equity \( r_{i_a} \) and government bonds \( r_{o_a} \) may change. These average returns read

\[
\begin{align*}
  \hat{r}_{i_a} & = [a \hat{r}_{i_j} (1-\varphi_{u_i}) + (1-a) \hat{r}_{i_k} (1-\varphi_{u_i})] \frac{1}{1-\varphi_{u_i}} \quad (46)-(47) \\
  \hat{r}_{o_a} & = [a \hat{r}_{o_j} (1-\varphi_{u_i}) + (1-a) \hat{r}_{o_k} (1-\varphi_{u_i})] \frac{1}{1-\varphi_{u_i}} \quad (48)-(49)
\end{align*}
\]

where 'a' represents the initial ratio of holdings of domestic non-monetary financial assets to total holdings of non-monetary assets by residents. As can be checked from the appendix 7.1, this ratio takes a value which implies 'Local Asset Preference' to a considerable extent (cf. Dealtry and Van 't Dack, 1989). The symbol \( \varphi_{u_i} \) stands for the elasticity.

6) In case of Cobb-Douglas preferences \( (\varphi_{u_i}=1) \), this relation degenerates to

\[
\hat{r}_{i_a} = r_{i_j}^{a} (1-a), x=i,o.
\]

\[
\hat{r}_{o_a} = r_{o_j}^{a} (1-a), x=i,o.
\]
of substitution between domestic and foreign non-monetary financial assets.

Evidently, a change in average returns will induce a rearrangement of portfolios. As a consequence, the functions concerning total demand for capital equity and government bonds by residents read

\[
\begin{align*}
\dot{K}_{pdj} &= K_{pdj} (E_s \cdot r_{iaj}) \quad (50)-(51) \\
\dot{O}_{pdj} &= O_{pdj} (E_s \cdot r_{oa}) \quad (52)-(53)
\end{align*}
\]

As can be verified from equations (A50)-(A51) through (A52)-(A53), the simplifying assumption is adopted that the elasticity of substitution between equity and speculative money (ϕ) is equal to the elasticity of substitution between government bonds and speculative balances. Therefore, ϕ may be referred to as the uniform elasticity of substitution between broader types of financial assets. The value of ϕ is relatively low, reflecting imperfect asset substitutability.

Secondly, having spread total funds over speculative money balances, government bonds and equity, investors choose between domestic and foreign equity and government bonds. At this point, it should be stressed that we ignore currency substitution (McKinnon, 1990).

In the reference situation, holdings of domestic and foreign assets are a constant share of total asset demand ('a' and '1-a', respectively). However, unilateral policy-measures or non-symmetrical shocks may lead to interregional yield differentials, inducing shifts in the portfolio-mix. Thus,

\[
\begin{align*}
\ddot{K}_{idj} &= a \cdot \frac{r_{ij}}{r_{iaj}} \dot{p}_{u1} \quad (54)-(55) \\
\ddot{K}_{udj} &= (1-a) \cdot \frac{r_{ik}}{r_{iaj}} \dot{p}_{u1} \quad (56)-(57)
\end{align*}
\]
where $K_{dj}^{id}$ and $K_{dj}^{ud}$ denote demand for domestic and foreign equity, in home currency, by residents.

Analogously,

$$\hat{O}_{idj} = a \hat{O}_{pdj} \left( \frac{r_{0j}}{r_{oaj}} \right) \varphi_{u1}$$  \hspace{1cm} (58)-(59)

$$\hat{O}_{udj} = (1-a) \hat{O}_{pdj} \left( \frac{r_{0k}}{r_{oaj}} \right) \varphi_{u1}$$  \hspace{1cm} (60)-(61)

where $\hat{O}_{idj}$ and $\hat{O}_{udj}$ stand for demand for domestic and foreign government bonds, in home currency, by residents. It should be emphasized that the elasticity of substitution between domestic and foreign non-monetary assets ($\varphi_{u1}$) is relatively low, expressing imperfect substitutability of assets across countries.

Foreign demand for domestic equity ($K_{mj}^{id}$) and bonds ($\hat{O}_{mdj}^{ud}$), expressed in home currency, is by definition equal to the product of this demand, expressed in foreign currency, and the nominal exchange rate. So,

$$K_{mj}^{id} = K_{udj}^{id} p_{w}$$  \hspace{1cm} (62)-(63)

$$\hat{O}_{mdj}^{ud} = \hat{O}_{udj}^{id} p_{w}$$  \hspace{1cm} (64)-(65)

As stated before, the financing of government spending by using the "printing press" is ruled out by assumption. As a consequence, the year-end supply of government bonds is equal to the government debt at the end of the previous period plus the current budget deficit ($-F_{gj}$)

$$\hat{O}_{j} = \hat{O}_{j-1} - F_{gj}$$  \hspace{1cm} (66)-(67)
Equilibrium in the markets for domestic equity and government bonds, respectively, implies

\[
K_{d_j} = K_{d_j}^* + K_{d_j}^* 
\]

and

\[
0_{d_j} = 0_{d_j}^* + 0_{d_j}^* 
\]

VI Aggregate demand

Nominal demand for 'home produced' goods includes four components, viz. private consumption \(c_{p_j}\), gross capital investment \(i_{p_j}\), material government expenditure \(x_{g_j}\) and net exports \((b_{p_j} - m_{p_j})\).

The producers' price level clears the goods market. As a result, output of the market sector is always at its potential level. Therefore, one may write

\[
y_j = \frac{c_{p_j} + i_{p_j} + x_{g_j} + (b_{p_j} - m_{p_j})}{p_{y_j}} 
\]

where \(c_{p_j}, i_{p_j}, x_{g_j}, b_{p_j}\) and \(m_{p_j}\) denote the volumes of private consumption, gross capital investment, material government expenditure, exports and imports.

The spending power, which a region derives from its productive efforts, is measured by real gross value added of the market sector in terms of the expenditure basket \(y_{x_j}\).

\[
y_{x_j} = \frac{y_{j}}{p_{x_j}} 
\]

Real national income is the sum of real gross value added \(y_{x_j}\) and the capital income account surplus \(S_{r}\).
As will be shown in section 7.3, this variable plays a crucial role in the analysis of effects and spill-over effects.

An appeal is made on classical assumptions on saving and consumption. According to this hypothesis, the propensity to save over wage-income (and transfer-income) is less than over profits (and interest-income). The classical explanation of differential saving is class-related: workers versus capitalists. However, following Kaldor (1956), the proposition that the propensity to save is less over wages than over profits is attributed to differences in the type or source of income. At this point it should be remarked that Van Ewijk (1989) clearly demonstrates that mainstream microeconomic life-cycle models do not conflict with differential saving. On the contrary, these models may even give a justification for it, if liquidity constraints and intergenerational transfers, gifts and bequests are taken into account.

For simplicity, the extreme position is taken that the propensity to consume out of wage- and transfer-income and the propensity to save over profit- and rentier-income both equal unity (cf. Kolnaar and Van Tuijl, 1990). Therefore, private consumption can be explained as follows

\[
\frac{(1-\tau)^{\hat{L}_j} + \hat{L}_{g_j}}{p_{x_j}}
\]

As stated before, in the reference situation net public sector salaries and social benefits exactly equal wage-tax revenues. As a consequence, private consumption then simply equals the wage-bill in the market sector.

In the reference situation, private capital investment equals the product of the gross steady growth rate (\(g_b\)) and the private capital stock. The gross steady growth rate is equal to the sum of the net steady growth rate (\(g_n\)) and the depreciation rate of private capital.

An important feature of the model is the incorporation of the q theory of investment (Smulders, 1990 and Van Els, 1990). Either disturbances or some
type of economic policy may cause Tobin’s q, the ratio of the capital stock’s market value to its replacement value, to depart from its equilibrium value, which is, of course, unity. This influences private capital investment. Thereby, two things should be noticed. Firstly, here Tobin’s q is represented by the ratio of the price of equity \( p_k \) to the price of investment expenditure \( p_x \). This is due to the abovementioned assumption that each unit of physical capital is financed by the issuance of one share. Secondly, for the sake of simplicity, installation costs (Hayashi, 1982) are ignored. So, private capital investment can be described as follows

\[
\dot{i}_j = D \dot{k}_j \left( \frac{p_k}{p_x} \right)^x
\]

where \( x \) denotes the acceleration coefficient.

Material government expenditure is supposed to be a constant fraction of gross value added of the market sector. So,

\[
\dot{g}_j = K \frac{y_j p_y}{p_x}
\]

Of course, the government possesses the discretionary power to change the share of material government expenditure in output of the market sector \( \dot{g}_g \).

Material government expenditure consists of two components, material government consumption and - exogenous - government investment

\[
\dot{x}_g_j = C \dot{k}_j + \dot{i}_g
\]

In a two-country-setting one country’s exports necessarily equal the other country’s imports

\[
\dot{b}_j = m_k
\]
In the reference situation, imports move proportionally with output of the market sector. In addition, we follow the Armington tradition instead of assuming the Law of One Price to hold. Thus, home and foreign produced goods are imperfect substitutes. Consequently, a change in competitiveness, reflecting itself in a change in the real exchange rate 
\[
p_{x,j} \frac{p_{x,j}p_{w}}{p_{x,j}p_{w}} (- \frac{\eta_m}{\mu y_j})
\]
(affects imports. Hence we may write

\[m_j = \mu y_j \left( \frac{p_{x,j}}{p_{x,j}} - \eta_m \right)
\] (88)-(89)

Obviously, the parameter \( \eta_m \), which indicates the sensitivity of imports with respect to competitiveness, has a finite value. Furthermore, it should be remembered that \( \mu \) equals the ratio of imports to gross value added on the reference path.

VIII Private savings, government savings and balance of payments

Given our consumption function (relations (78)-(79)), the savings surplus of the private sector \( F_p \) is equal to net profit and rentier income of residents minus net capital investment

\[
\dot{F}_p = Y_p - (i_{j}p_{x,j} + \delta k_{j}p_{x,j})
\]

(90)-(91)

The total government budget deficit \( -F_g \) equals the sum of the primary or fiscal deficit \( -F_{g1} \) and the secondary deficit, i.e. the budget deficit arising from interest payments on government bonds \( -F_{g2} \).

\[
-F_{g_j} = -F_{g1} - F_{g2}
\]

(92)-(93)

The government taxes gross wages of employees in the market sector, civil servants' salaries and social benefits at a rate \( \tau \), while it taxes
profits net of depreciation at a rate $\tau^*_r$. Government non-interest outlays consist of (gross) public sector wages, transfer payments as well as material government expenditure. The fiscal deficit equals the difference between these non-interest outlays and total tax revenues$^7$). So,

$$
F_{g_{1j}} = \tau^*_j p_{y_{ij}} - (1-\tau^*_j) \bar{L}^*_{g_{1j}} \bar{p}_{y_{ij}} + \tau^*_r (y_j p_{y_j} - \bar{L}_{j} \bar{p}_{y_{ij}} - \delta k_j p_{x_{ij}}) - x_{g_{1j}} p_{x_{ij}}
$$

(94)-(95)

The secondary deficit is equal to the product of outstanding government debt at the end of the preceding period and last period's after-tax bonds' rate.

$$
F_{g_{2j}} = \delta^*_j r_{j-1} \text{g}_{j-1}
$$

(96)-(97)

In the reference situation, the ratio of the fiscal deficit to gross value added of the market sector is constant. The government debt ratio remains constant as well, owing to a positive growth/bond rate differential (see note 6).

The balance of trade surplus ($S_b$), the capital income account surplus ($S_r$) and the capital account surplus ($S_k$) sum up to the balance of payments surplus ($S_u$)

7) On the reference path, the fiscal deficit equals material government expenditure minus profit tax revenues, as an extended Pay-As-You-Go-system is maintained (viz. including civil servants' salaries). This PAYG-system is preferable to a fully funded system, as the steady growth rate exceeds the government bonds' rate. Under Classical assumptions on savings, the average return on private wealth equals the steady growth rate (Meulendijks, 1992, pp. 343-353). Obviously, the return on risk-bearing assets is higher than the return on riskless assets. Consequently, equity return exceeds the steady growth rate, whereas the government bonds' rate is lower than the steady growth rate. At this point, it should be emphasized that the sign of the growth/interest rate differential has been subject to ample empirical and theoretical discussion (Domar 1944, Stevers 1983, Schouten 1986, Bomhoff 1987, Schouten and Kolnaar 1987a and 1987b, Verbon 1987, Abel et al. 1989, Leslie, 1993).
Subtraction of the value of imports \((m \cdot p_{x_k} \cdot p_w)\) from the value of exports \((b \cdot p_x)\) yields the balance of trade surplus

\[
S_{bj} = b_j p_{x_j} - m_j p_{x_k} p_w
\]  

Domestic residents earn dividend on holdings of foreign capital equity and interest on holdings of foreign government debt. On the other hand, domestic firms pay dividends and the home government pays interest to non-residents, who own part of the outstanding stock of share capital and government debt. The difference between these flows is the capital income account surplus

\[
S_{rj} = \frac{y_{nk}}{K_{k-1}} p_{x_k} p_w - \frac{y_{nj}}{K_{j-1}} p_{x_j} + \frac{r_{ok}}{K_{k-1}} p_{w-1} - \frac{r_{oj}}{K_{j-1}} p_{w-1}
\]

Domestic holdings of foreign capital equity, as expressed in home currency, increase if the price of foreign equity rises and if the home currency depreciates. A rise of the nominal exchange rate also leads to a rise in residents' foreign bonds holdings, in home currency. The above events \textit{ceteris paribus} positively affect the capital account balance, since residents then need to buy less foreign shares and bonds, respectively, to attain their desired level of foreign equity and bond holdings. Evidently, if residents buy foreign shares or foreign government debt, the capital account is \textit{ceteris paribus} negatively influenced.

On the other hand, non-residents buy home equity as well as home government bonds. This positively affects the capital account. Non-residents' holdings of domestic shares, in home currency, increase if the price of domestic equity rises. This has a negative influence on the
capital account balance, as non-residents need to buy less domestic shares to reach their desired level of domestic equity holdings. The above facts give rise to the following relationship

\[
S_{K_j} = K_{md_j} + K_{ud_j} - K_{md_{j-1}} + K_{ud_{j-1}} - p_{k_j} - p_{k_{j-1}} + p_{k_{k-1}} + p_{w_{k-1}} + p_{w_{-1}}
\]

There are 105 equations and 105 endogenous variables, viz. \(b, c, c', E, E', E_s, E_t, F, F', F_s, F_t, h, h', i, k, K, K', K_d, K_m, K_p, K_{ud}, l, l', m, 0, 0_d, 0_m, 0_d, P, p, p_k, p_{k'}, p', p_x, p_y, r, r', r_{ia}, r_a, r_o, S, S'_{a}, S_{d}, S_{r}, S_{u}, t_{l}, w, w', x, y, y_d, y_r, Y, Y_r, Y_{r_{tp}}, y_{x} \) (for both countries) and \(p_w\).

7.3. STIMULATING PUBLIC INVESTMENT: SOME NUMERICAL EXERCISES

In this section the international transmission effects of an increase in government investment, the size of 1% of gross value added of the market sector, will be studied by discussing some policy simulations. The computations have been carried out with the PSREM package developed by Markink and Van der Ploeg (1991). The simulations version of the model, along with the numerical assumptions, can be found in Appendix 7.1. It is worthwhile noticing that the symbols now refer to relative deviations from the reference path of steady growth. Exceptions to this rule are net exports \(s_b\) and the capital income account surplus \(S_r\), which are expressed as the ratio of to nominal gross value added in the reference situation.

The short-, medium- and long-run (spill-over) effects of a unilateral fiscal expansion, directed at spending on public capital formation, are shown in Table 7.1, where Europe takes steps to raise government expenditure, and Table 7.2, where the United States take the initiative.
Thereby, the focus is on real national income ($Y_d$), which indicates a region's spending power. Of course, output of the market sector ($y$), as a measure of a region's productive efforts, deserves attention as well. Finally, employment in the market sector ($l$) may not be ignored. Here, it suffices to say that the system of characterizing the policy variants by 'LOC' (locomotive) and 'BTN' (beggar-thy-neighbour), respectively, is similar to that of the previous chapters.

In the short run ($t=1$), a European fiscal expansion (Table 7.1) turns out to be a BTN-policy. The increase in material government expenditure induces some crowding-out of both private capital investment and net exports. The rise in aggregate demand forces up the terms of trade ($P$). The resulting deterioration of European competitiveness causes net exports to decrease. The terms-of-trade improvement also leads to fall in real labour costs. For, nominal wages are indexed to the price of (consumer) expenditure, which remains behind the producers' price level. The decline of real producers' wages stimulates employment ($l$) and, therefore, production capacity ($y$).

Along this channel a part of the incremental aggregate demand is satisfied. The increase in both output and the producers' price level implies a vehement rise of transactions demand for money. This drives up asset yields, including, in this portfolio context, return on capital equity. As a result, the relative price of equity drops, which depresses private capital investment. So, this spending category is crowded out as well. Evidently, European real gross value added ($Y_x$) rises quite strongly, as both composing factors, viz. $y$ and $P$, increase.

Obviously, an improvement of U.S.' competitiveness is the mirror-image of Europe's gains in the terms of trade. This boosts U.S.' net exports. However, domestic expenditure is hampered by a terms-of-trade induced decrease of U.S.' spending power. So, the rise in total aggregate demand is dampened, which keeps upward pressure on the producers' price level relatively low. Nevertheless, with the nominal wage rate almost fixed, this implies a decline of real labour costs. As a result, employment ($l$) and output ($y$) increase. On balance, the growth of output appears to be just too small to compensate for the losses in the terms of trade, so that U.S.' real gross value added of enterprises ($Y_x$) decreases.

In the short run, the development of asset yields fully determines
Table 7.1 European increase in government investment, the size of 1% of real gross value added ($x_{g1} = 10.71$ and $i_{g1} = 20.83$)

<table>
<thead>
<tr>
<th>Period</th>
<th>1</th>
<th>5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (y)</td>
<td>0.23</td>
<td>0.85</td>
<td>3.62</td>
</tr>
<tr>
<td>Real gross value added ($y_x$)</td>
<td>0.63</td>
<td>0.93</td>
<td>2.90</td>
</tr>
<tr>
<td>Real national income ($y_d$)</td>
<td>0.60</td>
<td>0.84</td>
<td>2.80</td>
</tr>
<tr>
<td>Employment ($l$)</td>
<td>0.35</td>
<td>-0.34</td>
<td>0</td>
</tr>
<tr>
<td>Private capital stock ($k$)</td>
<td>0</td>
<td>-0.42</td>
<td>0.88</td>
</tr>
<tr>
<td>Public capital stock ($k_{inf}$)</td>
<td>0</td>
<td>6.87</td>
<td>20.83</td>
</tr>
<tr>
<td>Multifactor productivity ($h_g$)</td>
<td>0</td>
<td>1.22</td>
<td>3.33</td>
</tr>
<tr>
<td>Government debt ($o$)</td>
<td>1.89</td>
<td>10.31</td>
<td>18.38</td>
</tr>
<tr>
<td>Private consumption ($c_p$)</td>
<td>0.28</td>
<td>0.46</td>
<td>2.13</td>
</tr>
<tr>
<td>Gross capital investment ($i$)</td>
<td>-1.01</td>
<td>-1.05</td>
<td>0.88</td>
</tr>
<tr>
<td>Net exports ($s_b$)</td>
<td>-0.77</td>
<td>-0.29</td>
<td>0.72</td>
</tr>
<tr>
<td>Capital income account ($S_r$)</td>
<td>-0.03</td>
<td>-0.08</td>
<td>-0.11</td>
</tr>
<tr>
<td>Terms of trade ($P$)</td>
<td>0.40</td>
<td>0.08</td>
<td>-0.72</td>
</tr>
<tr>
<td>Wage share ($w_y'$)</td>
<td>-0.35</td>
<td>-0.08</td>
<td>0.88</td>
</tr>
<tr>
<td>U.S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production (y)</td>
<td>0.35</td>
<td>0.18</td>
<td>0.04</td>
</tr>
<tr>
<td>Real gross value added ($y_x$)</td>
<td>-0.04</td>
<td>0.09</td>
<td>0.76</td>
</tr>
<tr>
<td>Real national income ($y_d$)</td>
<td>-0.01</td>
<td>0.18</td>
<td>0.86</td>
</tr>
<tr>
<td>Employment ($l$)</td>
<td>0.53</td>
<td>0.28</td>
<td>0</td>
</tr>
<tr>
<td>Private capital stock ($k$)</td>
<td>0</td>
<td>-0.06</td>
<td>0.25</td>
</tr>
<tr>
<td>Multifactor productivity ($h_g$)</td>
<td>0</td>
<td>0.01</td>
<td>-0.04</td>
</tr>
<tr>
<td>Private consumption ($c_p$)</td>
<td>-0.57</td>
<td>-0.08</td>
<td>0.94</td>
</tr>
<tr>
<td>Gross capital investment ($i$)</td>
<td>-0.13</td>
<td>-0.30</td>
<td>0.25</td>
</tr>
<tr>
<td>Wage share ($w_y'$)</td>
<td>-0.53</td>
<td>-0.34</td>
<td>0.25</td>
</tr>
</tbody>
</table>

qualification of policy

Real national income  | BTN   | LOC   | LOC   |
Real gross value added | BTN   | LOC   | LOC   |
Production            | LOC   | LOC   | LOC   |
Employment            | LOC   | LOC   | 0     |
the capital income account, as dividend and interest flows are linked to
asset stocks at the end of the preceding period. Evidently, upward
pressure is much stronger on European than on U.S.' asset returns. As a
result, the European capital income account shows a small deficit.
Nevertheless, European real national income (y_d) rises, whereas U.S.' real
national income (y_d) falls. Obviously, the small capital income balances do
not match the mutations in real gross value added of the market sector.

In the medium run, for which arbitrarily period 5 is chosen, the
indication LOC-policy is correct. Now the increase in European multi-
factor productivity, arising from the stimulus to public investment,
dominates the picture. This factor alone keeps European production
capacity (y) above its reference level. For, the medium-term private
capital stock is below its steady-growth level, due to crowding-out of
private investment in the previous periods. Employment (l) is also below
its reference value. This must be attributed to the combined negative
effects of the higher efficiency level and the shrunk capital stock
dominating feeble wage restraint. The latter stems from the fact that the
decline of the terms of trade (P), as compared to the short run (t=1),
dominates the workings of the Phillips-mechanism. 8)

European real gross value added (y_x) still exceeds its steady-growth
level. The terms of trade (P) are still more favourable than in the
reference situation. The fall of the terms of trade, in comparison with
the first period, must be ascribed to the fact that domestic expenditure
remains behind production capacity. A tax increase, aimed at keeping the
government debt ratio under control, hampers private consumption. In
addition, private capital investment remains low, due to continuously high
equity return, keeping down the relative price of equity. Therefore,
maintaining goods market equilibrium requires a higher level of net
exports than in the short run. Meanwhile, European net exports are
negatively affected by the positive interregional output-differential.
Therefore, a substantial improvement of competitiveness and, thus, a
considerable fall in the terms of trade is required.

U.S.' production capacity (y) has dropped as compared to the short
run; yet, it is still above its reference level. The factor underlying

8) See equations (A13) and (A30), while keeping in mind that z_1 = 0.99.
this result is that employment \( (L) \) still exceeds its reference level as well, owing to continued wage moderation. Upward pressure on aggregate demand is ex ante strong relative to the development of production capacity. The decline of the government debt ratio opens the possibility of a tax-cut, which stimulates private consumption. Therefore, some reduction of net exports is inevitable. This implies a rise in the terms of trade \( (P) \), as U.S.' net exports are simultaneously forced up by the negative interregional output-differential. However, the U.S.' terms of trade still fall short of their reference value. On balance, U.S.' real gross value added of enterprises \( (y_x) \) is above its steady-growth level.

Europe's capital income account deficit has grown, due to both a widening of the yield differentials and a worsening of its net foreign asset position. The latter follows from uninterrupted current account deficits. However, the adverse state of the capital income account is dominated by the higher real gross value added, so that European real national income \( (y_d) \) exceeds its reference value. The U.S.' capital income account surplus comes on top of favourable real gross value added. So, U.S.' real national income \( (y_d) \) is above its steady-growth level too.

In the long run \( (t->\infty) \) the indication LOC-policy is suited as well. Europe now fully reaps the fruits of raising public investment. The index of multifactor productivity exceeds its reference level substantially. The resulting rise in production capacity \( (y) \) creates room for crowding-in of capital investment. So, the stock of capital equipment exceeds its reference level too, which also contributes to higher production capacity. However, domestic expenditure remains behind potential output. The reason is twofold. Firstly, private consumption is hampered by higher taxes, arising from a risen government debt ratio. Secondly, higher return on equity demanded by the market keeps the investment-output ratio below its reference value. As a consequence, higher net exports are necessary to prevent excess supply in the goods markets. Therefore, the terms of trade \( (P) \) are less favourable than in the reference situation. However, on balance, real gross value added of firms \( (y_x) \) in Europe is substantially above its reference level.

In the U.S. long-run production capacity \( (y) \) is only slightly above its reference level. This must be attributed to the fact that the unchanged public capital stock has not kept pace with the expansion of the
stock of private capital equipment. This disturbance of the complementarity results in a lower index of multifactor productivity, which dampens the positive influence of the higher private capital stock. Gross private investment has benefitted somewhat from crowding-out of U.S.' net exports. However, private consumption, stimulated by a higher wage share, exceeds its reference level most. The higher wage share must be explained from the fact that labour has become the relatively scarce factor of production in the U.S.. For, the Phillips-mechanism restores labour market equilibrium (\(\lambda = 0\)), whereas the capital stock has grown little. Needless to say, the same line of reasoning holds for Europe. An improvement of the U.S.' terms of trade is the mirror-image of the deterioration of the European terms of trade. Higher U.S.' output combined with gains in the terms of trade imply that U.S.' real gross value added \((y_x)\) is above its reference value.

In the new steady state, Europe's capital income account still shows a deficit. This deficit has risen as compared to the medium run, due to a further worsening of the European net foreign asset position. Of course, Europe's significantly higher real gross value added dominates this comparatively small capital income account deficit, so that real national income \((y_d)\) is at a much higher level than in the reference situation. In the U.S., real national income \((y_d)\) exceeds its reference level as well, since this holds for both components.

In the short run, a U.S.' fiscal expansion (Table 7.2), appears to be a BTN-policy, just like its European equivalent. The increase in aggregate demand drives up the U.S.' producers' price level. Nominal wage inertia precludes money wages from adapting to this inflation, inducing real labour costs to decrease, which boosts production capacity \((y)\). The resulting drop in the wage share frustrates private consumption. So, crowding-out of net exports is kept within limits, while, in contrast with the previous case of a European fiscal expansion, private investment is even allowed to increase. Logically, the deterioration of competitiveness, and, thus, the rise in the terms of trade \((P)\) are moderate. Evidently, the combination of an increase in production and gains in the terms of trade implies a rise in real gross value added of U.S.' enterprises \((y_x)\).

The increase in European net exports requires a strengthening of competitiveness. So, this region inevitably incurs some losses in the
### Table 7.2 U.S.' increase in government investment, the size of 1% of gross value added ($x = 10.71$ and $i = 20.83$)

<table>
<thead>
<tr>
<th>Period</th>
<th>1</th>
<th>5</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production ($y$)</td>
<td>0.78</td>
<td>1.82</td>
<td>3.62</td>
</tr>
<tr>
<td>Real gross value added ($y_x$)</td>
<td>0.85</td>
<td>1.65</td>
<td>2.90</td>
</tr>
<tr>
<td>Real national income ($y_d$)</td>
<td>0.78</td>
<td>1.58</td>
<td>2.80</td>
</tr>
<tr>
<td>Employment ($l$)</td>
<td>1.17</td>
<td>0.93</td>
<td>0</td>
</tr>
<tr>
<td>Private capital stock ($k$)</td>
<td>0</td>
<td>0.33</td>
<td>0.88</td>
</tr>
<tr>
<td>Public capital stock ($k_{inf}$)</td>
<td>0</td>
<td>6.87</td>
<td>20.83</td>
</tr>
<tr>
<td>Multifactor productivity ($h_g$)</td>
<td>0</td>
<td>1.09</td>
<td>3.33</td>
</tr>
<tr>
<td>Government debt ($O$)</td>
<td>1.44</td>
<td>8.31</td>
<td>18.38</td>
</tr>
<tr>
<td>Private consumption ($c_p$)</td>
<td>-0.31</td>
<td>0.75</td>
<td>2.13</td>
</tr>
<tr>
<td>Gross capital investment ($i$)</td>
<td>0.91</td>
<td>0.92</td>
<td>0.88</td>
</tr>
<tr>
<td>Net exports ($s_b$)</td>
<td>-0.31</td>
<td>-0.05</td>
<td>0.72</td>
</tr>
<tr>
<td>Capital income account ($S_r$)</td>
<td>-0.08</td>
<td>-0.07</td>
<td>-0.11</td>
</tr>
<tr>
<td>Terms of trade ($P$)</td>
<td>0.07</td>
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<td>-0.72</td>
</tr>
<tr>
<td>Wage share ($w'_y$)</td>
<td>-1.17</td>
<td>-0.60</td>
<td>0.88</td>
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<tr>
<td><strong>Europe</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production ($y$)</td>
<td>-0.03</td>
<td>-0.13</td>
<td>0.04</td>
</tr>
<tr>
<td>Real gross value added ($y_x$)</td>
<td>-0.11</td>
<td>0.04</td>
<td>0.76</td>
</tr>
<tr>
<td>Real national income ($y_d$)</td>
<td>-0.03</td>
<td>0.12</td>
<td>0.86</td>
</tr>
<tr>
<td>Employment ($l$)</td>
<td>-0.05</td>
<td>-0.10</td>
<td>0</td>
</tr>
<tr>
<td>Capital stock ($k$)</td>
<td>0</td>
<td>-0.35</td>
<td>0.25</td>
</tr>
<tr>
<td>Multifactor productivity ($h_g$)</td>
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<td>0.06</td>
<td>-0.04</td>
</tr>
<tr>
<td>Private consumption ($c_p$)</td>
<td>-0.06</td>
<td>-0.12</td>
<td>0.94</td>
</tr>
<tr>
<td>Gross capital investment ($i$)</td>
<td>-1.23</td>
<td>-0.44</td>
<td>0.25</td>
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<tr>
<td>Wage share ($w'_y$)</td>
<td>0.05</td>
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<td>0.25</td>
</tr>
<tr>
<td><strong>qualification of policy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real national income</td>
<td>BTN</td>
<td>LOC</td>
<td>LOC</td>
</tr>
<tr>
<td>Real gross value added</td>
<td>BTN</td>
<td>LOC</td>
<td>LOC</td>
</tr>
<tr>
<td>Production</td>
<td>BTN</td>
<td>BTN</td>
<td>LOC</td>
</tr>
<tr>
<td>Employment</td>
<td>BTN</td>
<td>BTN</td>
<td>0</td>
</tr>
</tbody>
</table>
terms of trade. As a consequence, the producers' price level remains behind the price of (consumer) expenditure. It should be kept in mind that in Europe short-term rigidity of real consumers' wages prevails. So, the real producers' wage rises, inducing a decline of production capacity \( (y) \). As stated above, net exports rise somewhat. Private consumption drops, albeit only slightly, owing to a rise of the wage share. Therefore, private capital investment heavily suffers from crowding-out. Of course, European real gross value added \( (y_x) \) declines, due to a decrease of both components.

As mentioned before, in the short run the capital income balance solely depends on the changes of asset yields. The U.S.' fiscal expansion has resulted in a yield differential in favour of this region, so its capital income account now shows a deficit. However, the increase in real gross value added of U.S.' firms dominates this small deficit, so that U.S.' real national income \( (y_d) \) rises. European real national income \( (y_d) \) decreases, as its small capital account surplus is outweighed by the decline of European real gross value added.

In the medium run \( (t=5) \), the U.S.' fiscal expansion turns out to be a LOC-policy, again analogous to its European counterpart. U.S.' production capacity \( (y) \) has risen as compared to the short run. Firstly, the U.S. benefit from the increase of the index of multifactor productivity, driven by the stimulus to government investment. This creates room for crowding-in of private capital investment. So, an expanded stock of capital equipment is the second factor contributing to higher U.S.' medium-term output. Finally, employment \( (\lambda) \) is above its reference level as well, as wage restraint and a grown capital stock dominate the labour-saving effects of the improved technology.

The development of aggregate demand is relatively weak compared to production capacity. This is mainly due to the fact that private consumption is hampered by both wage moderation and an increase in taxes, intended at controlling the government debt ratio. So, net exports must rise, requiring an improvement of competitiveness and, therefore, a terms-of-trade deterioration. The latter is so strong that the terms of trade \( (P) \) even fall below their reference level. However, this adverse state of the terms of trade is strongly dominated by the higher level of output, so
that real gross value added of U.S.' enterprises \((y_x)\) is well above its reference level.

European production capacity \((y)\) is below its reference value. Crowding-out of private capital investment in the previous periods, mainly by net exports, has led to a smaller capital stock. Employment \((l)\) falls short of its reference level as well, the positive effects of wage restraint being outweighed by the negative effect of a decreased capital stock. The lower wage share must be ascribed to gains in the terms of trade. These have risen considerably since the short run, when they were below their initial steady-state level. This must be attributed to the favourable development of aggregate demand as compared to productive capacity. Especially, private investment strongly recovers, induced by a rise in the relative price of equity. Therefore, crowding-out of net exports is inevitable, which requires a terms-of-trade improvement. The gains in the terms of trade turn out to dominate the output losses, so that real gross value added of European enterprises \((y_x')\) is above its reference level.

The story with respect to the capital income balance may sound familiar. The U.S.' capital income account deficit has increased, due to both a worsening of the net foreign asset position, stemming from persistent current account deficits, and an increased discrepancy between regional asset yields. However, the U.S. deficit is far too small to outweigh U.S.' increased real gross value added. As a consequence, U.S.' real national income \((y_d)\) exceeds its reference value. The same applies to Europe, as the capital income account surplus of this region comes on top of higher real gross value added.

It should be noted that the difference between the RWR-region (Europe) and the NWR-region (U.S.) as the initiating country has no relevance in case of a long-run analysis. In the new steady state, labour markets are again equilibrated by the Phillips-mechanism \((\ell_1 = \ell_2 = 0)\). Therefore, it suffices here to refer to the long-term effects of the European fiscal expansion.
7.4. SUMMARY AND CONCLUSIONS

In this chapter the effects of once-and-for-all increases in government expenditure, wholly consisting of a rise in public investment, were examined. In time, higher government investment leads to a rise in the stock of public capital. Thereby, it was assumed that the index of multifactor productivity positively depends on this public capital stock.

A two-country framework was used with a portfolio choice between domestic cash balances, domestic and foreign government bonds as well as domestic and foreign equity, flexible exchange rates and static expectations. Furthermore, capital accumulation, the dynamics of the government budget and the current account, classical assumptions on consumption and saving, the q-theory of investment, imperfect substitution between domestic and foreign produced goods, international factor immobility, short- and medium-term real wage rigidity in Europe and nominal wage rigidity in the U.S. were taken into account.

These (spill-over) effects were primarily measured in terms of real national income ($y_d$). This variable equals the sum of real gross value added or terms-of-trade corrected output of the market sector ($y_x$) and the capital income balance ($S_p$). Of course, the level of production ($y$) and employment ($l$) of the market sector were given attention as well.

In the short run ($t=1$) this type of fiscal expansion primarily takes on the demand side of the economy. As remarked before, in terms of output ($y$) a European fiscal expansion must be indicated as a LOC-policy, whereas a U.S.' fiscal expansion is a BTN-policy. This is in accordance with the findings of Argy and Salop (1983), based on a flex-price static two-country model of the Mundell-Fleming variety, with floating exchange rates and sluggish labour markets. These results may be considered as standard in the context of this type of models (see Van der Ploeg, 1988). A country conducting an expansionary fiscal policy is also rewarded with gains in the terms of trade, so that real gross value added rises considerably. Meanwhile, the passive country incurs losses in the terms of trade. In case of a European fiscal policy, this even changes a positive outcome for U.S.' output into a negative result with respect to U.S.' real gross value added. At this point, it should be remarked that a higher sensitivity of net exports with respect to competitiveness would allow the changes in the
terms of trade to be smaller. As a consequence, the outcomes concerning real gross value added would change from BTN into LOC. Positive interregional yield differentials turn the active country's capital income balance into deficit. However, these deficits are too small to cause a difference between the (spill-over) effects concerning real national income and the (spill-over) effects with respect to real gross value added.

In the medium run \((t=5)\), the supply effects of the stimulus to government investment play a prominent role. The index of multifactor productivity of the active country is well above its reference level. This is the main factor underlying higher output there. The higher level of production is the driving force behind both the risen real gross value added and the increased real national income. In the passive country real national income is higher too, partly owing to a capital income account surplus. The latter must be explained from two factors. Firstly, persistent current account surpluses have led to an improvement of the passive country's net foreign asset position. Secondly, interregional yield differentials have widened. The share of the passive country's asset supply in total world's asset supply has decreased. The relative scarcity of the passive country's assets implies lower yields. Of course, for the active country the opposite holds.

In the long run \((t=\infty)\) the initiating country reaps all the fruits of its supply-oriented fiscal expansion. The index of multifactor productivity is substantially above its old steady-state level. This in itself boosts production capacity. Moreover, some room is created for crowding-in of capital investment, implying a higher steady-state capital stock. Of course, the expansion of the capital stock contributes to higher production capacity as well. Domestic expenditure remains behind potential output. This must be ascribed to both a decreased consumption rate, due to higher taxes, aimed at keeping the government debt ratio under control and a lower investment rate. For, the higher efficiency level has led to a lower capital-output ratio. Goods market equilibrium is maintained by higher net exports. Of course, this requires an improved competitiveness. The incurred losses in the terms of trade imply that real gross value added stays behind output. Evidently, the terms of trade of the passive country rise, which explains higher real gross value added there. It
should be noticed (see Tables 7.1 and 7.2) that in the long run the role of the capital income balance is only a minor one.

The present analysis can be extended in several ways. Firstly, relaxing the Classical assumption on savings by allowing for a positive propensity to save of workers and/or a positive propensity to consume of capitalists/rentiers would certainly influence the results. Secondly, introduction of rational expectations (cf. chapters 3 till 6) obviates the well-known Lucas Critique, while shedding an interesting light on the short- and medium-run. Thirdly, public investment in human capital has been ignored completely. This could, for instance, be modelled by linking the quality index of labour to the number of people employed in public education. Assuming this to be a constant fraction of the total number of income-earners chargeable to the government sector ($I_g$), the latter variable could be taken as a proxy. Fourthly, this model assumes government investment in infrastructure to be highly efficacious. Doubts about this effectiveness imply the fear of the dominance of the usual crowding-out effects of a bond-financed rise in government expenditure. These crowding-out effects, however, could be avoided by a tax-increase, wage restraint or by simply cutting government non-investment outlays. An example of the latter is the decoupling of civil servants' salaries and social benefits. Therefore, coordination of wage-, fiscal and perhaps monetary policies within a region could be analysed. Finally, simply adding up tables 7.1 and 7.2 teaches that coordination of fiscal expansions directed at public capital formation across regions would raise their efficacy tremendously. So, international coordination of these policies is another field that could be fruitfully studied.

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APPENDIX 7.I THE LINEAR MODEL AND NUMERICAL ASSUMPTIONS

The model presented in section 7.2 is linearized around a symmetrical steady-state solution. As stated before, it is assumed that in the reference situation both economies follow a path of steady growth, determined by the population growth rate (n=0.01) and the rate of, Harrod-neutral, labour-augmenting technical progress (ρL=0.04). Most variables are expressed as percentage deviations from their steady-growth values.
However, there are some exceptions to this rule. Firstly, some variables are measured as the quotient of the arithmetic difference from their steady-growth values and nominal gross value added of the market sector in the reference situation. This holds for the private (nonfinancial) sector's savings surplus ($F_p$), the government's primary deficit (noninterest outlays minus total revenues; $-F_{g1}$), the government's budget deficit arising from interest payments ($-F_{g2}$), the total budget deficit of the government ($-F_g$), the balances on current ($S_b$), capital income ($S_r$) and capital account ($S_k$), as well as the balance of payments surplus ($S_u$). Secondly, the tax rate on wage-income ($t'$) is expressed as a percentage of private sector wage income. Finally, for the rates absolute instead of relative deviations are taken in case no 'hat' is used. This means that a 'hat' still refers to its initial steady-state value.


As in the main text of this chapter, the model is divided into eight subsystems. The numbers of equations correspond with the numbers given in section 7.2. Exogenous variables are barred. All coefficients are positively defined. Their numerical values are given below.

I Supply side

Private capital accumulation

$$\Delta k_j = \frac{y_i}{\kappa (1+\alpha + \phi_a)} (t_j - k_{j-1}) \tag{A1} \tag{A2}$$

Production function

$$y_j = h_{g,j} + \lambda (h_{j} + h_{k,j}) + (1 - \lambda) (k_j + h_{k,j}) \tag{A3} \tag{A4}$$

Index of multifactor productivity

$$h_{g,j} = \delta (k_{inf,j} - k_j) \tag{A5} \tag{A6}$$
Public capital accumulation

\[ \Delta k_{inf j} = \frac{y_i g_i}{x_i (1 + n + \rho_i)} (i_j - k_{inf j - 1}) \]  \( \text{(A7)-(A8)} \)

II Labour market

Employment (in the market sector)

\[ l'_j = y'_j - \varphi_k (p_{l_j} - p_{y_j} - h_{g_j} - h_{l_j}) - h_{g_j} - h_{l_j} \]  \( \text{(A9)-(A10)} \)

Income-earners chargeable to the government sector

\[ l'_j = \frac{(1 + a_j)}{a_j} l'_j - \frac{1}{a_j} l_j \]  \( \text{(A11)-(A12)} \)

(These relationships boil down to \( l'_j = - l_j \), since \( A_T = 0 \) and \( a_j = l'_j / l_j = 1 \))

Change in nominal wage rate

\[ \Delta p_{l_j} = (1 - \tau_j) \Delta p_{l_{j-1}} + \varphi_j \Delta p_{x_j} + \varphi_j (\Delta y_j - \Delta l_j) + \eta l_j - \eta (1 - \tau_j) l_{j-1} \]  \( \text{(A13)-(A14)} \)

III Prices

Price of expenditure

\[ p_{x_j} = \frac{1}{1 + \mu} p_{y_j} + \frac{\mu}{1 + \mu} (p_{x_k} + p_{\omega}) \]  \( \text{(A15)-(A16)} \)

Terms of trade

\[ p_j = p_{y_j} - p_{x_j} \]  \( \text{(A17)-(A18)} \)
Change in nominal exchange rate (Balance of payments equilibrium)

\[ \Delta P_w = -\xi S_{u_j} \xi \rightarrow \text{so, } S_{u_j} = 0 \]  

(A19)

Civil servants' salary/social benefit

\[ p_{i_j} = p_{i_j}^* + \epsilon g_j' \]  

(A20)-(A21)

Price of capital equity

\[ p_k = k^* - k_{j+1} \]  

(A22)-(A23)

IV Real factor munerations

Real disposable wage income

\[ w_{d_j} = p_{i_j} - p_{x_j} - t_j' \]  

(A24)-(A25)

Tax rate on wages (as a percentage of disposable wage income)

\[ t_j' = t_j' - t_j + \frac{\epsilon}{\lambda_j} g_j' + \epsilon_{r_j} \lambda_j \left( y_{j-1} - (y_{j-1} + p_{y_j} \) \) \]  

(A26)-(A27)

Rate of return on equity

\[ r_{i_j} = y_{r_j} + p_{x_j} - k_j^* \]  

(A28)-(A29)

V Income distribution

Wage share (in the market sector)

\[ w_{y_j} = \lambda_j + p_{k_j} - y_j - p_{y_j} \]  

(A30)-(A31)
Net real profits

\[
y_{r_{n_j}} = \frac{1-\lambda}{1-\lambda-\delta_k} (y_j + p_{r_{n_j}} - p_{x_{j}} - \lambda \omega_{r_{n_j}} - \frac{\delta_k}{1-\lambda}k_j)
\]  
(A32)-(A33)

Interest payments on domestic government bonds

\[
y_{r_{o_j}} = 0 + r_{o_{j-1}}
\]  
(A34)-(A35)

Dividend and interest income of domestic residents

\[
y_{r_{t_{p_j}}} = \frac{x_{r_{n_j}}}{x_{r_{n_j}} + \omega_{o_j}} (y_{r_{n_j}} + p_{x_j}) + \frac{\omega_{r_{o_j}}}{x_{r_{n_j}} + \omega_{o_j}} y_{r_{o_j}} + \frac{1}{x_{r_{n_j}} + \omega_{o_j}} \tilde{S}_{r_{j}}
\]  
(A36)-(A37)

VI Financial assets

Money supply

\[
E_j = E_{b_j}
\]  
(A38)-(A39)

Total money demand

\[
E_{d_j} = (1-a_{e_s}) E_{t_j} + a_{e_s} E_{s_j}
\]  
(A40)-(A41)

Transactions demand for money

\[
E_{t_j} = y_j + p_{y_j}
\]  
(A42)-(A43)

Money market equilibrium

\[
E_{d_j} = E_j
\]  
(A44)-(A45)
Average rate of return on capital equity holdings of domestic residents

\[ r_{i a_j} = a r_{i j} + (1-a) r_{i k} \]  \hspace{1cm} (A46)-(A47)

Average rate of return on government bonds holdings of domestic residents

\[ r_{o a_j} = a r_{o j} + (1-a) r_{o k} \]  \hspace{1cm} (A48)-(A49)

Total demand for capital equity by domestic residents

\[ K_{p d_j}^* = E_{s j} + \varphi r_{i a_j} \]  \hspace{1cm} (A50)-(A51)

Total demand for government bonds by domestic residents

\[ O_{p d_j} = E_{s j} + \varphi r_{o a_j} \]  \hspace{1cm} (A52)-(A53)

Demand for domestic capital equity by domestic residents

\[ K_{i d_j}^* = K_{p d_j}^* + \varphi u_i (r_{i j} - r_{i a j}) \]  \hspace{1cm} (A54)-(A55)

Demand for foreign capital equity by domestic residents (in home currency)

\[ K_{u d_j}^* = K_{p d_j}^* + \varphi u_i (r_{i k} - r_{i a j}) \]  \hspace{1cm} (A56)-(A57)

Demand for domestic government bonds by domestic residents

\[ O_{i d_j} = O_{p d_j} + \varphi u_i (r_{o j} - r_{o a j}) \]  \hspace{1cm} (A58)-(A59)
Demand for foreign government bonds by domestic residents (in home currency)

\[ 0_{d_j} = 0_{p_{d_j}} + \varphi_{u_i} \left( r_{o_{k}} - r_{o_{a_j}} \right) \]  
\[ (A60)-(A61) \]

Demand for domestic capital equity by non-residents (in home currency)

\[ K_{m_d} = K_{u_d} + p_{w} \]  
\[ (A62)-(A63) \]

Demand for home government bonds by foreign residents (in home currency)

\[ 0_{m_d} = 0_{u_d} + p_{w} \]  
\[ (A64)-(A65) \]

Supply of domestic government bonds

\[ \omega (1+g_{n}) \ O_{j} = \omega \ O_{j-1} - F_{g_{j}} \]  
\[ (A66)-(A67) \]

Equity market equilibrium

\[ K_{j}^* = a K_{i_{d_j}}^* + (1-a) K_{m_{d_j}}^* \]  
\[ (A68)-(A69) \]

Bonds market equilibrium

\[ 0_{j} = a 0_{i_{d_j}} + (1-a) 0_{m_{d_j}} \]  
\[ (A70)-(A71) \]

VII Aggregate demand

Goods market equilibrium

\[ y_{j} = y_{c_{j}} p_{j} + y_{i_{j}} i_{j} + y_{g_{j}} g_{j} + \mu (b_{j} - m_{j}) \]  
\[ (A72)-(A73) \]
Real gross value added of the market sector in terms of the expenditure basket

\[ y_{x,j} = y_j + p_y _j - p_{x,j} \]  

Real national income

\[ y_{d,j} = y_{x,j} + S_{r,j} \]

Private consumption

\[ (1 + A_g) c_p_j = (1 + A_{k_j}) + A_g(1 + A_g)^t G_j - (1 + A_g)^t P_{x,j} \]

Gross capital investment

\[ i_j = k_j + x(p_{k,j} - p_{x,j}) \]

Material government expenditure

\[ x_{g,j} = y_j + p_y _j - p_{x,j} + x_{g,j} \]

Division of material government expenditure

\[ x_{g,j} = x_{c,g} g_{j} + (1 - x_{c,g}) i_{g,j} \]

Exports

\[ b_j = m_k \]
Imports

\[ m_j = y_j + \eta_m(x_j - p_x - p_w) \]  

(A88)-(A89)

VIII Private savings, government savings, balance of payments

Private sector savings’ surplus

\[ F_{p_j} = (\kappa n + \omega r_0) x_j - \gamma_j + b_k k_j - \gamma g_n p_x j \]  

(A90)-(A91)

Total government budget deficit

\[ -F_g = -F_{g1} - F_{g2} \]  

(A92)-(A93)

Fiscal deficit/primary budget deficit

\[ -F_{g1} = -\lambda (\lambda_j + t_j - \gamma g_j) \]  

(A94)-(A95)

\[ \gamma t_j (1 - \lambda - b_k) (y_j + p_x j) + \gamma g_j (x_j + p_x j) \]

Budget deficit due to interest payments on government debt

\[ -F_{g2} = -\omega r_0 r_j \]  

(A96)-(A97)

Balance of payments surplus

\[ S_{u_j} = S_{b_j} + S_{r_j} + S_{k_j} \]  

(A98)-(A99)

Balance of trade surplus

\[ S_{b_j} = \mu(b_j - m_j) + \mu(p_j - p_x - p_w) \]  

(A100)-(A101)
Investment income account surplus

\[ S_{r_j} = (1-a) \times r_n \{ y_{r_n} + px_k - k^*_{s_k-1} + K_{ud_{j-1}} + \Delta P_w \} \] (A102)-(A103)

\[ - y_{r_n} - px_j + k^*_{s_{j-1}} - K_{md_j} \]

\[ + (1-a) \omega \{ r_{o_{k-1}} + 0_{ud_{j-1}} + \Delta P_w - r_{o_{j-1}} - 0_{md_{j-1}} \} \]

Capital account surplus

\[ S_{k_j} = (1-a) \times \{ (1+g_n)(k_{md_j} - k_{ud_j}) - (K_{md_{j-1}} - K_{ud_{j-1}}) \} \] (A104)-(A105)

\[ - \Delta p_{k_j} + \Delta p_{k_k} + \Delta p_w \}

\[ + (1-a) \omega \{ (1+g_n)(0_{md_j} - 0_{ud_j}) - (0_{md_{j-1}} - 0_{ud_{j-1}}) \]

\[ + \Delta p_w \} \]
Parameter values for the reference situation

**Elasticity of substitution**

\[ p = 1.0 \]  

between financial assets (capital equity, government bonds and speculative cash balances)

\[ \rho_{kl} = 0.25 \]  

between capital and labour

\[ \rho_{ui} = 1.0 \]  

between domestic and foreign non-monetary financial assets (equity or government bonds)

**Other behavioural parameters**

\[ \varepsilon_{\tau_w} = 0.1 \]  

elasticity of tax rate on wages with respect to (one period lagged) government debt ratio

\[ \gamma_1 = 0.99 \]  

real wage inertia coefficient for Europe

\[ \gamma_2 = 0.01 \]  

real wage inertia coefficient for the U.S.

\[ \eta_l = 0.2 \]  

Phillips-coefficient

\[ \eta_m = 1 \]  

elasticity of imports with respect to competitiveness

\[ \xi = 0.1667 \]  

elasticity of the index of multifactor productivity with respect to the ratio of public to private capital

\[ \xi_w \rightarrow = \]  

elasticity of (the change in) nominal exchange rate with respect to disequilibrium in the foreign exchange market

\[ \tau_r = 0.375 \]  

tax rate on profits

\[ \tau_k = 0.5 \]  

tax rate on wages, civil servants' salaries and social benefits

\[ \chi = 1.0 \]  

acceleration coefficient
Initial steady-state ratio of:

\[
\begin{align*}
    a &= 0.9 & \text{domestic holdings of capital equity and bonds to total holdings of capital equity and bonds} \\
    a_{es} &= 0.6667 & \text{speculative demand for money to total money demand} \\
    a_{g} &= 1.0 & \text{employment in the market sector to civil servants plus social beneficiaries (income-earners chargeable to the government sector)} \\
    A_{g} &= 1.0 & \text{civil servants' salaries plus social benefits to the wage bill in the market sector} \\
    \gamma_{cp} &= 0.6667 & \text{private consumption to gross value added of the market sector} \\
    \gamma_{i} &= 0.24 & \text{gross capital investment to gross value added of the market sector} \\
    \gamma_{cg} &= 0.4857 & \text{material government consumption to material government expenditure} \\
    \gamma_{ig} &= 0.048 & \text{government investment to output of the market sector} \\
    \gamma_{g} &= 0.0933 & \text{material government expenditure to gross value added of the market sector} \\
    \iota_{T} &= 0.1667 & \text{transactions demand for money to gross value added of the market sector} \\
    \mu &= 0.2 & \text{exports (imports) to gross value added of the market sector} \\
    \omega &= 0.4667 & \text{government debt to gross value added of the market sector (at the beginning of the period)}
\end{align*}
\]

Other non-behavioural parameters

\[
\begin{align*}
    \delta &= 0.05 & \text{depreciation rate of the private capital stock} \\
    \delta_{inf} &= 0.05 & \text{rate of depreciation of the stock of public capital} \\
    g_{n} &= 0.05 & \text{natural growth rate}
\end{align*}
\]
\( \kappa = 2.4 \) ratio of the value of the private capital stock to nominal gross value added of the market sector

\( \kappa_g = 0.48 \) ratio of the value of the public capital stock to nominal gross value added of the market sector

\( \lambda = 0.6667 \) wage share/ production elasticity of labour in the market sector

\( \pi = 0.01 \) population growth rate

\( r_n = 0.0556 \) net rate of capital return (in the reference situation)

\( r_o = 0.0214 \) real interest rate on government debt (reference situation)

\( \rho_\lambda = 0.04 \) rate of Harrod-neutral, labour-augmenting technical progress
Appendix 7.II Intervals of robustness with respect to real national income.

<table>
<thead>
<tr>
<th>Parameter (reference value)</th>
<th>European fiscal expansion $(x_{g_1} &gt; 0 \text{ and } i_{g_1} &gt; 0)$</th>
<th>U.S. fiscal expansion $(x_{g_2} &gt; 0 \text{ and } i_{g_2} &gt; 0)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\xi$ (0.167)</td>
<td>$0.01-0.33$</td>
<td>$0.01-0.33$</td>
</tr>
<tr>
<td>$\varphi_{k_1}$ (0.25)</td>
<td>$0-0.26$</td>
<td>$0-0.4$</td>
</tr>
<tr>
<td>$\xi_1$ (0.99)</td>
<td>$0.96-1$</td>
<td>$0.9-1$</td>
</tr>
<tr>
<td>$\xi_2$ (0.01)</td>
<td>$0-0.5$</td>
<td>$0-0.5$</td>
</tr>
<tr>
<td>$\eta_l$ (0.1)</td>
<td>$0.15-\infty$</td>
<td>$0.01-\infty$</td>
</tr>
<tr>
<td>$\lambda$ (1.0)</td>
<td>$0.5-5$</td>
<td>$0.1-5$</td>
</tr>
<tr>
<td>$\epsilon_{\tau\omega}$ (0.1)</td>
<td>$0-0.3$</td>
<td>$0-0.3$</td>
</tr>
<tr>
<td>$\eta_m$ (1.0)</td>
<td>$0.67-1.015$</td>
<td>$0.67-1.33$</td>
</tr>
<tr>
<td>$\varphi_{ui}$ (1.0)</td>
<td>$0.5-\infty$</td>
<td>$0.83-\infty$</td>
</tr>
<tr>
<td>$\varphi$ (1.0)</td>
<td>$0.2-1.05$</td>
<td>$0.2-1.1$</td>
</tr>
</tbody>
</table>

(* denotes infinity)
Samenvatting

Dit proefschrift bestaat uit een zestal min of meer los van elkaar staande artikelen. Deze hebben als gemeenschappelijk thema de interdependentie, de samenhang tussen de economieën van de onderscheiden landen (blokken). Deze neemt thans sterk toe als gevolg van het proces van economische integratie. Er is gebruik gemaakt van een tweetal invalshoeken, de macroeconomische en de mesoeconomische, via de desaggregatie van een macroeconomisch model naar een model waarin onderscheid wordt gemaakt tussen een tradables- en een nontradables-sector.

Er wordt met name nagegaan (zie de hoofdstukken 2, 4, 5 en 6) wat de consequenties zijn van economische integratie voor de effecten en spill-over effecten van het budgettair beleid. Dit laatste dient hier overigens te worden opgevat in de enge zin van het manipuleren van het niveau van de materiële overheidsbestedingen. De resultaten zijn verkregen door middel van simulaties met gelineariseerde modellen. Een uitgebreide gevoeligheidsanalyse is steeds uitgevoerd om na te gaan in hoeverre de uitkomsten coëfficiënt-specifiek zijn. Dit bleek in het algemeen niet in hoge mate het geval te zijn.

Het inleidende hoofdstuk 1 geeft een motivatie voor de keuze van het gemeenschappelijk thema, een overzicht van de inhoud van de onderscheiden hoofdstukken, alsmede een relatief uitgebreide beschrijving van de gehanteerde methode.

Hoofdstuk 2 bevat een tweelanden-twee-sectoren-model van het bekende Mundell-Fleming-type. Naast ongedekte rentepariteit heeft dit model als kenmerken flexibele prijzen, een flexibele wisselkoers, reële loonstarheid (RLS) in de ene regio en nominale loonstarheid (NLS) in de andere regio.

Aan het einde van de jaren '80 merkte een aantal Duitse economen (o.a. Fels, Fröhlich, Hellwig en Neumann) op, dat, als de goederenmarkten perfect geïntegreerd zijn, en dus - in een macroeconomische context - de koopkrachtpariteitstheorie opgaat, budgettaire politiek in een land gekenmerkt door RLS het produktievolume aldaar niet beïnvloedt. In dit hoofdstuk wordt nagegaan of deze stelling ook opgaat in een twee-sectoren-

Hoofdstuk 3 behandelt het probleem van het terugdringen van het zogenaamde 'dubbeltekort', op zowel de overheidsbegroting als de lopende rekening, alsmede de daaruit voortvloeiende 'dubbele schuld', nl. overheidsschuld en buitenlandse schuld, van de Verenigde Staten van Amerika.

Als voertuig van de analyse fungeert daarbij een macroeconomisch model, met als voornaamste kenmerken imperfecte substitueerbaarheid van financiële activa (portefeuilletheorie in plaats van ongedekte rentepariteit) en van goederen (in plaats van koopkrachtpariteit). Voorts kenmerkt dit model zich door rationele verwachtingen, flexibele prijzen en wisselkoersen, een verklaring voor het investeringsgedrag à la Tobin's q, vermogenseffecten in de consumptiefunctie, kapitaalaccumulatie, de dynamiek van zowel de lopende rekening als van het overheidsbudget alsmede de corresponderende intertemporele budgetrestrietie(s).

Twee alternatieven worden vergeleken: enerzijds bezuinigen op de overheidsbestedingen, anderzijds een tactiek van 'de zaken op hun beloop laten'. Dit laatste heeft een financiële crisis, gemodelleerd als een preferentieverschuiving van Amerikaanse naar Europese obligaties bij Europese beleggers tot gevolg. Eerstgenoemde strategie geeft de beste resultaten. Reeds op korte termijn dalen beide tekorten; op lange termijn vindt een substantiële sanering van beide schuldposities plaats. De politiek van 'niets doen' resulteert op lange termijn weliswaar in een veel lagere buitenlandse schuld, maar slechts in een geringe daling van de overheidsschuld. Bovendien is het consumptievolume gedurende een reeks van jaren lager dan in de uitgangssituatie. Deze resultaten zijn tamelijk ongevoelig voor variaties in de gedragsparameters, met name ook in de loonvormingsfuncties.
Het model van de hoofdstukken 4 en 5 is in wezen een desaggregatie van het model van hoofdstuk 3. Een ander belangrijk verschil is een 'alomvattend' reëel beschikbaar inkomen in de consumptiefunctie in plaats van de reële toegevoegde waarde van bedrijven. In hoofdstuk 4 worden de gevolgen van financiële integratie nagegaan, in hoofdstuk 5 de consequenties van de integratie van goederenmarkten. De wijze van modelleren van integratie in beide hoofdstukken vertoont een sterke mate van gelijkenis. In hoofdstuk 4 wordt een uitgangssituatie, waarin een unilaterale budgettaire impuls leidt tot renteverschillen, vergeleken met een situatie waarin op korte termijn de nominale rentepariteit blijft gehandhaafd. Op lange termijn is er na de voltooiing van de financiële integratie een geringer renteverschil tussen de actieve (expansieve) regio en de passieve regio, alsmede een grotere buitenlandse schuld van de actieve regio. In hoofdstuk 5 wordt een uitgangssituatie, waarin sprake is van imperfecte substitueerbaarheid van tradable goederen en diensten, vergeleken met een situatie waarin voor tradables de 'Law of One Price' geldt. In zowel de uitgangssituatie als de 'alternatieve' situatie van hoofdstuk 5 is het proces van financiële integratie overigens voltooid.

Beide typen integratie blijken de (spill-over) effecten van budgettaire politiek te beïnvloeden. Bovendien zijn soms de effecten van tradables- en nontradables-impulsen verschillend, waaraan een argument kan worden ontleend dat desaggregatie van belang is.

In hoofdstuk 6 wordt een in reële termen geformuleerd tweelanden-twee- sectoren algemeen evenwichtsmodel als instrument van de analyse gehanteerd. Dit model wordt gekenmerkt door imperfecte substitueerbaarheid van binnen- en buitenlandse financiële activa, intertemporeel optimaliserende economische subjecten, eindige levens, intertemporele budgetrestricties voor de overheid en de particuliere sector, kapitaalaccumulatie, de dynamiek van de lopende rekening en een flexibele wisselkoers. Wederom worden de consequenties van de integratie van goederenmarkten voor de (spill-over) effecten van het budgettair beleid worden nagegaan. Echter, thans worden vier bij het modelleren van integratie van goederenmarkten belangrijke grootheden onder de loupe genomen: een verhoging van de substitutie-elasticiteit tussen binnen- en buitenlandse tradables, een verhoging van het aandeel van geïmporteerde tradables in de consumptie van tradables, een positieve
produktiviteitsschok in de tradables-sectoren en een verlaging van invoerrechten. Er worden drie budgettaire impulsen onderscheiden, namelijk expansieve politiek ten aanzien van 'home produced' tradables, geïmporteerde tradables en nontradables. De gevolgen van de integratie van goederenmarkten voor de (spill-over) effecten van budgettaire beleid zijn afhankelijk van de wijze van modelleren enerzijds en het type budgettaire impuls anderzijds.

In hoofdstuk 7 worden de effecten van een verhoging van de overheidsinvesteringen nagegaan. Dit wordt gedaan aan de hand van een macroeconomisch tweelanden-model, met als voornaamste karakteristieken statische verwachtingen, zowel flexibele prijzen als wisselkoersen, imperfecte substitueerbaarheid van zowel binnen- en buitenlandse financiële activa als goederen, de klassieke spaarhypothese, kapitaalaccumulatie, de dynamiek van zowel de lopende rekening als het overheidsbudget, op korte en middellange nominale loonstarheid in de ene regio en reële loonstarheid in de andere regio.

Op korte termijn beïnvloedt een dergelijk beleid louter de effectieve vraag. De resultaten zijn dan min of meer de standaardresultaten voor dit type modellen. Een expansief beleid in het RLS-land doet de produktie in beide landen stijgen ('locomotive policy'), terwijl een budgettaire expansie in het NLS-land de produktie aldaar doet toenemen ten koste van het andere land ('beggar-thy-neighbour policy').

Op lange termijn stijgt de produktie(capaciteit) in het actieve land sterk; het passieve land incasseert ruilvoetwinsten en geniet een overschot op de kapitaalopbrengstenbalans. Dit lange termijn aanbodeffect is hét verschil met de hoofdstukken 3, 4 en 6, waarin het expansieve land geconfronteerd wordt met 'crowding out' van de investeringen, een hogere overheids- en buitenlandse schuld.
ERRATA  Essays in Interdependent Macro- and Mesoeconomics  Martin van Tuijl

pagina 4  '...' moet zijn '

pagina 5  'or the medium run' moet zijn 'or to the medium run'

paragraaf 6.2  'LGP = tg β' moet zijn 'l + LGP = tg β'

pagina 142  G moet zijn G_m^∗

pagina 143  'represent' moet zijn 'represents'

pagina 144  'government debt' moet zijn 'government debt (D)'

pagina 145  C_m - C_m^* E_h moet zijn C_m^* - C_m E_h

pagina 153  'influences' moet zijn 'influences'
  'is concered' moet zijn 'are concerned'
  'nontradable' moet zijn 'nontradables'
  'the degree of GMI' moet zijn 'the way GMI is modelled'

pagina 154  'more micro-founded way' moet zijn 'a more micro-founded way'

pagina 170  'Appendix II' moet zijn 'Appendix 7.II''

Het juiste nummer van het vaak geciteerde CentER Discussion Paper 'Fiscal Aspects of Monetary Integration in Europe', van de hand van F. van der Ploeg, is 8930.