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Economic Structure, the Exchange Rate and Adjustment in the Federal Republic of Germany: A General Equilibrium Approach

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Abstract

This paper traces the effects of an appreciation of the deutsche mark with the help of a computable general equilibrium model under alternative structural policy scenarios. In the first scenario, characterized by severe structural rigidities, the contractionary effects of exchange rate appreciation dominate the expansionary effects so that GDP and employment fall and the external surplus declines only little. In the alternative (and polar opposite) case of free movement of goods, services, and factors, the expansionary effects of the appreciation become more prominent as supply and demand respond much more readily to the relative price changes.

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When efforts to redress international economic imbalances among major industrial countries began in 1985, emphasis was placed on macroeconomic policies and exchange rate changes. As room for maneuver in these policies diminished, however, and the adjustment remained far from complete, the focus has shifted recently to structural policies.

With regard to the Federal Republic of Germany, the view has gained strength that trade liberalization, as well as deregulation of goods, services, and labor markets, would make a major contribution to the external adjustment of this economy by increasing its responsiveness to exchange rate changes that have already taken place. The present paper examines this hypothesis by investigating the effects of structural rigidities and protectionist practices on the adjustment process in Germany. The analysis is conducted in the form of an illustrative quantitative exercise in which the effects of an exogenous appreciation of the deutsche mark are examined under different structural policies.

In the first case, characterized by severe structural rigidities, the contractionary effects of the appreciation (i.e., the loss in exports, output, and employment in the exposed industries) dominate the expansionary effects (i.e., the increase in output and employment in the nontraded goods sector) so that GDP and employment fall, and the external surplus declines only little. In the second (and polar opposite) case of free movement of goods, services, and factors, the expansionary effects of the appreciation become more prominent as supply and demand respond much more readily to the relative price changes. Allowing for a likely increase in real domestic demand, both real GDP and employment are significantly higher, and the external surplus falls considerably.

I. Introduction

When efforts to redress the international economic imbalances among major industrial countries began in 1985, the emphasis was on macroeconomic policies and exchange rate changes. However, with the room for maneuver in these policy areas diminishing and the adjustment being far from complete, the focus has recently shifted to structural policies. In particular with regard to Germany, the view has gained strength that trade liberalization as well as deregulation of goods, services, and labor markets would make a major contribution to the external adjustment of this economy by increasing its responsiveness to the exchange rate changes that have already taken place. The present paper seeks to examine this hypothesis by investigating the effects of structural rigidities and protectionist practices on the adjustment process in Germany. The analysis is conducted in the form of an illustrative quantitative exercise in which the effects of an exogenous appreciation of the deutsche mark are examined under different structural policies. The results of this investigation indicate that structural policy action, supported by macroeconomic policies consistent with the nominal targets of the German authorities' medium-term economic strategy, would indeed facilitate external adjustment in an environment of higher growth, lower unemployment, and lower inflation. In the following section, several protectionist practices and rigidities that could be obstacles to adjustment are identified. Section III outlines an analytical framework for a quantitative analysis of the effects of these policies and rigidities on the German economy and section IV presents the results of the illustrative exercise. Section V discusses possible costs of adjustment to more liberal policies and some concluding observations are contained in section VI.

II. Impediments to Adjustment

In an open economy, which is free from restrictions on international trade and the domestic flow of resources and where foreign currency prices of traded goods are largely determined on world markets, an appreciation of the exchange rate lowers the domestic currency price of traded goods and, everything else being equal, also the general price level. The decline in prices elicits higher real consumption (real balance effect) leading to higher domestic demand and an increase in imports. At the same time, the supply of exports and import substitutes declines in response to lower domestic currency prices of these goods. As a result, the volume of exports falls relative to that of imports. Higher domestic demand militates against a fall in the price of nontraded goods (the supply of which is limited by the production potential of the economy) even though there might be downward pressure on input costs; thus the increase in the relative price of these goods that was elicited by the decline in the price of traded goods is reinforced. Consequently, there is a shift of resources from the traded goods' industries to the sector producing nontraded goods. Real GNP (and, if there is slack in the labor market, employment) rises if the nontraded

goods' sector absorbs more resources than those released by the traded goods' sector. 1/ Then, the increase in domestic demand (weighted by its share in GNP) will exceed the sum of the increase in imports and the decrease in exports (each also weighted by its respective share in GNP). 2/

The smooth adjustment of the German economy to an appreciation of the deutsche mark, however, is likely to be hampered by a number of sectoral policies and rigidities. First, the system of variable subsidies and import levies in the agricultural sector and the coal mining industry is designed so that, in addition to providing considerable protection against external competition, it offsets the price effects of a currency appreciation for these sectors (Table 1). As a result, output and employment in these sectors are not reduced by the appreciation. Also, a given nominal appreciation of the deutsche mark has a smaller effect on the domestic price level, domestic demand and the resource allocation in the economy. Thus, for a given nominal appreciation, the real exchange rate appreciates more so that exporters in the unprotected industries face a sharper decline in the external demand for their products (or a greater squeeze on their profits). In other words, they have to carry a larger burden of the adjustment. Whether the deterioration of the real trade position is smaller than in the absence of these protective policies depends on the size of the net exports in the protected sectors relative to those of the unprotected sectors and the price elasticities of export and import demand.

Second, import quotas, voluntary export restraints, and other non-tariff barriers impede the response of imports of a number of products (such as textiles, clothing, iron, steel and ships) to an appreciation of the deutsche mark. Given the lesser competitive pressure from abroad in these sectors, the domestic prices of the goods are likely to decline by less than in a regime of free trade. As described above, this leads to smaller effects of the nominal appreciation on the general price level, domestic demand and the reallocation of resources in the economy

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1/ Guitián (1976) showed that this is likely to be the case when the share of the non-traded goods' sector in total output is smaller than that of the traded goods' sector.

2/ Growth of GNP is given by $gnp = (DD/GNP)*dd + (X/GNP)*x - (M/GNP)*m$ with DD denoting domestic demand, X exports, M imports and lower case letters standing for percentage changes. Partial analysis would suggest that GNP falls in response to an appreciation due to the negative influence from trade. In contrast, general equilibrium analysis suggests that there are forces which militate against a decline of GNP. For instance, the improvement in the terms of trade and the decline in the price level elicited by the appreciation are likely to boost real private consumption through income, wealth, and real balance effects. Higher real consumer expenditures and the need to improve competitiveness in the traded goods' sector would support real investment; and a fiscal policy that follows medium-term nominal expenditure targets would temporarily lead to higher real public consumption.

Table 1. Germany: Protection in Selected Economic Sectors in 1982

Sector	Type of Protection	Degree of Protection 1/ (In percent)
Agriculture	Tariff with quota, import licensing, variable duties and subsidies	233.5
Coal mining	Quota, variable subsidies	137.5
Iron and steel	Quota, voluntary export restraint, minimum pricing	30.1
Shipbuilding	Subsidies	16.2
Textiles	Quotas, import licensing	38.3
Clothing	Quotas, import licensing	46.3

Sources: F.D. Weiss, "Importrestriktionen der Bundesrepublik Deutschland," Die Weltwirtschaft 1985/2 (p.99); World Bank/UNCTAD Inventory of Non-Tariff Barriers; OECD, Costs and Benefits of Protection, Paris 1985; and own estimates.

1/ Calculated as the sum of the rate of effective protection and the ratio of subsidies to value added.

while eliciting a larger real appreciation and shifting of the burden of adjustment from import-competing to exporting companies and from the protected to the unprotected industries. In those industries where protection is afforded through subsidies, domestic prices have to follow domestic-currency prices of imported goods in order to maintain a constant share of imports in the domestic market. This necessitates larger government expenditures on subsidies and thus requires either more government borrowing or measures to increase revenue. Increased government borrowing may contribute to higher interest rates (and, possibly, a further appreciation of the currency) and, not unlike an increase in taxes, raise the costs and reduce the competitiveness of the unprotected industries.

Third, the immobility of labor between industries 1/ and the numerous regulations that exist in the services sector (Table 2) might lower the supply response of the nontraded goods' sector to an improvement in the relative price of goods produced in this sector. As a consequence, prices in this sector are likely to rise by more than they would otherwise have done, resulting in less of a fall in the domestic price level, a smaller increase in domestic demand, a larger real currency appreciation and, probably, a greater squeeze on the traded goods' sector.

The importance of the industries affected by these protectionist practices, regulations, and rigidities for the German economy can be seen from Table 3. In this table, agriculture and coal mining are consolidated into a sector producing "basic goods". 2/ Iron, steel, textiles, clothing and shipbuilding are aggregated into a sector dubbed "protected goods", and industries producing services that are less likely to be traded internationally, such as professional services, retail trade, etc., are combined in a "nontraded goods'" sector. The remaining industries are aggregated into a "traded goods'" sector. 3/

1/ There are a number of impediments to labor mobility both on the demand and on the supply side. On the demand side, laws enacted for the protection of employees have over time increased the costs of lay-offs for companies with the result that employers have become reluctant to hire even when their business outlook is improving; often they prefer to invest with a view to increasing the productivity of the existing work force to meet higher demand. On the supply side, relatively generous unemployment benefits and a deep rooted regionalism have tended to discourage laid-off workers from bearing the adjustment costs associated with a change to a new industry and/or region. See Burda and Sachs (1987).

2/ Industries with similar characteristics were aggregated into sectors in order to facilitate the quantitative analysis following in sections IV and V.

3/ From the service industries listed in Table 2 only telecommunications and transportation were allocated to the "traded goods'" sector given their potential (telecommunications) or actual (transportation) role in the international trade in services.

Table 2. Germany: Rules and Regulations

Industry/Sector	Type of regulation	Likely effect
Professional services	Access to industry regulated by state or professional organizations; limited price competition; regulated advertising.	monopolistic rents for the provider of these services, sluggish supply response to higher demand.
Retail trade	Construction of shopping centers regulated by government; price competition regulated; shop-opening hours regulated.	limited price competition and shop opening hours imply welfare loss for consumers and probably lower consumption.
Banking	Exemption from cartel law; competiton regulated by credit law.	concentration and price collusion lead to monopolistic rents of banking industry.
Insurance	Exemption from cartel law; certain insurances mandatory; insurance contracts regulated by state; market access regulated; profit margins regulated.	protection against external and domestic competition leads to monopolistic rents for insurance industry.
Capital markets	Cumbersome legal requirements for incorporated companies; limited access of medium-sized and smaller companies to stock market; protection of mutual stock funds against external competition; prohibition of financial futures markets.	limited role of stocks both as a source of financing and in private portfolios.
Telecommunication	State monopoly	significantly higher prices for telecommunications services than in some other countries; limited access of foreign manufacturers of equipment to German market; sluggish supply response to higher demand.
Energy	Local monopolies for the generation and distribution of energy; price regulation for private consumers.	limited competition of different energy sources; inefficiencies in energy production.
Transportation	State monopoly for railways; limited access to and price regulation of the taxi and busing industry; price controls and limited access to trucking industry; price controls for shipping; limited access to and price regulation of airline industry.	monopolistic rents for existing companies; sluggish supply response to higher demand.

Source: Rüdiger Soltwedel et al., Deregulierungspotentiale in der Bundesrepublik. Tübingen 1986.

Table 3. Germany: Stylized Structural Features of the Economy in 1982

	Basic Goods Sector	Protected Goods Sector	Traded Goods Sector	NonTraded Goods Sector
Value added (in percent of total)	5.6	3.8	56.2	34.4
Private consumption (in percent of total)	14.1	5.2	45.3	35.4
Public consumption (in percent of total)	--	--	--	100.0 1/
Investment (in percent of total)	--	2.7	79.9	17.4
Exports (in percent of total)	5.4	9.6	85.0	-- 2/
Export orientation (exports in percent of output)	8.9	19.8	20.3	-- 2/
Imports (in percent of total)	14.0	10.6	75.4	-- 2/
Import penetration (imports in percent of total use)	17.3	16.6	14.0	-- 2/
Employment (in percent of total)	4.2	5.3	54.3	36.1
Fixed capital (DM per employed person)	173,916	132,360	168,084	130,733
Average annual remuneration (DM per employed person)	32,046 3/	34,939	37,710	36,027
Rate of return to capital (in percent)	6.1 4/	4.6	13.4	14.8

Source: Statistisches Bundesamt, Input-Output-Tabellen 1982 (Fachserie 18, Reihe 2), Stuttgart, Mainz 1987; and own calculations.

1/ The German input-output table has a "government sector" which creates the goods used by government. This sector was included in the non traded goods sector.

2/ Some of the industries included in the non traded goods sector do in fact export and import. For the following analysis, however, trade of these industries was disregarded.

3/ Excludes self-employed in agriculture.

4/ Estimate.

In 1982, the industries most heavily protected from international competition (i.e., the so-called "basic goods" and "protected goods" producing industries) accounted for about 9 1/2 percent of GDP and employment. Basic and protected goods held a share in total exports and imports of 15 percent and 25 percent, respectively, and imports accounted for 17 percent of the total use of these goods--in the traded goods' sector the import penetration ratio was 14 percent. Within the nontraded goods' sector, services subject to a significant degree of government regulation (Table 2) accounted for about 55 percent of value added. 1/ Notably, the return to productive factors was lower in the protected industries than in the rest of the economy. However, reflecting the strength and centralized organization of German trade unions, differences in the return to labor were small relative to those in the return to capital. The basic goods' industries, with a relatively low return to capital, had the highest capital:labor ratio, while the nontraded goods' industries, which had the highest return to capital, were the most labor intensive.

The nature and pervasiveness of certain protectionist practices and structural rigidities in the German economy would suggest that there are indeed impediments to the response of the economy to exchange rate changes. It is, however, impossible to give a quantitative assessment of the importance of these impediments without a numerically specified model that facilitates a "counterfactual" simulation, i.e., the reaction of the German economy to an appreciation of the deutsche mark without the sectoral policies and structural rigidities that hinder the adjustment. An analytical framework that allows counterfactual simulations is presented in the following section.

III. Analytical Framework

Econometric models of an economy in general rely on historical evidence for the quantification of relationships between aggregated economic variables. As these estimates depend on a given set of structural features, they are not suited to establishing counterfactual reactions of an economy to an exogenous shock, such as a currency appreciation, under different structural policy regimes. For this, a computable general equilibrium (CGE) model of the sort described below is a better instrument. The advantage of CGE models is that they are firmly based on microeconomic theory and that many parameter estimates are in fact derived at the microeconomic level; they are therefore likely to be more stable and less susceptible to the problem of "structural breaks."

The computable general equilibrium model used for the following illustrative exercise is comparative-static and belongs to the type of so-called Johansen models; it follows closely the version developed by

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1/ The telecommunications and transportation industries that were classified as traded goods' industries accounted for about 12 percent of the value added of this sector.

Dixon et al. (1982). The model emphasizes the role of relative prices and substitution possibilities in explaining trade flows and the commodity composition of domestic activity. The essential postulates governing producer and consumer behavior are profit and utility maximization. The model distinguishes the four productive sectors described in the previous section (basic goods, protected goods, traded and nontraded goods), four types of final demand (investment, government consumption, private consumption, and exports) that are satisfied either from domestic sources or from imports, and three types of primary inputs (labor, capital and land). It is numerically specified using a 1982 input-output table for Germany and parameter estimates culled from the literature. The equations of the model can be grouped into equations for input demand, final demand, supply behavior, market equilibrium, and a number of miscellaneous equations defining macroeconomic aggregates.

a. Input demand

Producers are assumed to minimize the costs of production subject to a two-level production function. The first level imposes constant returns to scale and Leontieff complementarity between different types of intermediate inputs and between intermediate and primary inputs. The second level allows for CES substitution between imported and domestically produced intermediate inputs 1/ and between different types of primary factors. The solution of this optimization problem yields a set of equations for producers' factor demand. Thus, in a given sector (sector j) demand for both domestically produced and imported intermediate inputs (INTERINPUT) depends on the activity level and the prices of imports and domestic products (P): 2/

(1)-(12) INTERINPUT[DOM,i,j] = F1(Z[j], P[DOM,i], P[IMP,i]); i = 1, 2, 3; j = 1, ... 4.

(13)-(24) INTERINPUT[IMP,i,j] = F2(Z[j], P[DOM,i], P[IMP,i]); i = 1, 2, 3; j = 1, ... 4.

(25)-(28) INTERINPUT[DOM,4,j] = F3(Z[j]); j = 1, 2, 3, 4.

Equations (25)-(28) relate input-demand for nontraded goods (which are produced by sector 4) only to activity levels in the demanding industries, as there are no imports to substitute for domestic deliveries.

1/ Following Armington (1969), it is assumed that domestically produced goods and imported goods are imperfect substitutes.

2/ A full set of variable names is given in Table 4.

Table 4. German Model: Notation of Variables

Variable name	Interpretation	Number
INTERINPUT[DOM,i,j]	Sector j's use of domestic intermediate inputs, delivered by sector i.	16
INTERINPUT[IMP,i,j]	Sector j's use of imported intermediate inputs of type i.	12
LAB[j]	Use of labor by sector j.	4
CAP[j]	Use of fixed capital by sector j.	4
LAND[j]	Use of land by sector j.	1
Z[j]	Total production in sector j.	4
INV[DOM,i]	Investment demand for domestically produced goods of type i.	4
INV[IMP,i]	Investment demand for imported goods of type i.	3
INV[TOTAL]	Total investment.	1
CONS[DOM,i]	Consumption of domestically produced goods of type i.	4
CONS[IMP,i]	Consumption of imported goods of type i.	3
CONS[TOTAL]	Total consumption	1
GOV[DOM,4]	Government consumption of domestically produced goods of type i.	1
EX[i]	Exports of domestically produced goods of type i.	3
IMP[i]	Imports of type i.	3
P[DOM,i]	Price of domestically produced goods of type i.	4
P[IMP,i]	Price of imports of type i.	3
P[LAB]	Price of labor.	1
P[CAP]	Price of capital.	1
P[LAND]	Price of land.	1
FCP[EX,i]	Foreign currency price of exports of type i in the world market.	3

Table 4 (continued). German Model: Notation of Variables

Variable name	Interpretation	Number
FCP[IMP,i]	Foreign currency price of imports of type i in the world market.	3
XRATE	Exchange rate (measured in local currency per unit of foreign currency).	1
MARKUP [i]	Mark-up factor in foreign trade (covering transport, insurance, etc.).	3
SUBSIDYRATIO [i]	1 plus the ad valorem rate of export protection.	3
DUTYRATIO [i]	1 plus the ad valorem rate of import protection.	3
LAB	Supply of labor	1
CAP	Supply of capital	1
LAND	Supply of land	1
NINV [TOTAL]	Total nominal investment	1
IPI	Price index for investment goods	1
NCONS [TOTAL]	Total nominal consumption	1
CPI	Price index for consumer goods	1
NGOV[DOM, 4]	Nominal government consumption	1
GDP	Gross domestic product	1
E	Total exports	1
M	Total imports	1
Y	Real income	1
EP	Export price index (in foreign currency)	1
MP	Import price index (in foreign currency)	1
NABS	Nominal absorption	1
TB	Real trade balance	1
P[LAB]R	Real wage	1
	Total	107

The equations for primary input-demand (labor, capital, and land) relate each sector's demand to its activity level and the prices of labor, capital and land: 1/

(29)-(32) LAB[j] = F4(Z[j], P[LAB], P[CAP], P[LAND]); j = 1, .., 4

(33)-(36) CAP[j] = F5(Z[j], P[LAB], P[CAP], P[LAND]); j = 1, .., 4

(37) LAND[j] = F6(Z[j], P[LAB], P[CAP], P[LAND]); j = 1

b. Final demand

(1) Investment

Investors are assumed to minimize costs subject to a given level of investment. Thus, the model allows for substitution between imports and domestically produced investment goods, when relative prices change. Total investment in real terms is derived from total nominal investment (NINV[TOTAL]) and the price index for investment goods (IPI).

(38)-(41) INV[DOM,i] = F7(INV[TOTAL], P[DOM,i], P[IMP,i]); i = 1, .., 4

(42)-(44) INV[IMP,i] = F8(INV[TOTAL], P[DOM,i], P[IMP,i]); i = 1, .., 3

(45) INV[TOTAL] = NINV[TOTAL] / IPI.

(2) Household consumption

Consumers are assumed to maximize their utility subject to an overall budget constraint. The resulting set of equations relates consumption demand for domestic and imported goods (CONS) to aggregate consumption and the prices of domestic and imported goods. Real aggregate consumption is derived from total nominal consumption (NCONS[TOTAL]) and the price index for consumer goods (CPI).

(46)-(49) CONS[DOM,i] = F10(NCONS[TOTAL], P[DOM,1], P[DOM,2], P[DOM,3],
P[DOM,4], P[IMP,1], P[IMP,2], P[IMP,3]); i = 1, .., 4

1/ Note that only sector 1 (basic goods) uses land as a productive factor.

(50)-(52) CONS[IMP,i] = F11(NCONS[TOTAL], P[DOM,1], P[DOM,2], P[DOM,3], P[DOM,4], P[IMP,1], P[IMP,2], P[IMP,3]); i = 1, 2 ,3

(53) CONS[TOTAL] = NCONS[TOTAL] / CPI

(3) Government consumption

Like private consumption, real government consumption is derived from nominal government consumption (NGOV) and the price index for goods consumed by the government. Since government services are solely provided by the "nontraded services' sector" (sector 4), 1/ this relationship can be expressed as follows:

(54) GOV[DOM,4] = NGOV[DOM,4] / P[DOM,4]

(4) Exports

The model describes total export-demand as a function of world prices for the exported good, measured in foreign currency.

(55)-(57) EX[i] = F14(FCP[EX,i]); i = 1, .., 3 2/

c. Supply

(1) Imports

As in the case of exports, import supply of each good rises in response to an increase in the foreign currency price of imports.

(58)-(60) IMP[i] = F15(FCP[IMP,i]); i = 1, .. , 3 3/

1/ The German input-output table has a "government sector" which creates the goods used by government. This sector is contained in the nontraded goods' sector of the model.

2/ The Armington assumption implies that goods are differentiated by source of production. Thus, German exporters face a downward sloping foreign demand curve.

3/ Implicit in this treatment of import supply is the assumption that the rest of the world produces goods for the German market that are not complete substitutes for goods shipped to other markets. In other words, the Armington assumption also holds for import supply.

(2) Domestic supply

A constant-returns-to-scale technology and zero pure profits are assumed for all productive sectors. 1/ Thus, the individual producer chooses the output level which equates marginal costs with the output price:

(61)-(64) P[DOM,i] = F16(P[DOM,j], P[IMP,w], P[LAB], P[CAP], P[LAND]; j = 1, ...4 but j ≠ i, w = 1, ...3); i = 1, ...4.

Here, F16 is the marginal cost of production.

d. Domestic prices and world market prices

Domestic and import prices for traded goods are determined by the respective foreign currency prices of those goods, the exchange rate, the mark-ups in foreign trade (for transport, wholesale, retail services, etc.), the subsidy ratio (defined as 1 plus the ad valorem rate of subsidies) in the case of domestic goods, and the duty ratio (defined as 1 plus ad valorem rate of import protection) in the case of imports.

(65)-(67) P[DOM,i] = FCP[EX,i] * XRATE * SUBSIDYRATIO[i] * 1/MARKUP[i]; i = 1, .., 3

(68)-(70) P[IMP,i] = FCP[IMP,i] * XRATE * DUTYRATIO[i] * MARKUP[i]; i = 1, .., 3

e. Market clearing

The model is closed by a set of equations which link demand and supply by imposing market clearing on factor and product markets.

(1) Markets for primary factors

The clearing of factor markets requires that the sum of the demand for labor and capital equals total supply. 2/ The supply of land equals demand for this factor by the basic goods producing sector.

1/ The assumption of zero pure profits implies that there are no undistributed profits. Rents to productive factors, however, are not excluded.

2/ Note that market clearing does not necessarily imply full employment of all factors. In fact, as outlined below, the model allows the fixing of factor prices at above full employment levels and the equilibrating of supply and demand at these prices.

(71) $LAB = \sum_j LAB[j];\ j=1, \ldots 4$

(72) $CAP = \sum_j CAP[j];\ j=1, \ldots 4$

(73) $LAND = LAND[1]$

(2) Domestic production

The clearing of the product markets for output from the four sectors requires that total domestic production satisfy aggregate demand:

(74)-(77) $Z[i] = \sum_j INTERINPUT[DOM,i,j] + INV[DOM,i] + CONS[DOM,i] + GOV[DOM,i] + EX[i];\ i = 1, .., 4$

f. Miscellaneous equations

The model also includes a number of equations that define macroeconomic aggregates, such as GDP, aggregate exports and imports, etc.

(78) $GDP = CONS[TOTAL] + INV[TOTAL] + GOV[DOM,4] + E - M$

(79) $E = \sum_i Ex[i];\ i=1, \ldots 3$

(80) $M = \sum_i IMP[i];\ i=1, \ldots 3$

(81) $Y = F81(EP/MP, GDP)$

(82) $EP = \sum_i w(x,i)FCP[EX,i],\ i=1, \ldots 3$

(83) $MP = \sum_i w(m,i)FCP[IMP,i],\ i=1, \ldots 3$

(84) $CPI = \sum_i w(cd,i)P[DOM,i] + \sum_j w(cm,j)P[IMP,j],\ i=1, .. 4,\ j=1, ..3$

(85) $IPI = \sum_i w(id,i)P[DOM,i] + \sum_j w(im,j)P[IMP,j],\ i=1, ..4,\ j=1, ..3$

(86) NCONS = F86 (NABS)

(87) NINV = F87 (NABS)

(88) NGOV = F88 (NABS)

(89) TB = EP * E - MP * M

(90) P[LAB]R = P[LAB] / CPI

Equation (81), for example, defines real income as a function of real GDP and the terms of trade. Equations (86)-(88) relate nominal private and public consumption, and investment to nominal domestic absorption. 1/ Equation (89) defines the real trade balance as the difference between exports and imports corrected for terms of trade effects and equation (90) defines the real wage rate as the nominal wage rate deflated by the consumer price index.

g. Parameter settings

Most of the parameters needed for the numerical specification of the model can be derived from the 1982 German Input-Output table. 2/ There are, however, a number of other parameters that have to be taken from econometric studies or, if not available, assumed. Table 5 shows the values of these parameters that were used for the following simulations.

The consumption parameters were derived from a linear expenditure system. The underlying household utility function was assumed to be additive; thus the uncompensated own price elasticities (n_{ii}) and cross price elasticities (n_{ij} for $i \neq j$) can be derived as follows: 3/

$$n_{ii} = (\xi_i/w) - \xi_i\alpha_i[1 + (\xi_i/w)]$$

$$n_{ij} = -\xi_i\alpha_j[1 + (\xi_j/w)] \quad \text{for } i \neq j$$

1/ In the following experiments it is assumed that the shares of (private and public) consumption and investment in domestic absorption remain unchanged.

2/ See Dixon et al. (1982) for details.

3/ See Lluch et. al. (1977).

Table 5. German Model: Key Parameter Settings

	Basic goods	Protected goods	Traded goods	Nontraded goods
Expenditure elasticity 1/	0.5	0.5	1.0	1.2
Elasticity of substitution between domestic production and imports 2/	1.0	1.0	0.9	...
Elasticity of substitution between primary factors 3/	0.3	1.0	1.0	1.0
Price elasticities of import supply 4/	2.0	2.0	1.3	...
Price elasticities of export demand 5/	-1.3	-1.3	-1.0	...

1/ Based on Lluch et al (1977), p. 54.

2/ Based on Lächler (1985), p. 85 and staff calculations. These elasticities are assumed to be the same for all uses.

3/ A simple Cobb-Douglas production function was assumed to characterize the protected, traded, and non-traded goods sectors, while the substitution elasticity for primary factors in the basic goods sector was set at a level, which brought the output supply price elasticity in line with estimates from the literature.

4/ The parameters give the percentage change of import supply in the respective sector in response to a 1 percent change in the foreign currency price of imports. These parameters enter equations (58)-(60).

5/ The parameters give the percentage change of export demand in the respective sector in response to a 1 percent change in the foreign currency price of exports. These parameters enter equations (55)-(57).

Here ξ_i represents the expenditure elasticity and α_i the budget share for product i, while w is the Frisch parameter. The Frisch parameter was set at -1.83. 1/

The elasticities of substitution between domestically produced and imported products were specified on the basis of an econometric study for Germany by Lächler (1985). On the supply side, a Cobb-Douglas production function was assumed for the protected, traded, and nontraded goods sectors and a CES function for the basic goods sector; the elasticity of substitution between primary factors in the latter sector was specified such that the supply elasticity was broadly in line with estimates from the literature.

No sector-specific information was found in the literature for the price elasticities of import supply and export demand. Appropriate values for these parameters were therefore determined by numerous sensitivity analyses with the model.

h. Solving the model

The equations of the model are first transformed into a log-linear form that allows solving by simple matrix methods. 2/ The model in the form described above consists of 107 variables and 90 equations. Thus, in order to arrive at a solution, 17 variables have to be assumed exogenously. The selection of the exogenous variables and the design of the simulations is described in the following section.

IV. Design of Experiments and the Simulation Results

The selection of the exogenous variables of the model follows from the assumptions about the macroeconomic environment in which the exchange rate shock takes place, and the specific protectionist practices and structural rigidities that are to be analyzed. While the macroeconomic environment was assumed to be the same for all experiments that were conducted, a number of different sectoral policies and rigidities were investigated that required changes in the set of exogenous variables. Table 6 provides an overview of the variables assumed exogenously in each of the simulations.

The simulations were intended to trace the short run (1-2 year period) effects of a 10 percent increase in the nominal value of the deutsche mark (induced exogenously by a shift in international portfolio preferences) on the German economy. Thus, it was assumed that (i) capital and land are fixed factors of production in each sector and investment does not add to the productive capital stock in an industry during

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1/ Using the relationship between per capita GDP and w estimated by Lluch et al (1977), p. 248.

2/ The design of the model ensures that there is a unique solution provided that the matrix to be solved is not singular (see Dixon et al., 1982).

Table 6. German Model: Values of Exogenous Variables 1/

(In percentage changes from base period)

Variables	Base Line	Scenarios (1)	(2)	(3)	(4)
CAP[j] j=1,..,4	0	0	0	0	0
LAND[1]	0	0	0	0	0
MARKUP[i] i = 1,..,3	0	0	0	0	0
SUBSIDYRATIO[1]	0	(en)	0	0	(en)
SUBSIDYRATIO[2]	0	0	0	0	0
SUBSIDYRATIO[3]	0	0	0	0	0
DUTYRATIO[1]	0	(en)	0	0	(en)
DUTYRATIO[2]	0	0	(en)	0	(en)
DUTYRATIO[3]	0	0	0	0	0
XRATE	-10	-10	-10	-10	-10
NABS	0	0	0	0	0
P[LAB]R	0	0	0	(en)	(en)
P[DOM, 1]	(en)	0	(en)	(en)	0
P[IMP, 1]	(en)	0	(en)	(en)	0
IMP[2]	(en)	(en)	0	(en)	0
LAB[4]	(en)	(en)	(en)	0	0
Total	17	17	17	17	17

1/ (en) indicates that variable is endogenous in this experiment.

the period under investigation; (ii) proportional mark-ups in foreign trade are constant; (iii) real wages are constant and above full employment levels; 1/ and (iv) fiscal and monetary policy continue to follow the nominal targets of the authorities' medium-term economic strategy so that nominal domestic absorption is maintained unchanged. The latter assumption implies that monetary policy supports nominal private consumption and investment by allowing monetary expansion to exceed nominal GDP growth when the latter is reduced by a decline in the external surplus, 2/ and that the government maintains growth of nominal expenditures unchanged even if, due to lower nominal income growth direct tax revenues decline and the budget deficit widens.

The "baseline" simulation establishes the counterfactual reaction of the economy to the appreciation of the deutsche mark, i.e., the likely developments in the absence of protectionist practices and structural rigidities. As shown in Table 6, in addition to the above-mentioned variables, the subsidy and duty ratios were assumed to be unchanged for this simulation. Four alternative scenarios were designed to illustrate the effects of the protectionist practices and structural rigidities. In scenario 1, it was assumed that variable import levies and export subsidies isolate the basic goods' sector from the effects of the appreciation. Thus, the prices of the domestically produced and imported products of this sector were assumed to remain unchanged while the subsidy and duty ratios were endogenously determined by the model so

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1/ Real wages that are rigid and above full employment levels have been a common characteristic of most European countries during the 1980s.

2/ In principle, the decline in the domestic price level elicited by the exchange rate appreciation will increase real financial household balances which in turn will boost real consumption and contribute to a decline in the savings rate. Higher real consumer demand, together with a higher rate of return for capital, will then stimulate real investment. The role of monetary policy in this context is to support these effects by stabilizing nominal private absorption through monetary expansion in line with potential output growth and some acceptable and sustainable rate of price increases.

as to offset the change in the exchange rate. 1/ In scenario 2, it was assumed that quotas, voluntary export restraints and other nontariff barriers present in the protected goods' sector prevent imports competing with the goods produced by this sector from reacting to the appreciation. 2/ Hence, imports of these goods were assumed to remain unchanged while the duty ratio, which in this case measures the tariff equivalent of the nontariff barriers in this sector, was endogenously determined by the model. In scenario 3, it was assumed that government regulations and labor market rigidities prevent output and employment in the nontraded goods' sector from reacting to the appreciation. This, of course, is an extreme assumption which serves only as a benchmark for a more complex reality. However, the regulations on market access and competition in industries such as retail trade, financial services, and professional services, and the (voluntary and systematic) restrictions to labor mobility all contribute to a sluggish supply response of the nontraded goods' sector to an increase in demand. Hence, changes in the demand for goods produced by this sector lead to changes in the return to the productive factors employed there. By assumption, changes in the return to labor employed in the nontraded goods' sector affect the general wage level. 3/ Thus, employment is assumed to remain unchanged in the nontraded goods' sector while the real wage rate is determined endogenously in the model. Finally, in scenario 4, all of the above protectionist practices and structural rigidities together were assumed to influence the adjustment of the economy to the exchange rate shock.

1/ While these assumptions are in accordance with the key principles of the EC Common Agricultural Policy and the German support scheme for coal mining, the implementation of these policies is in reality slightly different. For example, the authorities are likely to take into account, at least partly, the effects of an appreciation on costs and factor incomes in the respective sectors when they set prices there. Moreover, subsidies are given to two main industrial users of coal, the steel and electricity industry, in order to partly compensate them for the use of high priced German coal. In the case of steel, the subsidies are born by the federal budget and in the case of electricity, the costs of the subsidies are passed on to the consumers (Kohlepfennig). While these arrangements may alleviate the direct effects of the coal support scheme on the respective industries, they do not change the final effects on the German economy. In either case, relative prices are distorted and aggregate production costs increase.

2/ Protection for shipbuilding, which has been afforded largely in the form of subsidies, was not separately modeled. Instead, it was assumed that measures similar to those in the other protected industries were taken to reduce competition from imports.

3/ This assumption, which again is only a crude approximation of reality, reflects the low degree of inter-sectoral wage differentiation (see Table 3) and the highly centralized organization of the German trade unions. This organization has contributed to the fast diffusion of wage increases from one industry to the other industries in the economy.

The results of the baseline simulation and deviations from the baseline under the four alternative scenarios are presented in Tables 7 and 8. In interpreting these tables it is important to keep in mind that the results are contingent upon the numerous model assumptions and the assumed parameter values. They are therefore more of the nature of controlled laboratory experiments than projections of actual developments of the German economy in response to an appreciation of the deutsche mark. The simulation results of the baseline scenario indicate the percentage deviation of a variable in response to the exchange rate shock from the level it would have otherwise attained after all the domestic and international effects have worked their way through the economy. The results of the alternative policy simulations are reported as percentage deviations of the endogenous variables from the baseline simulation.

In the absence of protection and structural rigidities, a 10 percent appreciation of the exchange rate lowers domestic consumer prices by about 4 1/2 percent (Table 7). With nominal domestic absorption maintained by macroeconomic policies, the decline in the consumer price level leads to a corresponding increase in real domestic absorption. 1/ Import volumes are buoyed by higher domestic demand and the decline of the domestic currency price of imported goods relative to that of domestic products. The increase in imports is, however, smaller than that of domestic absorption as demand for imported inputs, which comprise about half of total imports, rises less than that for imported consumer and investment goods. 2/ Exports, on the other hand, decline by around 5 1/2 percent owing to the increase in prices expressed in foreign

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1/ Note that the increase in real domestic absorption is not explicitly explained by the model. The result is, however, in line with conventional wisdom: real private consumption increases as a result of higher real income and real balance effects, elicited by the decline in the price level and the expansionary effects of a monetary policy that follows nominal potential GDP growth rather than actual growth; real investment increases due to accelerator effects and a higher return to capital; and real government expenditures increase as the authorities stick to their medium-term nominal expenditure targets.

2/ The buoyancy of imports with respect to GNP is slightly greater than 2 and close to the historical average in Germany over the recent years. The (general equilibrium) elasticity of imports with respect to the real exchange rate is about 0.7 percent, a little higher than most econometric estimates of the partial real exchange rate elasticity of imports.

Table 7. Germany: Alternative Patterns of Adjustment to a 10 percent Appreciation of the Exchange Rate--Macroeconomic Results

(In percentage changes from base period or baseline) 1/

	Baseline	Deviations from Baseline Under Alternative Scenarios (1)	(2)	(3)	(4)
Output	1.8	-1.0	-0.2	-4.3	-4.0
Absorption	4.4	-1.3	-0.2	-3.5	-3.7
Exports	-5.5	0.1	-0.2	-4.0	-2.9
Imports	3.7	-0.7	-0.4	-0.8	-1.7
Trade balance 2/	-27.2	5.5	2.6	5.4	11.8
Employment	2.8	-1.6	-0.3	-6.8	-6.3
Consumer prices	-4.4	1.3	0.2	3.5	3.7
Real exchange rate	5.6	1.3	0.2	3.5	3.8
Terms of trade	2.8	0.5	0.4	4.4	3.9
Real income	2.6	-0.9	-0.1	-3.1	-2.9
Real wage	--	--	--	4.4	2.9

1/ Results for the baseline simulation indicate percentage deviations of endogenous variables from the values they would have attained in the absence of the exchange rate shock. Results for the alternative policy simulations indicate percentage changes from the baseline simulation.

2/ Absolute change in billions of 1982 deutsche mark.

Table 8. Germany: Alternative Patterns of Adjustment to a 10 Percent Appreciation of the Exchange Rate-- Sectoral Results

(In percentage changes from base period or baseline) 1/

	Baseline	Deviations from Baseline Under Alternative Scenarios (1)	(2)	(3)	(4)
Output					
Basic goods	0.1	1.3	-0.1	-2.1	-0.2
Protected goods	-1.5	-1.3	0.5	-5.3	-4.3
Traded goods	0.7	-1.1	-0.2	-4.5	-4.2
Non traded goods	4.2	-1.3	-0.2	-4.2	-4.2
Employment					
Basic goods	0.2	3.2	-0.2	-3.0	-0.6
Protected goods	-1.8	-1.5	0.6	-6.2	-5.0
Traded goods	1.1	-1.7	-0.3	-7.2	-6.7
Non traded goods	6.5	-1.9	-0.3	-6.5	-6.5
Exports					
Basic goods	-6.8	13.8	--	-0.6	10.6
Protected goods	-6.4	-1.3	-0.9	-5.8	-5.9
Traded goods	-5.4	-0.6	-0.1	-4.0	-3.4
Imports					
Basic goods	3.8	-3.0	-0.1	-1.2	-4.5
Protected goods	3.5	-0.2	-3.5	-0.2	-3.5
Traded goods	3.7	-0.4	--	-0.9	-1.0
Prices					
Basic goods	-5.5	5.5	--	0.3	5.5
Protected goods	-6.4	0.6	2.4	2.6	4.5
Traded goods	-4.9	0.5	0.1	3.5	2.9
Non traded goods	-3.0	0.6	0.1	5.0	4.0

1/ Results for the baseline simulation indicate percentage deviations of endogenous variables from the values they would have attained in the absence of the exchange rate shock. Results for the alternative policy simulations indicate percentage changes from the baseline simulation.

currency. 1/ As a result, the real trade balance deteriorates by about DM 27 billion (in 1982 prices, equivalent to about 1.9 percent of GDP). The increase in domestic absorption, however, more than compensates for the lower exports and higher imports, so that GDP rises by about 1.8 percent; owing to the improvement in the terms of trade, real income increases by even more. With capital and land being fixed factors of production, the increase in aggregate output triggers an over proportionally large increase in employment. 2/

As a result of the deterioration in the external balance, nominal GDP falls by about 1 3/4 percent. Revenue of the government from direct taxes and social security contributions can be expected to decline by a similar percentage 3/ so that the general government deficit increases by a little more than 1/2 percentage point of GDP. 4/ With the ratio of investment to GDP up by a little less than 1/2 percentage point, the share of private savings in GDP declines by about 3/4 percentage points. These changes in the savings-investment balance are in line with historical experience. Indeed, the projected increase in the fiscal deficit is of the same magnitude as the expected actual increase for 1987-88, and the projected decline in the private savings rate is considerably smaller in absolute amount than the increase that took place in 1985-87.

A better insight into the way the economy adjusts to the exchange rate shock can be obtained from the sectoral results presented in Table 8. The appreciation leads to a large drop in domestic currency prices of protected goods, the sector with the highest exposure to

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1/ The elasticity of exports with respect to the real exchange rate is about one. Econometric studies have usually arrived at a value a little smaller than this. Part of the discrepancy can be explained by the assumed absence of protectionist practices and structural rigidities under the baseline simulation, which contributes to higher trade elasticities in the economy. Indeed, in scenario 4, the export and import elasticities decline to 0.9 and 0.2, respectively.

2/ Given the assumption of constant returns to scale, the percentage change in output equals the weighted average of the percentage changes of factor inputs plus any efficiency gains that may arise from a reallocation of factors among industries. In the case of Germany, there are only very small differences in the marginal returns to labor across industries so that efficiency gains do not arise. Thus, the increase in employment is almost identical to the increase in output divided by the share of labor in total value added (0.63).

3/ Indirect taxes will remain largely unaffected since they are related to nominal domestic absorption which remains unchanged.

4/ This implies a largely neutral fiscal policy stance as the decline in total government revenue is smaller than that of nominal GDP and the ratio of expenditures to potential nominal GDP remains broadly unchanged.

international trade. 1/ This sector benefits relatively little from the increase in domestic absorption and, as a consequence, it suffers relatively large losses in output and employment. The basic goods' sector is less dependent on foreign demand and is therefore able to maintain output and employment despite the sharp drop in exports and increase in imports. The traded goods' sector, on the other hand, benefits from the appreciation despite greater competition from imports as the increase in domestic demand more than compensates for the decline in exports. The clear winner, however, is the nontraded goods' sector. As anticipated, the rise in domestic demand, and the decline in the domestic currency price of those goods that are traded internationally, leads to a significant improvement in the relative price for nontraded goods. This triggers an expansion of output and an increase in employment. Nevertheless, absolute prices fall also in this sector--although by a smaller amount than in the other sectors--due to the lower input and nominal wage costs.

Variable import levies and subsidies in the basic goods' sector neutralize the exchange rate effects on prices in this sector; consequently, prices for basic goods increase sharply relative to those for other goods (and vis-à-vis the baseline simulation) in the presence of these policies (Table 8, scenario 1). This leads to a rise in employment and output in this sector that far exceeds the domestic demand for basic goods. The surplus production has to be dumped in the world market if a buildup of stocks is excluded; hence, exports increase sharply. 2/ The output and employment gains of the basic goods' sector are at the expense of the other sectors. Higher input and nominal wage costs (because of the assumption of constant real wages and the spillover effects from food prices into the consumer price index) lead to an increase in domestic prices that reduces foreign and domestic demand for products produced in these sectors. The resulting drop in output and employment in these sectors is larger than the rise in the basic goods' sector so that GDP and aggregate employment decline by about 1 percent and 1 1/2 percent, respectively, vis-à-vis the baseline simulation. Owing to somewhat higher exports and lower imports as well as a larger terms-of-trade gain, the trade balance declines by DM 5 1/2 billion (equivalent to 0.4 percent of GDP) less than in the baseline simulations. The consumer price level and the real value of the deutsche mark

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1/ Like the basic goods' sector, the protected goods' sector has a higher price elasticity of imports and exports, and a higher substitution elasticity between imported and domestically produced goods, than the traded goods' sector. Its export orientation (measured as exports in percent of output) is only a little smaller than that of the traded goods' sector, but more than twice as high as that of the basic goods' sector. Also, its import penetration ratio is only slightly smaller than that of the basic goods' sector but substantially larger than that of the traded goods' sector.

2/ In reality, part of the increase in production would, of course, lead to stock accumulation and therefore to a smaller rise in exports than projected in this illustrative exercise.

rise by 1.3 percent against the baseline, which implies a corresponding fall in real domestic absorption.

If trade barriers prevent imports in the protected goods' sector from responding to the appreciation, relative prices, output and employment increase in this sector compared with those in the baseline simulation (Table 8, scenario 2). The effects of these trade restrictions are, however, much smaller than those of the variable import levies and export subsidies used as an instrument of protection in the basic goods' sector. As a consequence, the effects on other sectors and the economy at large are also less severe than under scenario 1. Nevertheless, protectionist practices in the protected goods' sector are likely to result in a decline in GDP and domestic absorption of about 0.2 percent, a fall in aggregate employment of 0.3 percent, and an increase in the real trade balance of DM 2.6 billion (or 0.2 percent of GDP, Table 7) vis-à-vis the baseline scenario. In addition to shifting the burden of adjustment to other sectors of the economy, import protection in the protected goods' sector has also the effect of hurting exporting companies in this sector, as evidenced by the fall of almost 1 percent (against the baseline scenario) of exports of these protected goods.

More serious than the protectionist practices analyzed in scenario 2 are the labor market rigidities and regulations, which are assumed to prevent output and employment in the nontraded goods' sector from reacting to the shift in demand toward nontraded goods elicited by the exchange rate change (scenario 3). Indeed, with output failing to respond to higher demand, prices of nontraded goods increase by 5 percent against the baseline which, due to the assumptions of zero pure profits and equalization of wage increases across sectors, leads to a real wage increase of almost 4 1/2 percent. Sharply higher wage costs result in higher domestic prices (and a larger real appreciation) than in the baseline simulation and a deterioration of the international competitiveness of the economy. This leads to a drop in exports, output and employment. As a result of the lower domestic activity level, imports fall too and the real trade balance improves by almost DM 5 1/2 billion (0.4 percent of GDP) relative to the baseline scenario. The effects of the rigidities simulated in this scenario are so strong that real income, GDP and aggregate employment all fall not only vis-à-vis the baseline simulation but also vis-à-vis the base period.

Finally, when all the protectionist practices and structural rigidities so far considered are combined, the exchange rate shock, which under the baseline simulation led to an improvement in income and employment, has negative implications for the economy. As in the previous scenario, real income, GDP, and employment all decline vis-à-vis both the baseline simulation and the base period. In addition, helped by protectionist trade policies, exports decline by less and imports by more than in scenario 3, so that the trade balance improves by almost DM 12 billion (or 0.8 percent) vis-à-vis the baseline simulation. In the latter, a 1 percent increase in the real exchange rate led to a

DM 4.9 billion deterioration of the real trade balance. In scenario 4, the same real exchange rate change is capable of inducing a change in the real trade balance of only DM 1.6 billion.

V. The Costs to Adjustment

While the economy clearly would be better off if more liberal policies were followed, there are some groups of the population who are likely to lose and it is the strong resistance of those groups that has prolonged protectionist policies and structural rigidities. Table 9 presents the change in the real return to productive factors as a result of the exchange rate shock under the baseline simulation and alternative scenarios. Under scenario 1, the return to capital and land in the basic goods' sector increases substantially over the baseline simulation. Similarly, under scenario 2, the return to capital in the protected goods' sector increases, and under scenario 3 the return to those who are able to hang on to their jobs despite the decline in employment rises sharply. When all protectionist practices and structural rigidities are combined, as in scenario 4, however, it is only the return to capital and land in the basic goods' sector and the return to those who manage to maintain their jobs despite the slowdown of economic activity that is higher than in the baseline simulation. The returns to fixed factors in all other sectors is lower and so, of course, is the return to those who have to rely on unemployment support as a result of the job losses generated under scenario 4. Seen from this perspective, it is not surprising that the strongest resistance against more liberal policies in Germany comes from the representatives of agriculture and the coal mining industry and from those with a high degree of job security, i.e., the employees and workers in the nontraded goods' sector who anticipate an increasing demand for their services.

VI. Concluding Remarks

The exercise conducted in this paper has illustrated how certain protectionist practices in Germany are capable of impeding the adjustment of the economy to an exogenous exchange rate shock. These distortions are likely to lead to income, output and employment losses as well as to a slowdown of the adjustment process itself. Inefficient domestic producers are protected at the expense of more efficient foreign and domestic suppliers, which, in addition to short-term welfare losses, is also likely to have long-term consequences for the growth potential and the dynamics of the economy.

Table 9. Germany: Real Return to Productive Factors 1/
Under the Baseline and Alternative Scenarios

(In percentage changes from base period or baseline) 2/

	Baseline	Deviations from Baseline Under Alternative Scenarios (1)	(2)	(3)	(4)
Labor					
Total economy	--	--	--	4.4	2.9
Capital					
Basic goods 3/	0.5	10.6	-0.5	-11.9	1.0
Protected goods	-1.8	-1.5	0.7	-1.8	-2.0
Traded goods	1.1	-1.7	-0.4	-2.9	-3.8
Non traded goods	6.5	-0.7	-0.4	-2.1	-3.6

1/ Nominal returns deflated by the consumer price index.
2/ Results for the baseline simulation indicate percentage deviations of endogenous variables from the values they would have attained in the absence of the exchange rate shock. Results for the alternative policy simulations indicate percentage changes from the baseline simulation.
3/ Return to capital and land.

The paper has also illustrated how labor market rigidities and regulations are likely to combine with protectionist policies to generate an environment in which an appreciation of the exchange rate is a serious threat to economic growth and employment. In the absence of these distortions, and with appropriate macroeconomic policies, the economy would react positively to an appreciation of the exchange rate, with output, employment, real income, and absorption all up, and prices and the trade surplus down. Resistance against more liberal economic policies, however, is likely to come from well organized interest groups that stand to lose if present policies are changed.

References

Armington, Paul S. "The Geographic Pattern of Trade and the Effects of Price Changes". IMF Staff Papers Vol. 16, July 1969, pp. 176-199.

Burda, M.C., Sachs, J.D., "Institutional Aspects of High Unemployment in the Federal Republic of Germany." National Bureau of Economic Research, Working Paper No. 2241, Cambridge, MA, May 1987.

Dixon, Peter B., Brian R. Parmenter, John Sutton, and David Vincent, ORANI - A Multisectoral Model of the Australian Economy. (Amsterdam: North Holland, 1982).

Guitián, Manuel, "The Effects of Changes in the Exchange Rate on Output, Prices and the Balance of Payments." Journal of International Economics 6 (1976) pp. 65-74.

Lächler, U., "The Elasticity of Substitution between Imported and Domestically Produced Goods in Germany," Weltwirtschaftliches Archiv, Kiel, Vol. 121, (No. 1, 1985), pp. 74-96.

Lluch, C., Powell, A.A., and William, R.A., Patterns in Household Demand and Saving, (Washington, D.C.: Oxford University Press, 1977).

OECD, Costs and Benefits of Protection. (Paris: OECD, 1985).

Soltwedel, Rüdiger et al., Deregulierungspotentiale in der Bundesrepublik. (Tübingen: J.C.B. Mohr, 1986).

Statistisches Bundesamt, "Input-Output-Tabellen 1982". Fachserie 18, Reihe 2. (Stuttgart, Mainz: Kohlhammer, 1987).

Weiss, F.D., "Importrestriktionen der Bundesrepublik Deutschland". Die Weltwirtschaft 1985 No.2.