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TRADE AND EXCHANGE RATE POLICY IN BRAZIL
AND TURKEY

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International Institute for Applied Systems Analysis
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FOREWORD

Many of today's most significant socioeconomic problems, such as slower economic gorwth, the decline of some established industries, and shifts in patterns of foreign trade, are inter- or transnational in nature. Intercountry comparative analyses of recent historical developments are necessary when we attempt to identify the underlying processes of economic structural change and formulate useful hypotheses concerning future developments. The understanding of these processes and future prospects provides the focus for IIASA's project on Comparative Analysis of Economic Structure and Growth.

This study analyzes trade flows for eleven countries and examines in detail the effects of depreciation policies for two developing countries. It was written during the author's stay with IIASA in summer 1985.

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Project Leader
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Economic Structure and Growth

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TRADE AND EXCHANGE RATE POLICY IN BRAZIL AND TURKEY

J.H.A. van Maanen

Introduction and Outline

The purpose of this paper is to investigate the lower growth of bilateral trade flows in relation to the lower growth of the Gross Domestic Product (GDP) in the years 1979-1983. Attention is then turned to the effects of monetary policy on trade flows, given GDP growth.

The investigation used eleven countries. These are split into three groups: two developing countries - Turkey and Brazil - three socialist countries - Hungary, the Soviet Union (USSR), and the German Democratic Republic (GDR) - , and six market oriented developed countries - Italy, France, the United Kingdom (UK), the United States (US), the Netherlands, and the Federal Republic of Germany (FRG)-.*

The investigation has three steps: one to research the link between depressed GDP and trade, two the depreciation of currencies and three, the effects upon trade.

The first step is to investigate the slower growth of bilateral trade flows in relation to slower GDP growth. To this end the average GDP growth is calculated in the period 1963 up to 1978. Then this growth is

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* The countries are chosen more or less at random.

extrapolated for 1979 up to 1983. The resulting figures are compared with actual GDP figures to obtain an assessment of the slow down of GDP growth after 1978. These results are used in an equation which links GDP to bilateral trade flows. After the estimation of this equation, two sets of simulated trade flows are presented: one using actual GDP figures and one using extrapolated GDP figures. The differences between the two sets of trade flows indicate the extent to which bilateral trade flows decline in relation to decreased GDP growth.

The second step is to investigate briefly the currency depreciation in the years 1979-1983. For this purpose the depreciation of the currency versus the US, corrected for the difference in inflation (so called real depreciation) is examined. Thus two developments must be reviewed: the exchange rate movements of a currency versus the US $ and the difference in inflation between a particular country and the US. These developments are modelled as a set of equations estimated for the period up to 1978. After 1978 these equations are simulated for 1979-1983 under the assumption of extrapolated GDPs. This provides a background from which the actual exchange rate movements and inflation can be viewed. Turkey and Brazil show clearly that they followed a policy of impressive real depreciation, while the developed countries pursued minor real depreciation or even pursued minor real appreciation policy.

In the third step the effects of real depreciation policies upon the volume of bilateral trade flows is examined. Actual bilateral trade flows are compared with simulated trade flows. A ratio (actual bilateral trade flows over simulated trade flows) is calculated annually. This allows the calculation of an index for total exports and imports. This index shows a qualitatively different movement in case of Brazil and Turkey than in case of the other countries. The import indices of Brazil and Turkey show a decline over time while the other import indices remain stable. This indicates that Brazil and Turkey show decreasing propensities to import. The export index of Brazil shows an increase over time, while the export index of Turkey remains stable over time. Most other export indices show a decline. This indicates a better performance in exports of Brazil and Turkey than most other countries.

1. The slow down of GDP

The first step taken in the investigation was to examine a general economic indicator for the period 1963-1983: the volume of Gross Domestic Product (GDP). To obtain data for GDP volume for developed and developing market oriented countries the International Financial Statistics (IFS) were used.

For the socialist countries Net Material Product (NMP) was used as a proxy for their GDP. In this paper the GDP in case of socialist countries refers to NMP.

Once the data for the volume of GDP were collected, the period 1963-1983 was divided into two parts: 1963-1978 and 1979-1983. For 1963-1978 a level of GDP was calculated under the assumption of no shortfalls in demand and full utilisation of production capacity. It is assumed that this level of GDP was reached only once or twice in 1963-1978.

In all other years the actual GDP falled short of this calculated level. The mathematical procedure was to estimate a function for each country:

$$\exp(a_i+fa_i) * \exp(b_i *(t-1962)) \qquad (1)$$

which fullfills the requirements. In this function suffix i indicates country i (US, USSR, etc.); t is a time parameter (t= 1963, 1964, ... 1978). The coefficients a_i and b_i were derived by minimising in a_i and b_i the following function:

$$\lim_{k \to \infty} \left(\sum_{t=1963}^{t=1978} (\ln(GDP_{it})-a_i-b_i(t-1962))^k \right)^{\frac{1}{k}} \qquad (1')$$

The coefficient b_i is an indication for the growth of GDP_i in country i.* The line $a_i + b_i(t-1962)$ was displaced upward by adding a factor fa_i (different for each country) which locates the line so two conditions hold:

$$\text{a) } \exists \ \ln(GDP_{it})_{t=1963,\ 1964\ \text{etc}}',\quad \ln(GDP_{it}) = (a_i+fa_i) + b_i(t-1962)$$

$$\text{b) } \forall \ \ln(GDP_{it})_{t=1963,\ 1964\ \text{etc}}',\quad \ln(GDP_{it}) \leq (a_i+fa_i) + b_i(t-1962)$$

The effect of this procedure is that a level of GDP was calculated under which full utilisation of production capacity could be assumed. Downfalls from this level are thought to be related to underutilisation of the production capacity, which could be caused by shortfalls in demand.

After estimating a_i, fa_i and b_i in eq. (1), extrapolations were made for 1979-1983 upon these estimates. Shortfalls of actual GDP to extrapolated GDP is seen as an indication for the recession since 1979. Table 1 displays the relative difference between the actual and extrapolated GDP values for all countries analyzed. Moreover the b_i are shown. Of the countries analyzed, Brazil and Turkey show the greatest percentage shortfall. In the next paragraph these results are used to assess the slower growth of bilateral trade flows.

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* The estimates for a_i and b_i are sensitive to the period chosen for which (1') was minimised. Therefore it seems the best to take the same period (1963-1978) for each country. 1963 was chosen as the first year because this is the first year for which each country in the sample has data on the volume of GDP and 1978 was chosen because after 1978 dramatic changes occurred in most countries in the sample.

Table 1 % difference between extrapolated GDP volume and actual GDP volume

Country	U.S.	F.R.G.	U.K.	France	Italy	The Nether-lands	Brazil	Turkey	Hungary	G.D.R.	USSR
b_i*/100	3.3	3.7	2.5	4.7	4.1	4.1	9.0	6.4	6.1	5.0	6.4
Year											
1979	3.1	8.0	6.4	9.6	9.7	9.0	15.6	13.6	7.5	3.9	11.4
1980	6.8	9.2	11.4	13.7	9.9	13.1	17.5	22.2	15.0	4.3	14.0
1981	7.7	13.6	16.0	18.7	14.2	19.2	30.1	24.9	19.2	4.6	17.4
1982	13.7	19.0	16.1	21.9	19.4	26.7	40.5	27.2	24.2	6.4	20.9
1983	13.3	21.9	15.1	26.6	25.8	31.3	58.1	30.9	30.7	7.6	24.4

*b_i from eq. (1). This coefficient can be interpreted as the average growth of GDP in 1963-1978.

2. The implications for trade

To investigate the relationship between reduced GDP growth and trade, one has to have a model which links GDP to trade flows. The gravity model was used for that purpose. The form of the equation is:

$$X_{ij} = f(Y_i, Y_j, D_{ij} \quad .. \quad) \qquad (2)$$

where the flow from i to j, X_{ij}, is a function of characteristics of i (Y_i), j (Y_j) and the distance between i and j (D_{ij}). Other variables can be added to these explanatory variables. In this case X_{ij} is the volume of trade from i to j. The subscripts i and j stand for the 11 countries (US, FRG, France, etc.). $Y_{i(j)}$ indicates the volume of $GDP_{i(j)}$ and D_{ij} is the distance in kilometers between i and j.

Eq. (2) is in this paper:

$$X_{ij} = \exp(a_0) Y_i^{a_1} Y_j^{a_2} D_{ij}^{a_3} d\,\text{Hun}^{a_4} d\,\text{GDR}^{a_5} d\,\text{USSR}^{a_6} \qquad (3)$$

To facilitate the estimation the logarithmic form was taken. Hence:

$$\ln X_{ij} = a_0 + a_1 \ln Y_i + a_2 \ln Y_j + a_3 \ln D_{ij} + a_4 d\,\text{Hun} + a_5 d\,\text{GDR} + a_6 d\,\text{USSR} \qquad (3')$$

d Hun is a dummy variable which is 1 if Hungary is a trade partner - otherwise d Hun is 0. The same holds for d GDR and d USSR. d GDR is 1 if the GDR is a trade partner and d USSR is 1 if the USSR is a trade partner. These dummy variables have been added since their trade policy is different from the market oriented countries. Eq. (3) is estimated for a cross section of trade flows for each year separately in 1970-1983. Each year has in principle 11 times 11 (=121) trade flows. Excluded from the data were internal trade flows (X_{ii}). Moreover trade

flows between socialist countries and trade flows between FRG and GDR were excluded since no consistent data were available for thes flows. For each year in the period 1970-1983 102 trade flows were estimated using Ordinary Least Squares (OLS).*

Because data for the volume of bilateral trade, X_{ij}, are not available, these data were constructed. So, data for bilateral trade in current US $ prices were collected from the Direction of Trade Statistics (DOTS). These figures were divided by a product:

$$p_x(t) \frac{Er\ (80)}{Er\ (t)}$$

where $p_x(t)$ stands for the unit value of export in the year t (t=1970, 1971, ... 1983). For 1980 $p_x(t)$ is 100. This index is assumed to be equal to bilateral prices.**

Er(t) represents the exchange rate, defined as local currency versus the US $. The source for $p_x(t)$ and Er(t) is IFS and Comecon data. This yields an estimate of the price of exports, corrected for exchange rate movements. This can be interpretated as an index of export prices in US $. The nominal trade flows were divided by the above product yielding the trade flows in constant prices. These figures were used for X_{ij}. For Y_i it was necessary to divide the GDP, which was given in constant prices in local currency, by the exchange rate to obtain GDP figures denominated in the same currency (the US $).

Table 2 displays estimates for the sets of coefficients for 1970-1983. Here - as in literature*** - the coefficients to Y_i, Y_j and D_{ij} show a remarkable stability over time.

The dummy variables for Hungary, a_4, shows a remarkable change over time which can be attributed to the change in exchange rate policy in

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* Since the sample has no zero trade flows OLS yields unbiased estimates. See: Van Maanen (p 9)

** A simular assumption is made in the LINK project. See: Ball.

*** For a survey of the literature: Van Maanen.

Hungary. This is not the case for the GDR and the USSR, which also show remarkable increases over time in their dummy variables. This indicates a greater propensity to trade with market economies.

Table 2 Estimations of the gravity equation

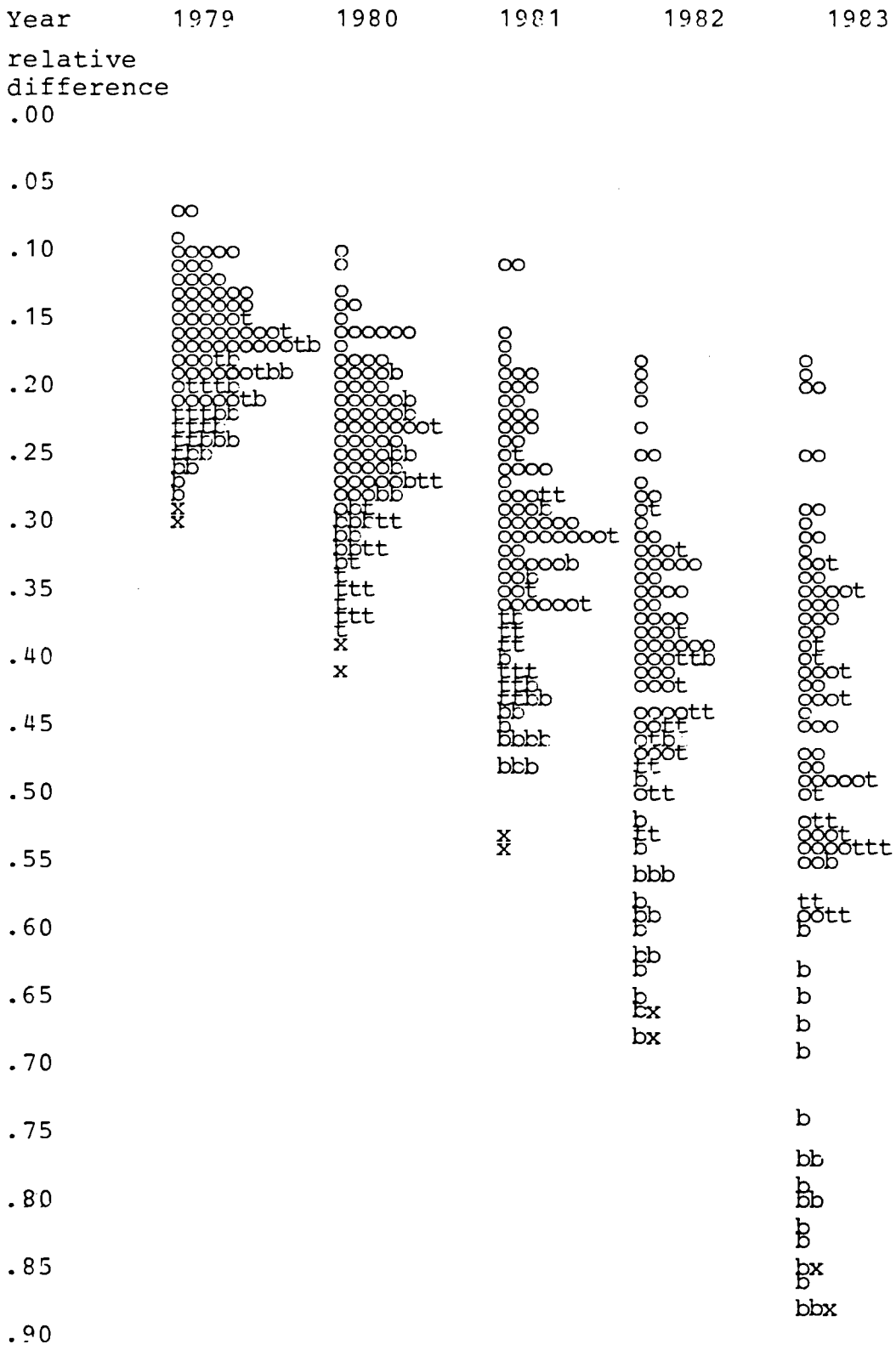
$$\ln(X_{ij}) = a_0 + a_1 \ln(Y_i) + a_2 \ln(Y_j) + a_3 \ln(D_{ij}) + a_4 d\,\text{Hun} + a_5 d\,\text{GDR} + a_6 d\,\text{USSR}$$

year	a_0	a_1	a_2	a_3	a_4	a_5	a_6	R^2
1970	-0.31	0.66	0.82	-0.68	-0.20	-1.76	-1.68	0.83
t-val.	-0.32	8.80	10.89	-9.16	-0.56	-5.84	-6.69	
1971	-0.42	0.65	0.86	-0.69	-0.03	-1.85	-1.66	0.86
t-val.	-0.49	9.57	12.66	-10.40	-0.09	-6.88	-7.44	
1972	-0.62	0.66	0.87	-0.67	-0.14	-1.92	-1.59	0.85
t-val.	-0.69	9.39	12.31	-9.80	-0.44	-6.91	-6.89	
1973	-0.84	0.68	0.88	-0.66	-0.14	-2.02	-1.46	0.87
t-val.	-0.97	10.05	12.92	-10.05	-0.45	-7.58	-6.61	
1974	-0.76	0.67	0.87	-0.65	0.03	-2.00	-1.30	0.90
t-val.	-1.07	11.97	15.55	-12.31	0.12	-9.30	-7.29	
1975	-0.88	0.71	0.94	-0.73	0.09	-1.93	-1.17	0.86
t-val.	-1.01	10.05	13.31	-11.15	0.29	-7.27	-5.33	
1976	-0.79	0.69	0.93	-0.71	0.00	-1.76	-1.08	0.86
t-val.	-0.88	9.59	12.98	-10.85	0.01	-6.54	-4.88	
1977	-1.05	0.72	0.97	-0.75	0.24	-1.70	-1.11	0.85
t-val.	-1.12	9.55	12.91	-10.91	0.71	-6.05	-4.00	
1978	-2.00	0.81	1.01	-0.73	0.64	-1.41	-1.09	0.87
t-val.	-2.38	12.14	15.03	-11.83	2.17	-5.62	-5.24	
1979	-2.39	0.87	1.04	-0.75	0.77	-1.15	-0.95	0.87
t-val.	-2.77	12.59	15.04	-11.73	2.50	-4.45	-4.43	
1980	-2.02	0.83	1.03	-0.76	0.69	-1.17	-0.92	0.86
t-val.	-2.26	11.71	14.40	-11.60	2.17	-4.37	-4.12	
1981	-1.71	0.80	0.96	-0.72	0.37	-1.42	-0.95	0.87
t-val.	-2.04	11.90	14.31	-11.59	1.22	-5.68	-4.55	
1982	-1.90	0.82	0.95	-0.70	0.29	-1.38	-0.90	0.85
t-val.	-2.12	11.34	13.18	-10.69	0.93	-5.21	-4.04	
1983	-1.53	0.82	0.89	-0.71	0.23	-1.59	-0.80	0.83
t-val.	-1.58	10.58	11.52	-9.96	0.66	-5.57	-3.33	

major deviations in trade if Brazil and Turkey are trade partners. Table 3 also shows the increasing relative differences over time between simulated trade flows under extrapolated GDP ($X_{ij}ch^s$) and simulated mode flows under actual GDP (X_{ij}^s). In 1979 the relative difference between between $X_{ij}ch^s$ and X_{ij}^s if these trade flows refer to trade between Turkey and Brazil is around .30. In 1983 the relative difference in those trade flows is between .85 and .90. This increasing difference is due to the increasing relative difference in the volume of actual GDP (Y) and extrapolated GDP (Ych). For 1979 the relative difference is .14 for Turkey and .16 for Brazil. In 1983 these same figures are .31 (Turkey) and .58 (Brazil). See also table 1. Using eq.(4) it can easily be seen that this induces an encreasing relative difference between $X_{ij}ch^s$ and X_{ij}^s.

Since most countries show increasing relative differences over time between extrapolated GDP and actual GDP, the relative differences between $X_{ij}ch^s$ and X_{ij}^s increase as well.

Table 3 Relative differences in trade volume



t:trade involving Turkey as trade partner
b:trade involving Brazil as trade partner
x:trade between Turkey and Brazil
o:other trade flows

3. The policy reaction of Brazil and Turkey

Turkey and Brazil reacted to the relative decreasing trends in many ways. One reaction was a sharp real depreciation* of their currency. To investigate this, the price level and the exchange rate was modelled for the market oriented economies. The combination of the trend of prices and exchange rates indicates the trend of the exchange rate movements. This trend is compared with the actual movements of prices and exchange rates. The result was used for an assessment of real depreciation.

Eq. (5) and (6) give the model for the price level.

$$\ln(\text{consr}) = b_0 + b_1 \ln(\text{GDP}) + b_2 \quad h(^{rl}/_{Pcp}) + b_3 \, \text{lhs}_{-1} \qquad (5)$$

$$\ln(\text{gdpdefl}) = c_0 \, c_1 \ln p_m + c_2 \ln(\text{consr}) \qquad (6)$$

In eq. (5) consr is the level of consumption, corrected for price increases; rl represents long term interest rate, Pcp stands for increase in consumer prices and lhs for left hand side. In eq. (6) gdpdefl stands for gdpdeflator and p_m for the index of import price level.

The set up of both eq. (5) and eq. (6) is such that sound economic theory is base for eq. (5) and eq. (6). Eq. (5) is based upon utility maximisation of economic subjects with respect to consumption and saving given their income, rewards for savings and prices of consumer goods. The behavioural function will be characterised by income, interest and consumer prices. If GDP is assumed to be a proxy for income, the above mentioned function will look like eq. (5). Because it was attempted to estimate the same equation for all countries involved, the choice of variables depended upon overall availability of relevant time series.

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* This term is used in contrast to nominal depreciation which only refers to exchange rate movements, without taking into account price differentials.

Eq. (6) has a cost push indicator (p_m) and a demand pull indicator (consr). Here too, the exact choice of the time series depended upon overall availability of relevant time series. Eq. (5) and (6) were estimated for each country separately using yearly figures for the period up to 1978. The data source was IFS. The starting point of the time series was generally in the early 1950's depending upon data availability. The fit was good: the R2 - or explained variation - was well above 95 percent.

In eq. (5) it is not certain which function of the interest rate, ($^{rl}/_{Pcp}$), should be taken. Two functions gave good results: the first differences ($^{rl}/_{Pcp} - {}^{rl}/_{Pcp_{-1}}$) and the $^{rl}/_{Pcp}$, which was lagged 3/4 year. These lagged values were obtained by linear interpolation. In table (4) the results for eq. (5) are given. It is also indicated which function of $^{rl}/_{Pcp}$ was taken.

In all cases possible the standard OLS estimator was used. In some cases the residuals of the equations showed a first order autocorrelation. Then a Generalized Least Squares (GLS) estimator was used. The Durbin Watson statistic is biased toward the hypothesis of no first order correlation if the left hand side is included among the explanatory variables, as in eq. (5). However since the estimates of the coefficients are unbiased in case of first order autocorrelation, the effects of first order autocorrelation in eq. (5) has not been further investigated.

See table 4 for estimates of coefficients in equation (6). With eq. (6) the same procedure with regard to OLS/GLS was used as with eq. (5). First an OLS estimation was derived and the GLS estimator was used only in cases of first order autocorrelation of the disturbance term.

Table 4 Consumption and price equations

$$\ln(consr) = b_0 + b_1 \ln(GDP) + b_2 f(^{rl}/_{Pcp}) + b_3 lhs_{-1}$$

Country and Estimation Procedure	DW	b_0	b_1	b_2	b_3
				lagged $^3/_4$	
the Netherlands	1.37	-3.46	0.67	-0.007	0.29
-OLS-		(-3.92)	(3.99)	(-1.26)	(1.70)
				first diff.	
FRG	1.92	-0.70	0.14	-0.009	0.85
-GLS-		(-1.22)	(1.41)	(-2.87)	(10.39)
				first diff.	
France	1.83	-1.53	0.30	-0.001	0.72
-OLS-		(-1.84)	(1.90)	(-1.90)	(4.82)
				lagged $^3/_4$	
Italy	1.23	-6.94	1.14	-0.0009	
-GLS-		(-8.80)	(17.83)	(-0.42)	
UK	1.64	-2.01	0.40		0.54
-GLS-		(-2.42)	(2.45)		(2.95)
US	1.71	-2.33	0.44		0.58
-GLS-		(-2.56)	(2.57)		(3.53)
Brazil	1.97	-4.32	0.86		0.12
-OLS-		(-2.82)	(3.04)		(0.44)
				first diff.	
Turkey	1.71	-3.18	0.67	-0.0004	0.29
-OLS-		(-2.74)	(2.83)	(-0.34)	(1.18)

$$\ln(gdpdefl) = c_0 + c_1 \ln(p_m) + c_2 \ln(consr)$$

	DW	c_0	c_1	c_2
the Netherlands	1.78	1.82	0.45	1.07
-OLS-		(7.79)	(7.41)	(23.91)
FRG	1.43	0.94	0.43	0.82
-GLS-		(2.64)	(4.69)	(16.98)
France	1.89	0.19	0.54	0.64
-OLS-		(2.00)	(11.07)	(13.08)
Italy	1.45	-3.72	0.52	0.75
-GLS-		[-7.68)	(10.02)	(9.39)
UK	1.67	1.08	0.62	1.12
-GLS-		(6.02)	(10.95)	(6.01)

Table 4 (continued)

US	1.38	1.21	0.31	0.69
-GLS-		(13.23)	(11.72)	(8.86)
Brazil	1.94	-9.50	0.28	2.65
-OLS-		(-16.71)	(0.90)	(8.90)
Turkey	1.08	-4.18	0.76	1.25
		(-10.65)	(4.11)	(5.72)

Eq. (7) relates the exchange rate to differences in short term interest rates (rs) and differences in gdpdeflators (gdpdefl);

$$\ln(Er) = d_0 + d_1 \ln\left(\frac{rs_i}{rs_j}\right)_{-1} + d_2 \ln\left(\frac{gdpdefl_i}{gdpdefl_j}\right) \qquad (7)$$

Here subscripts i and j indicate the countries involved. The exchange rate is defined as the amount of money of country i needed to purchase one unit of country j's currency. One expects a negative sign for d_1 and a positive sign for d_2. Until 1971, the international monetary system was based upon fixed exchanged rates. Since that time a system of managed floating evolved. Hence, only data from 1971 onwards (up to 1978) are utilized. Moreover quarterly data are used.

Another feature of the monetary system is the emergence of multilateral agreements upon exchange rates: in Europe the agreements were known as the "snake" and later the European Monetary System (EMS). This was modelled by estimating the exchange rate of FRG versus the US $. In turn, each of the European currencies was estimated in relation to the German currency - with exception of the UK where the exchange rate versus the US $ was estimated directly.

Table 5 indicates the exchange rates modelled.

Table 5 Exchange rate equations

$$\ln(Er) = d_0 + d_1 \ln\left(\frac{rs_i}{rs_j}\right)_{-1} + d_2 \ln\left(\frac{gdpdefl_i}{gdpdefl_j}\right)$$

Country	d_0	d_1	d_2	R^2	DW
Brazil -vis a vis US- -GLS-	3.39 (41.90)		0.75 (10.94)	.81	1.56
Turkey -vis a vis US- -GLS-	3.60 (30.48)		0.60 (6.63)	.61	2.30
FRG -vis a vis US- -GLS-	0.50 (5.21)	-0.07 (-1.78)	2.68 (4.01)	.38	1.90
the Netherlands -vis a vis FRG- -GLS-	0.06 (6.03)	-0.01 (-1.28)	0.25 (2.37)	.18	1.70
France -vis a vis FRG- -GLS-	0.93 (15.53)	-0.04 (-1.31)	1.10 (5.60)	.55	1.31
Italy -vis a vis FRG- -GLS-	6.35 (112.33)	-0.04 (-1.56)	1.33 (15.06)	.94	1.52
UK -vis a vis US- -GLS-	-0.55 (-7.88)		0.71 (3.27)	.28	1.51

The low R^2 indicate that other important factors were neglected. It was assumed being in the field of policy measures designed to influence exchange rates.

Eq. (5), (6) and (7) form a recursive model. Hence each equation is estimated consistently using OLS/GLS. These equations are estimated for a sample period up to 1978. From 1979 up to 1983 eq. (5), (6) and (7) are simulated. Because these equations are recursive, simulation is very easy.

First eq. (5) was simulated, treating $rl/_{Pcp}$ as exogeneous and under assumption of extrapolated GDP. Then one obtained a high growth path for the level of real consumption. This was substituted in eq. (6) to calculate a growth path for the gdpdeflator. As the growth paths of the gdpdeflators for 8 countries were calculated, the paths for the exchange rates yielded from eq. (7), as the gdpdeflator paths were substituted in eq. (7). For each country, a basic path was calculated for gdpdeflator over exchange rate, assuming an extrapolated GDP growth.
The results are given in table 6.
Table 6 relates the growth path of the variables (indicated by a *) to the actual growth path.
The last column of table 6 indicates whether one sees a real depreciation in relation to the basic growth path. It is clear that Turkey and Brazil pursued a policy of real depreciation. Despite their high inflation rates, they enforced a depreciation which more than compensated the inflation rate. The result is that their products are low in price in comparison to the world market. Thus exports are stimulated.
In other countries deviations are less clear. In comparison to the basic growth path, some countries show depreciated currencies, with respect to the US, while others show appreciated currencies. All deviations were within a range of ± 25 percent in 1983.

4. Influences upon trade volumes

The influence upon trade volumes was assessed with the help of the gravity model, see eq. (3). The actual bilateral trade flows were divided by a norm for international trade, which was derived from the gravity model.
A major problem was to decide which GDP one has to substitute in the gravity equation. If the actual GDP is substituted, one gets a norm which is a norm based upon depressed GDP figures, thus biasing the norm downwards. If one substitutes the extrapolated GDPs in the equation, this would bias the norm upwards. A solution was found to incorporate

Table 6 Simulated and actual values compared
note:all exchange rates are calculated vis a vis the US

Year	$\frac{GDP(Ch)}{GDP}^*$	$\frac{Consr}{Consr}^*$	$\frac{Gdpdefl}{Gdpdefl}^*$	$\frac{Er}{Er}^*$	$(\frac{\frac{Gdpdefl}{Er}}{\frac{Gdpdefl}{Er}})^*$
		United States			
1979	1.03	1.01	0.99		
1980	1.07	1.03	0.97		
1981	1.08	1.05	0.92		
1982	1.14	1.08	0.89		
1983	1.13	1.07	0.87		
		Turkey			
1979	1.14	1.14	0.32	0.32	1.00
1980	1.22	1.16	0.44	0.23	1.92
1981	1.25	1.17	0.43	0.21	2.10
1982	1.27	no data av	0.49	0.19	2.63
1983	1.31	no data av	0.49	0.16	3.07
		Brazil			
1979	1.16	0.98	0.64	0.52	1.23
1980	1.17	0.99	0.44	0.31	1.43
1981	1.30	1.10	0.29	0.21	1.40
1982	1.40	1.20	0.18	0.12	1.47
1983	1.58	1.35	0.11	0.04	2.04
		UK			
1979	1.06	1.00	0.86	1.06	0.81
1980	1.12	1.06	0.79	1.17	0.68
1981	1.16	1.09	0.76	1.04	0.73
1982	1.16	1.09	0.77	0.94	0.82
1983	1.15	1.07	0.79	0.85	0.93
		FRG			
1979	1.07	1.01	0.99	1.14	0.87
1980	1.08	1.02	1.05	1.14	0.92
1981	1.14	1.05	1.09	1.02	1.07
1982	1.19	1.10	1.07	0.97	1.10
1983	1.22	1.13	1.06	0.96	1.11

Table 6 (continued)

Year	$\frac{GDP(Ch)}{GDP}^*$	$\frac{Consr}{Consr}^*$	$\frac{Gdpdefl}{Gdpdefl}^*$	$\frac{Er}{Er}^*$	$(\frac{\frac{Gdpdefl}{Er}}{\frac{Gdpdefl}{Er}})^*$
		France			
1979	1.10	1.02	0.92	1.03	0.89
1980	1.14	1.05	0.93	1.07	0.87
1981	1.19	1.08	0.94	0.98	0.95
1982	1.22	1.11	0.91	0.88	1.04
1983	1.27	1.16	0.90	0.82	1.10
		the Netherlands			
1979	1.09	0.98	1.04	1.12	0.93
1980	1.13	1.00	1.08	1.12	0.97
1981	1.19	1.07	1.15	1.00	1.14
1982	1.27	1.13	1.14	0.97	1.18
1983	1.31	1.15	1.18	0.95	1.25
		Italy			
1979	1.10	1.07	0.89	0.99	0.90
1980	1.10	1.08	0.87	1.05	0.83
1981	1.14	1.11	0.90	1.03	0.87
1982	1.19	1.17	0.82	0.94	0.87
1983	1.26	no data av	0.75	0.89	0.85

these two norms into one norm which is an interval bounded by the upward biased norm and the downwards biased norm. Denoting this norm as n_{ij}, one would obtain: (see also eq. (3))

$$\exp(a_0)Y_i^{a_1}Y_j^{a_2}D_{ij}^{a_3}{}_d\,\mathrm{Hun}^{a_4}{}_d\,\mathrm{GDR}^{a_5}{}_d\,\mathrm{USSR}^{a_6} \leq$$

$$n_{ij} \leq \exp(a_0)Ych_i^{a_1}Ych_j^{a_2}D_{ij}^{a_3}{}_d\,\mathrm{Hun}^{a_4}{}_d\,\mathrm{GDR}^{a_5}{}_d\,\mathrm{USSR}^{a_6} \qquad (8)$$

If the actual trade flow, X_{ij}, is divided by n_{ij} one gets an interval. Each actual trade flow X_{ij} is thus divided by both the left hand side of eq. (8) and the right hand side of eq. (8). In total the 102 trade flows in the sample yield 2 x 102=204 values for each year. These figures are calculated for 1975 up to 1983; hence 9 x 204 figures are available. To facilitate the overview, figures were grouped together.

First, the ratios are taken together which represent the bilateral import flows of country j for a particular year. Then the means of these ratios are calculated. The results form the first part of table 7. Below, the results are referred to as import indices. Secondly all ratios are taken which deal with the export flow of country i in a certain year (1975, 1976 etc.). After that, the means are calculated and given in the second part of table 7. These means are called export indices.

Before making some conclusions, an important remark must be made. In the country sample, 11 countries are present and in the bilateral trade flow sample 102 trade flows are present. The actual 102 trade flows are compared with their simulated trade flows. Although an important part of each country's trade is included in these trade flows, not all developments in a country's trade is included. Eg. the trade flows of the FRG with the 10 other countries is reviewed but the trade between the FRG and Spain is excluded. If conclusions can be drawn from table 7, these are limited to the performance of the countries in the sample on each others' markets.

Looking at table 7, we first take Turkey. Its import indices decreased after 1977. This coindices with stabilization programmes which were set

in motion by the Turkish government. Amidst other aims, the programmes tried to limit imports. The measures taken to limit imports had an immediate effect. This can be explained by the firm grip the Turkish government has on the imports. Already at the end of the fifties a policy was implemented by which the government announced an import plan which divided the importables in 3 groups: one group of commodities which were prohibited to import, one group of commodities which could only be imported up to an announced ceiling and a group of commodities which were free to import if foreign exchange was available at the Central Bank of Turkey. Such an import plan gives the government a possibility of swift reaction to balance of payments problems through import limitation.

When we compare the export indices of Turkey to the export indices of the other economies, we see that the indices of Turkey remain stable over time, while most other indices show a decrease. This means that the export performance of Turkey on the markets of the other countries in the sample did not significantly improve although most other countries saw a worse performance of their exports on these markets.*

On the export side we see that it is far more difficult for Turkey to enlarge existing export flows to other countries in the sample. A priori one would expect that it is difficult because the enlargement is dependent on foreign demand, which can only be partially influenced by Turkey. In case of Turkey something else must be added. Turkey pursued an industrialization policy which was directed to the Turkish domestic market. Turkish products were primarily made to meet the demands of the Turkish people. It proved to be difficult to redress the industry to produce products for foreign markets since their demand is different.

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* Here we see the importance of the remark made earlier. It is true that the export performance of Turkey on the other economies has not been improved. But Turkey managed to build a strong export position on the markets of its warring neighbours Irak and Iran. Hence the volume of total exports of Turkey has been significantly improved.

In Brazil we see the export indices rising after 1979. This can be seen by noticing that the upper limit rises quickly while the lower limit remains stable. This indicates a stronger export performancer of Brazil on the export markets. This is remarkable since Brazil - like Turkey - is tradionally a country which pursued an import substituting policy. Whenever feasible domestic production was stimulated to replace imports on the domestic market. For Turkey it was difficult to redress domestic production to the needs of foreign markets but in case of Brazil it was nevertheless possible to acquire a better export performance.

This difference in success can be explained by the severity of the crisis in Brazil. Brazil experienced a large unprecedented drop in growth rates in GDP.

Table 1 shows the relative difference between actual GDP and GDP under the assumption of continued growth. This relative difference is larger in Brazil than in Turkey. Moreover the foreign exchange problems were far more acute in Brazil than in Turkey. Hence more pressure was put upon Brazil to drastic steps to reform its economy in order to counter decling growth rates and foreign exchange shortages.

These severe foreign exchange shortages were also responsible for the declining import indices of Brazil, as can be seen in the first part of table 7.

Table 7 Actual trade flows related to their norms

Imports

	1975	1976	1977	1978	1979	1980	1981	1982	1983
US	0.93	0.95	0.95	0.91	0.81	0.86	0.98	0.99	1.03
	0.83	0.87	0.86	0.82	0.72	0.72	0.78	0.73	0.74
FRG	1.43	1.51	1.57	1.52	1.52	1.57	1.49	1.56	1.54
	1.29	1.39	1.43	1.33	1.29	1.27	1.14	1.10	1.03
UK	0.88	0.90	0.99	1.05	1.11	1.01	0.99	1.11	1.10
	0.80	0.83	0.90	0.93	0.96	0.82	0.76	0.81	0.80
France	0.91	0.97	0.99	0.98	0.97	1.13	1.11	1.07	1.04
	0.83	0.89	0.90	0.87	0.81	0.90	0.83	0.75	0.69
Italy	1.42	1.50	1.50	1.45	1.58	1.72	1.56	1.67	1.65
	1.28	1.37	1.34	1.26	1.34	1.40	1.20	1.19	1.10
Netherlands	1.16	1.10	1.17	1.30	1.41	1.44	1.41	1.55	1.57
	1.05	1.00	1.08	1.15	1.19	1.15	1.06	1.06	1.02
Brazil	1.68	1.07	1.09	1.08	1.18	1.16	0.97	1.06	0.93
	1.54	0.99	0.98	0.94	0.97	0.94	0.71	0.71	0.56
Turkey	1.22	1.17	1.14	0.92	0.89	1.03	0.97	0.92	1.08
	1.14	1.11	1.08	0.80	0.74	0.78	0.70	0.64	0.72
Hungary	1.00	1.37	1.55	1.42	1.41	1.37	1.63	1.53	1.85
	0.93	1.27	1.43	1.26	1.17	1.05	1.16	1.00	1.09
GDR	1.19	1.53	1.68	1.33	1.42	1.12	1.41	1.58	1.72
	1.12	1.44	1.55	1.21	1.23	0.94	1.11	1.14	1.16
USSR	1.75	1.82	1.69	1.46	1.29	1.26	1.39	1.20	1.33
	1.60	1.68	1.52	1.27	1.07	0.99	1.04	0.83	0.86

Table 7 (continued)

Exports

	1975	1976	1977	1978	1979	1980	1981	1982	1983
US	1.03	0.98	0.88	0.92	1.00	1.03	0.85	0.82	0.78
	0.91	0.89	0.81	0.85	0.90	0.88	0.70	0.62	0.58
FRG	1.85	1.57	1.50	1.42	1.28	1.29	1.34	1.46	1.55
	1.66	1.44	1.35	1.24	1.09	1.05	1.04	1.05	1.07
UK	0.98	0.99	1.03	0.89	0.87	0.90	0.90	0.91	0.90
	0.89	0.91	0.93	0.79	0.76	0.73	0.70	0.68	0.66
France	0.92	0.87	0.88	0.87	0.88	0.86	0.91	0.83	0.88
	0.84	0.80	0.79	0.76	0.74	0.68	0.69	0.59	0.60
Italy	1.60	1.46	1.56	1.58	1.50	1.23	1.24	1.29	1.32
	1.43	1.33	1.38	1.36	1.27	1.01	0.97	0.93	0.91
Netherlands	1.57	1.51	1.31	1.28	1.33	1.38	1.33	1.19	1.20
	1.42	1.37	1.21	1.14	1.13	1.10	1.00	0.81	0.79
Brazil	1.47	2.29	2.70	2.15	2.29	2.24	2.69	2.78	3.32
	1.34	2.12	2.43	1.84	1.86	1.74	1.88	1.77	1.90
Turkey	0.72	0.80	0.80	0.94	0.94	0.91	0.79	0.92	0.88
	0.68	0.76	0.77	0.82	0.77	0.68	0.57	0.64	0.59
Hungary	1.39	1.36	1.32	1.18	1.34	1.34	1.17	1.15	1.15
	1.32	1.27	1.25	1.06	1.15	1.05	0.87	0.80	0.75
GDR	1.23	0.92	1.11	0.98	0.95	1.22	1.17	1.28	1.20
	1.17	0.87	1.04	0.91	0.83	1.04	0.95	0.97	0.87
USSR	0.76	0.86	0.92	0.98	1.03	1.25	1.35	1.53	1.42
	0.70	0.79	0.83	0.86	0.86	0.99	1.02	1.07	0.95

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