The J-Curve: An Empirical Investigation of the Trade Balance and Balance of Payments in Seven European Countries

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THE J-CURVE: AN EMPIRICAL INVESTIGATION OF THE
TRADE BALANCE AND BALANCE OF PAYMENTS
IN SEVEN EUROPEAN COUNTRIES

by

Sabine Beate Bomke

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Economics

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The effects of exchange-rate changes on the trade balance and the balance of payments of selected European countries is examined in this paper. Of particular interest are estimates of the existence and length of the J-curve effect, which describes the curve the trade balance may follow over time after devaluation. Contrary to popular expectations, the trade balance may deteriorate further after devaluation before "turning around" and improving.

Quarterly data from 1973 to 1985 for Belgium, Denmark, France, West Germany, Ireland, Italy and the Netherlands were used in this study. Out of a total of 84 realignments the J-curve was observed in 27 cases. The curves differed considerably in length, but the balance showed improvement after 3 quarters, a shorter period than has been reported in earlier studies.
ACKNOWLEDGEMENTS

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Sabine Beate Bomke
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The J-curve: An empirical investigation of the trade balance and balance of payments in seven European countries

Bomke, Sabine Beate, M.A.
Western Michigan University, 1987
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5. J-Curves by Countries for the Balance of Payments. 62
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The purpose of this paper is to investigate the effects of devaluation and revaluation on the trade balance and balance of payments of selected European countries. Of special concern is the J-curve effect of a devaluation on the trade balance. The J-curve describes the curve the trade balance is expected to show over time after a devaluation. A devaluation will alter the price relation of internationally traded goods. However, for contracts that are already written, quantities may not be able to respond to price changes and hence a worsening of the trade balance may result. For example, for the devaluing country, previously contracted imports in foreign currency will turn out to be more expensive, and exports contracted in domestic currency will provide less income. So, under certain conditions, expenditures will increase whereas income will fall and the trade balance worsens. This explains the downward sloping part of the J-curve shortly after a devaluation.
Traditional economists expect an eventual improvement of the trade balance when adjustments to prices in the form of new quantities can take place under new contracts. More expensive imports will induce imports to fall, and cheaper exports from the perspective of foreigners will cause exports to rise, thereby leading to improvements in the trade balance. Empirical investigation of this issue is especially interesting for international economics, because little evidence for the theoretical statements has been uncovered, so far, (see for example Miles1). Only a few studies on the J-curve are available. Furthermore, of those studies that have been undertaken, hardly any are conclusive. Finally it is argued below that the empirical work in this area is poorly executed and I intend to make improvements on it in this paper.

When investigating the trade balance and the balance of payments we are basically concerned with whether devaluations will result in lasting payment surpluses or deficits. A further concern is whether devaluation stimulates income and employment. Devaluation is also used as a means of improving a country's competitiveness; causing domestically produced goods to be more attractive abroad and foreign produced goods to be less attractive at home. The "beggar thy neighbor" devaluations of the 1930s

1Marc A. Miles, Devaluation, the Trade Balance, and the Balance of Payments (New York: Marcel Dekker, 1978).

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attest to the popularity of this theory, as do the press's explanations of interventions of central banks in managing exchange rates.

In this context the J-curve may interest both policymakers and economists. A recent article in the Wall Street Journal seemed concerned with the "Mystery of the Lazy J." The article noted that recent devaluations of the U.S. dollar were not followed by a J-curve. Instead the trade balance continued worsening, hence the appellation "Lazy J." The article noted that many economists feel that the J-effect is inevitable, and criticized it's implications:

The most insidious thing about the J-curve is that it has led to the notion among the word's mercantilists that broad economic advantages are gained by manipulating currencies.2

The article mentioned a few impediments that may have caused the J-curve not to be observed. First, the growth differential between the U.S. and the rest of the world led to a further worsening of the trade balance. Second, cost increases due to a weaker currency and simultaneous inflationary tendencies (partially felt during the Carter era) prevented a final improvement. Last, but not least, it is not the trade flows but rather capital flows between countries that affect and are affected by the exchange value of the dollar and also affect trade flows. The

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article concluded that exchange-rate manipulation cannot solve fundamental economic problems.

This shows clearly the importance of the issue in today's discussions. As the article states, there are influential economists, who support the J-curve theory, because the J-curve provides a convenient political and economic argument when a promised economic improvement does not take place immediately. The time-lag that is implied by this theory might prove important for politicians during election time. If a J-curve actually exists, then it would be interesting to determine the length of the time period after a devaluation in which an improvement in the trade balance can be expected.

In this study we will examine the effects of currency devaluation amongst members of the European Community who peg their exchange rates to one another. This is an ideal group of countries to study, because other factors that might distort relationships are eliminated. In particular, the fact that few trade barriers exist between the member countries is important. There are, of course, trade agreements between the countries, but trade is less controlled than with respect to the rest of the world.

The European Community

A short description of the nature of the European
Community (EC) follows. After preceding treaties concerning steel, coal, defense and economic cooperation after World War II, the European Economic Community was founded on March 25, 1957 in Rome, and included the following members: France, Italy, Germany, Belgium, Luxembourg, and the Netherlands. Subsequent treaties enlarged the community to twelve members, including Great Britain, Denmark and Ireland (1972), Greece (1981), and Spain and Portugal (1985).

The Rome treaties state several economic goals to be accomplished in forming an economic union. Major concerns were the creation of a common market and the achievement of similar economic conditions in member countries. Explicit measures to be implemented over a period of ten to twelve years were the abolition of tariffs and quotas, the introduction of common tariffs towards non-members, the establishment of free flows of services, capital and labor, a common farm policy and the creation of means to reduce imbalances in the balances of payments of the member-countries. The creation of more trade among the members was one of the goals, and another was to produce a

---

third political and economic power besides the U.S. and the U.S.S.R. after World War II.

The above measures have been implemented to different extents. Though common economic policies and farming arrangements still create many difficulties, trade flows are basically free, compared to the situation in the rest of the world. Trade among member nations has been stimulated, and for most countries of the EC, about half or more of their imports and exports consist of trade within the community. In 1971, for example 47 percent of all imports and 54 percent of all exports of the Federal Republic of Germany were within the Common Market. In October 1983, 48 percent of Germany's exports and 50 percent of its imports were with EC-members.³

Current problems in the EC are the growing political and economic diversity, a misguided farm policy and growing criticism from abroad concerning protectionist trade practices. However, within the community trade in goods and services, and capital transfers exist relatively free. So, some of the goals of the Treaty of Rome and of subsequent treaties have been achieved.

The European Monetary System (EMS) came into effect on January 1, 1979, though since 1973 some of the major

³Glasstetter, p. 254.

members did already practice a block-float towards the other important currencies of the world. The creation of the EMS was one more step towards economic integration in Europe. Currently Belgium/Luxembourg, Denmark, the Netherlands, Italy, Germany, France, Ireland and Greece are its members.

The major feature of the EMS is that member-nations agree to peg their exchange rates with intervention limits of 2.25 percent on either side of par. The member-countries are expected to take appropriate measures to keep the currencies within these boundaries. Only fundamental imbalances, lasting and serious deviations, can result in devaluations or revaluations.

The elimination of the influence of trade barriers is one reason why it seems sensible to study the effects of exchange-rate changes on European trade. The method of testing is basically derived from a study by Marc A. Miles. It incorporates domestic influences on the trade balance and the balance of payments. It is one of the few studies that report results for a possible J-curve effect.

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*For Italy the limit is 6 percent on either side of par.

*Miles, Devaluation.*
The J-Curve

The term J-curve refers to the shape of the curve that can be drawn of the trade balance over time after a devaluation. Initially the trade balance worsens but then improvements in the trade balance are expected. Stephen P. Magee identified different periods following a devaluation where the ability of traders to respond to the new set of prices created by the devaluation is at first limited, but over time becomes complete. He identified the "currency contract period" which is followed by the "pass through period."8

During the currency contract period Magee observed that contracts become due that were negotiated before the exchange rate was changed. The effects of the change on the trade balance depends on which currencies the contracts were written in. If the devaluing currency is the domestic currency, import contracts written in foreign currency and export contracts written in domestic currency will cause the trade balance to worsen during this period, because devaluation will cause export revenues to remain constant while expenditures for imports would increase. A J-curve may arise also if at devaluation a deficit is already in existence and import contracts and export

---

contracts are both written in foreign currency. Here, both revenues and import payments would rise. The final effect, therefore, depends upon the magnitude of the imports relative to the exports. If a trade deficit is already in effect, such that imports are greater than exports, the deficit would be further worsened.

Magee's second approach which he refers to as the "pass through analysis," looks at the price adjustment mechanisms. A devaluation should be followed by an increase in the prices of imported goods in the devaluing country and a decrease in the prices of this country's exports to the rest of the world. If this does not happen, then the desired reaction in the trade balance does not occur. If the demand does not react to the price changes then the J-curve effect persists. Unchanged demand for imports at higher prices and unchanged demand for exports at lower prices cause the trade balance to worsen. Eventually, through the substitution of goods and as a result of adjusting demand, the trade balance can recover or even improve. To summarize, the J-curve effect in the "pass through analysis" can occur if the demand for exports and imports is inelastic or if the supply of domestic exports and the demand for imports are inelastic and the trade balance is initially in deficit.

An issue that has not been resolved yet, and where there exists some controversy, is the time period in which
the above movements should take place. Most of the empirical studies have examined yearly data. This is because many of the researchers like Arthur B. Laffer, Magee and Miles were interested primarily in whether there would be final improvements in the trade balance. In order to obtain meaningful conclusions concerning the length of the J-curve the use of yearly data appears to be inappropriate. The J-curve is a short-run phenomenon with many contracts written for 90 to 360 days. The time over which a J-curve may be observed is likely to run not much longer than one year. Hence it seems more appropriate to use quarterly data.

In most studies the effects of monetary policy, income-growth and government expenditure are not taken into account. Though Miles does control for these variables, he does not seem to observe changes in the trade balance as a result of devaluation.10

The trade balance is only a part of the whole balance of payments which reflects all transactions with foreigners during a given time period. Besides trade flows (flows of goods and services) there are capital flows. If the trade balance does not react as expected to

10Miles, Devaluation.
devaluations but the balance of payments does, it may be that large capital flows are resulting from devaluation. This point has often been neglected by researchers. The implications of this for employment and income, however, are important. The following study will look at both the trade balance and overall balance of payments. And as in the Miles study, we will make adjustments for government expenditures, monetary policy, and growth differentials between countries. Following is a review of work in the area of modelling the behavior of the trade balance and the balance of payments.
CHAPTER II

MODELLING THE TRADE BALANCE AND THE BALANCE OF PAYMENTS

Overview

Miles presents two models of devaluation.\(^{11}\) In one case the public is assumed to have perfect foresight and government policy is optimal. In the second model the public does not accurately forecast, and the government does not follow an optimal monetary policy.\(^{12}\)

Miles's model is based on the absorption approach of the trade balance:

\[
TB = P \cdot Y - E(P, w) \tag{1}
\]

where

\(TB\) = nominal trade balance
\(Y\) = real level of domestic production
\(E\) = nominal level of domestic expenditure
\(P\) = domestic price level

\(^{11}\)Ibid.

\(^{12}\)An optimal monetary policy according to Miles is one in which all prices including the interest rate are kept constant, and where monetary policy will be tied to the domestic growth rate. Optimal monetary policy is not independent over time.
\( w = \text{level of real wealth.}^{13} \)

The law of one price is assumed to hold, as is an equal marginal propensity to expend among the individuals in different countries. Consequently, the trade balance depends only upon the level of real wealth.

If international capital flows are incorporated, a country's wealth can be represented by the current account.

\[
CA = P Y' - E(P,w) \tag{2}
\]

where

\( CA = \text{nominal current account} \)

\( Y' = \text{real GNP.}^{14} \)

If random monetary policy is pursued, increases in the supply of money will increase domestic net wealth. These printed pieces of paper represent assets, but since it is assumed they will never be retired there are no offsetting liabilities. Under imperfect foresight and non-optimal government policy, money can be regarded as real wealth.

But under an optimal monetary policy, an explicit liability becomes associated with each asset. Over a given period of time, the number of created units of currency, consistent with an optimal policy is constrained by the growth rate. For every unit issued

\[\text{---}\]

\(^{13}\text{Miles, Devaluation, p. 10.}\)

\(^{14}\text{Ibid., p. 12.}\)
this period, one fewer unit can be issued in the future. An alternative source of financing has to be found for the future, therefore, individuals assume that future tax liabilities increase. If the government pursues an optimal monetary policy and if the private agents perfectly foresee future liabilities, then increasing the money supply does not create net wealth.

Under perfect foresight, when the public correctly discounts future assets and liabilities the government cannot affect real variables like the trade balance. Monetary policy will only show in the balance of payments and in the capital account. An increase in money supply would function like an open market purchase. Public holdings of money would increase while net holdings of bonds decrease. Only portfolio adjustment occurs and the adjustment takes place through a balance of payments and capital account surplus. Devaluation causes only the domestic price level to rise, but no real wealth effects occur, only portfolio adjustments.

In the case of imperfect foresight, monetary and fiscal policy have real effects. Money is viewed as a net asset, therefore changes in money supply change real wealth. Devaluation will yield a temporary real effect, affecting both the trade balance and the balance of payments. The rising price level caused by devaluation reduces real wealth. Until this loss is recovered through
a current account surplus, expenditures are reduced, imports decreased and the trade balance improves. Appropriate government policy could prolong this effect.

Miles wished to discern with his empirical tests, which model is more suited to explaining past developments. He found support for the first model (perfect foresight), because in his analysis only the balance of payments reacted to devaluations, not the trade balance. However, the purpose of our study is not to choose between the perfect and imperfect foresight models, but rather to borrow Miles's approach to modelling the trade balance to uncover the existence and extent of the J-effect.

Variables that Affect the Trade Balance and the Balance of Payments

In contrast to earlier studies of Richard N. Cooper, Laffer, and Michael Salant, Miles does not want to deal only with the raw account figures. Improving and worsening of these numbers following devaluations are usually totally attributed to devaluation. No attempt is

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made by the other authors to standardize for the changes in other variables. But because devaluation is often accompanied by changes in other government policies, adjustments for these factors should be made. The following discussion will describe the method used by Miles which takes account of these various variables.

The Trade Balance

The absorption approach is used to estimate the trade balance:

\[ TB = Y - E \]  

(3)

where the trade balance \( TB \) is equal to the level of domestic output \( Y \) minus the level of domestic expenditure \( E \).\(^{16}\) Excess domestic expenditure must come from abroad, causing the trade balance to be negative. Similarly, a positive trade balance would result if domestic expenditures are less than domestic output. Taking the level of output as given, policy measures can cause changes in domestic expenditures. Changes in the trade balance would result as the total net inflow or outflow of goods during the calendar year changes due to policy variables.

The effect of the money supply on expenditure will depend on whether the creation of money is viewed as net wealth or not. If it is viewed as net wealth, money

\(^{16}\)Miles, *Devaluation*, p. 59.
supply increases will increase the level of expenditure and consequently have a negative effect on the trade balance. If money creation is not viewed as wealth, increases in money supply will not be reflected in the trade balance and will only worsen the balance of payments through adjustments in the capital account.¹⁷

The monetary variable to be used in the model should only reflect government actions, and hence should measure domestic credit. The variable Miles derived is obtained by summing the level of currency held by the public with reserves of banks plus foreign reserves.¹⁸

Government consumption will also influence domestic expenditure. Measured government consumption is directly related to the trade balance. Miles does not include commercial policy like tariffs in his study, because of difficulties in constructing a meaningful measure.¹⁹

The Balance of Payments

The balance of payments itself is defined, according to Miles,²⁰ as the level of change in international reserves minus the allocation of SDRs. Similar variables

¹⁷ The effects of changes in nominal money on the nominal interest rate are ignored in this analysis.

¹⁸ For details on how this was derived see: Miles, Devaluation, pp. 60-62.

¹⁹ Ibid., pp. 62-64.

²⁰ Ibid., pp. 64-69.
are used to account for changes in the balance of payments. Monetary policy is an especially significant distorting factor. The same monetary measure is used as was used for the trade balance.

Government consumption is of minor concern with respect to the balance of payments, because it primarily affects the absorption of goods. If government spending affects the level of income, this effect would be captured in the growth variable described below. Again tariffs and quotas have little effect and are left out.

The other variable included in both the trade balance and the balance of payments is the growth rate variable. The faster a country grows, the more its demand for money increases. With a constant money supply, the additional money demand must be satisfied from abroad. For an improved balance of payments it is necessary that the growth rate of one country relative to the rest of the world is smaller, because a higher growth rate means a higher money demand. Given world money supply, money will flow from where demand is relatively decreasing to where it is relatively increasing.

The effect on the trade balance is less clear. A larger increase in output than expenditure (an increase in relative growth) should result in an improvement in the trade balance. But according to Miles, empirical evidence by Miles and Laffer indicates the contrary. Laffer
associates the growth with changes in expenditure. He shows that increases in the relative rate of domestic expenditure cause the relative domestic price of nontradeables to rise. The substitution effects of demand and supply and income effects cause a deterioration of the trade balance.\textsuperscript{21}

**Testing the Equations**

To provide for trend effects over time, Miles divided the final variables by the GNP of each country, so that the time trend in the GNP standardizes the time trend in the other variables.\textsuperscript{22} Dividing equation (3) by $Y$ results in the following:

$$\frac{TB}{Y} = 1 - \frac{E}{Y}$$

or

$$\frac{TB}{Y} = f\left(\frac{E}{Y}\right)$$

Furthermore, Miles does not consider the levels of the different independent variables and works instead with the changes that occur over time. As Miles notes:

Economic theory does not tell us that countries with large money supplies run trade balance or balance of payments deficits.... Rather we expect that it should be countries with large increases in the


\textsuperscript{22}Miles, Devaluation, pp. 66-67.
money supply that find their accounts worsening.\footnote{23}{Ibid., p. 67.}

Finally Miles adjusts the growth, monetary and expenditure variables for interdependencies with the rest of the world.\footnote{24}{Ibid., pp. 67-68.} Only domestically originated changes are considered. The differences between the domestic variable and a weighted-average of the rest-of-the-world variables are constructed for money, growth and expenditure.

Miles tested the following equations for the trade balance and the balance of payments:

\[
\Delta \left( \frac{TB}{Y} \right)_i = a_0 + a_1 \Delta (g_i - g_R) + a_2 \Delta (M_i - M_R) \\
+ a_3 \Delta (G_i - G_R)
\] (6)

where

\( TB_i = \) the level of the trade balance in country \( i \)
\( Y_i = \) the level of output in country \( i \)
\( g_i, g_R = \) growth rates in country \( i \) and rest-of-world \( R \)
\( M_i, M_R = \) ratio of average level of high-powered money to output in country \( i \) and rest-of-world \( R \)
\( G_i, G_R = \) ratio of government consumption to output.

\[
\Delta \left( \frac{BP}{Y} \right)_i = b_0 + b_1 \Delta (g_i - g_R) + b_2 \Delta (M_i - M_R)
\] (7)

where

\( BP_i = \) balance of payments (change in international reserves not due to allocation of SDRs)
\[ Y_1 = \text{same as above} \]
\[ g_1, g_x = \text{same as above} \]
\[ M_1, M_x = \text{same as above}. \]

The coefficients \( a_1 \), \( a_3 \), and \( b_2 \) are expected to be negative, while \( k_1 \) should be positive. The coefficient \( a_3 \) is expected to be statistically not different from zero. (If money does not represent net wealth, there should be no effect of monetary policy on the trade balance.)

Miles obtained the data from the International Financial Statistics (IFS) tapes of the International Monetary Fund and tested the above equations first in a pre-test for thirteen countries which were not in the devaluation sample. The rest-of-the-world variables were constructed as a nominal GNP-weighted average of various countries. With this method, Miles provided support for the functional forms used in the following tests. The coefficients of the equations tended to conform to his expectations.\(^{36}\)

The results also seemed to indicate that monetary policy clearly has an effect on the balance of payments, but not on the trade balance. Hence Miles concluded that money does not represent net wealth.\(^{37}\)

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\(^{36}\) Ibid., pp. 69-70.

\(^{36}\) Ibid., pp. 70-75.

\(^{37}\) Ibid., p. 73.
Miles also found that government consumption did not affect the trade balance. If the coefficient for government consumption had been negative this would imply that increases in government consumption worsen the trade balance. More goods would have to be imported to meet a higher demand stimulated by the government. Miles, however, found that the coefficient for government consumption was statistically not different from zero. Increases in government consumption are immediately offset by a reduction in private consumption, possibly due to interest rate or price increases. A relationship between the trade balance and government consumption could not be established.

Testing for the Effects of Devaluation on the Trade Balance and the Balance of Payments

Basically two types of tests are employed to show the effects of devaluations on the balances. One test incorporated the exchange rate directly into equations (6) and (7) as an additional regressor. The other test examines the residuals. The latter test is more

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28 Ibid., pp. 71-73.

29 It also may be possible that fiscal policy is offsetting changes in private consumption. A causality cannot be established here.

30 Miles, Devaluation, p. 73.
interesting to us, because the direct test does not give any indication of whether the J-curve effect exists.

Miles examined eighteen countries in the period 1955 through 1973, during which twenty-six devaluations occurred. In the direct test, for only two of the eighteen countries did the exchange rate have an effect on the trade balance (Ghana and France). For the balance of payments, for only two of the eighteen countries does the exchange-rate change have a statistically significant effect on the balance of payments (Israel and the Philippines).

The second set of tests were performed with the help of a residuals technique. Miles used the estimated coefficients of the growth rate, monetary and expenditure variables to standardize for their effects on the balances. Using the estimated coefficients and actual values, Miles obtained estimated fitted values for the trade balance and the balance of payments. Subtracting the fitted values from the actual values of the balances yields residuals. The residuals represent changes in the balances that are due to effects other than growth, money and government expenditures, and could be due to the changes in the exchange rate.

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31 Ibid., p. 81.
32 Ibid., p. 94.
33 Ibid., pp. 81-84.
An examination of the residuals around the devaluation or the revaluation provides information about the behavior of the trade balance and the balance of payments. A permanent improvement in the trade balance or the balance of payments would result in large positive residuals at or shortly after the devaluation and small random residuals later on. This would indicate a large positive change in the balance, unexplained by the included variables. Temporary improvement would be discerned from large positive residuals first and large negative residuals later. If the balances do not change, then the sum of the residuals (positive and negative) should approximate zero.

By examining the residuals after devaluation the existence of a J-curve can be discerned. Large negative residuals would be followed by large positive residuals if the trade balance first worsens and then improves.

*Miles's Results*

Miles investigated the balances for eighteen countries three years before and three years after the devaluation. The results for the trade balance show that the average residuals are negative three to two years before the devaluation and positive one year before the devaluation. In the devaluation year the residuals were usually negative, which Miles interpreted as a short-lived
J-curve. Following devaluation Miles usually found one positive residual, in year two and three negative residuals. Miles concluded that there is no positive effect on the trade balance. In fact, the trade balance deteriorated even more.*4

For the balance of payments Miles expected that with controls on the monetary variable, improvements in the balance of payments after a devaluation would result at least temporarily. Though there was some tendency for negative residuals in the two or three years after devaluation, none of them offsets the initial positive residual in the devaluation year. Miles therefore concluded that the devaluation has clearly improved the balance of payments. Miles concluded that the final improvement in the balance of payments comes from the capital account, and found that the model confirmed the hypothesis that money is not viewed as net wealth by the public.*5

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*4 Ibid., pp. 84-87.
*5 Ibid., pp. 94-102.
CHAPTER III

OTHER STUDIES

The study by Miles was later criticized by Daniel Himarios.\textsuperscript{36} He casted some doubt on Miles' methodology and the conclusiveness of Miles' results. With a re-specification of the equation for the trade balance Himarios tried to find support for the more traditional view that devaluations have an influence on the trade balance.

The critique by Himarios mainly concerned the specification of the model. He included lagged variables for the exchange rates in the direct test with the justification that even older devaluations might still have some effect on the trade balance and the balance of payments. He also introduced separate coefficients for domestic and foreign variables to account for differences in the importance of the variables for the balances. In addition, Himarios criticized that Miles did consider tariffs and quotas as being unimportant in his investigation. His most serious complaint was the

"average" trade balance Miles constructed across countries and over time. The author found it inappropriate to construct such an average, because a worsening of the balance in one country will offset an equal improvement in another country.

With his re-estimation of modified equations Himarios could show more coefficients for the exchange rate that were significantly different from zero than Miles. He also provided a theoretical explanation for the use of the nominal exchange rate instead of the real exchange rate in the direct test. With empirical support Himarios discerned a close connection between the real and the nominal rates. Himarios found support for an improvement of the trade balance after a devaluation. Using the direct test (incorporating the exchange rate directly in the trade balance) he found a coefficient that was statistically different from zero for the exchange rate in nine out of ten cases.

While numerous authors stress the theoretical implications of the J-curve like Anne O. Krueger, Heinz-Dieter Smeets, Michael Melvin, Laffer, and Salant, there are only a few who actually tested the occurrence of this theoretical phenomenon.³

Miles, Salant and Laffer refer to the J-curve as just one way of interpreting their empirical results, however, the main investigation was not directed towards the curve. Laffer could find that four out of fifteen observed devaluations provide evidence for a J-curve, but his method seems inappropriate to discover all curves, because the use of annual data limits the possibility of discerning short-run effects. No adjustments were made for variables like the government's fiscal and monetary policy. Salant also worked with annual data. He could find no evidence that the trade balance improved after a devaluation and suggested that the reason for this might be a short-run J-curve effect.

Bahmani-Oskooee explicitly investigated the J-curve effect and its length in four developing countries: Korea, Thailand, Greece and India. He used quarterly data to account for the short-run nature of the effect. The observation period was from 1973 to 1980. The model he used was closely related to that of Miles. The trade balance was considered as a function of income and the ratio of the exchange rate and the domestic price level.


As in the study of Himarios, also variables for the rest of the world and money variables were incorporated. Over time all possible Almon lag structures were examined up to a maximum of twelve lags. For all four countries regression equations were estimated, investigating the signs, the significance and the behavior of the coefficients in the distributed lags.

A J-curve was observed for Greece, Korea and India. Thailand showed an improvement of the trade balance for five subsequent quarters and then a deterioration. For Greece the deterioration period was two quarters, for Korea three quarters and for India four quarters. In the long-run, however, the trade balances of Korea, India and Greece deteriorated. The final improvement did not outweigh the initial downward movement. The opposite was true for Thailand. Bahmani-Oskooee, too, had problems with the estimated regression equations. The expected signs only occurred for the income variables consistently, but money did not behave as expected. However, the sample of Bahmani-Oskooee was too small to tell something about the appropriateness of the estimated regressions. The study can be regarded as an invitation for further investigations.

The study of Smeets was basically concerned with the likeliness of the J-curve effect in the case of Germany. The theoretical considerations of Smeets led to the
conclusion that not the lagged adjustment of export price changes following import price changes lead to J-curve effects, but more the missing variation of volumes. Therefore the study is mainly concerned with elasticities. Based on annual data from Germany for the period from 1956 to 1976 the adjustment of export and import volumes to corresponding price movements were examined. Smeets estimated a relationship between the import volume and the import contract price, a lagged import contract price and the domestic real income. The same was done for the export volume, the export prices and the foreign real income.

The study found evidence in favor of the hypothesis that volumes of exports and imports do not react during the first year after the price change. Only later, adjustments of volumes occur even to the extent that the Marshall-Lerner condition gets fulfilled. It seems as if short-run elasticities are low and long-run elasticities increase considerably. Due to the fact that the German trade balance was usually in surplus during the observation period, the author came to the conclusion that J-curve effects have not been a serious danger. The author considered an initial deficit situation of the trade balance as one of the major pre-requisites for the J-curve to occur. The study of Smeets did not provide any further results for actual J-curves. No information was
given on the actual possible length. A length of more than one year was assumed.

Most of the other studies considered were mainly concerned with the different price elasticities or with the lag structure of price adjustments like the studies of William H. Branson, Helen B. Junz and Rudolf R. Rhomberg, and Dennis Warner and Mordechai E. Kreinin.39 These studies were helpful to provide a theoretical background for the investigation of the J-curve, but they did not provide any relevant empirical results. Not many authors were actually concerned with empirical evidence to underpin the relevance of the J-effect. The J-curve is often treated as a phenomenon to explain why empirical findings do not conform to theoretical considerations.

CHAPTER IV

THE DATA

Modifications in the Current Study

In the following we will be investigating the reaction of the trade balance to exchange-rate changes for selected European countries. The European framework provides an improved framework for the investigation of the J-curve because among the European countries there are fewer trade restrictions, and hence, undisturbed observations can be expected. (The effects of trade restrictions have been neglected by others examining the reaction of the trade balance to exchange rate changes.) In addition, the system of pegged exchange-rates within the EMS allows us to more accurately pinpoint the timing of large exchange-rate changes. It is hoped that this approach might yield more meaningful results than any other study done so far.

In addition, quarterly instead of yearly data, as in most previous studies, have been collected and analyzed. It might be that the J-curve effect is a short-run phenomenon and that worsening and improvement of the
balances might occur earlier than traditionally expected. Yearly data may prevent us from detecting these changes.

Furthermore, it could be interesting to examine the balance of payments, too, with respect to a possible J-effect. There may be restraints that cause monetary flows to adjust slower to the new exchange rates than expected. One of the causes may be the existing obligations of firms. Neither theories, nor existing empirical work have so far ever investigated this point.

Another modification of my model concerns the nature of the data that are examined. Most of the studies just deal with raw data on the trade balances and the balances of payments with respect to the rest of the world. Researchers then had to make adjustments for the growth differential, the money supply and other variables between the concerned countries and the rest of the world. With respect to the analysis of the trade balance, a bilateral analysis was made. A bilateral analysis has the advantage that trade effects between two countries can be observed directly. In addition to that, the adjustments for monetary and growth differentials are much simpler to calculate, and more accurate because an adjustment with a basket of countries to represent the rest-of-the-world data can never be fully satisfactory. One has to pick weights for the rest-of-the-world and under different schemes these weights can result in different rest-of-the-
world variables. Furthermore, there are differences in how the countries report their data, making the construction of a rest-of-the-world variable more difficult. Finally, countries usually do not report bilateral balance-of-payments data that could therefore not be studied.

Regression Equations

The first step of the investigation was to define appropriate regression equations for the bilateral trade balance and the balance of payments. The underlying theory is similar to that of the study of Miles,\textsuperscript{40} therefore the regression equations can be repeated here as above. However, some of the variables have been calculated differently:

\[ \Delta(BP/Y)_{i} = b_{0} + b_{1}(g_{i} - g_{s}) + b_{2}(M_{i} - M_{s}) \]  

where

- \( BP_{i} = \) balance of payments (change in international reserves not due to allocation of SDRs)
- \( Y_{i} = \) level of output in country \( i \)
- \( g_{i}, g_{s} = \) growth rates in country \( i \) and rest-of-world \( R \)
- \( M_{i}, M_{s} = \) ratio of average level of high-powered money to output in country \( i \) and rest-of-world \( R \).

\textsuperscript{40}Miles, Devaluation.
This is exactly the equation used by Miles (see equation 7, p. 20), as described above. The equation for the trade balance has to be modified since we are concerned with bilateral trade balances instead of country i's trade balance with respect to the rest of the world:

\[ \Delta(TB_4/Y_4) = a_0 + a_1 \Delta(g_i - g_j) + a_2 \Delta(M_i - M_j) + a_3 \Delta(G_i - G_j) \]  

(9)

where

- \( TB_4 \) = level of the trade balance of country i with respect to country j
- \( Y_4 \) = level of output in country i
- \( g_i, g_j \) = growth rates in country i and in country j
- \( M_i, M_j \) = ratio of average level of high-powered money to output in country i and in country j
- \( G_i, G_j \) = ratio of government consumption to output in country i and country j.

Definition of the Variables

The data were obtained from International Financial Statistics (IFS) of the International Monetary Fund, from the Direction of Trade issued by the International Monetary Fund and others, and from the Direction of Trade Statistics of the International Monetary Fund.\(^{41}\) The data

\(^{41}\)International Monetary Fund, International Financial Statistics (Washington, D.C.: International Monetary Fund, Bureau of Statistics, 1948-), 30 (1977); 33 (1980); 36 (1983); 38 (1985); 39 (1986); International Monetary Fund, International Bank of Reconstruction and
for the devaluations and revaluations were obtained from the IMF Survey, issued by the International Monetary Fund.4*

The balance of payments is defined as the level of change in international reserves minus the allocation of SDRs. The data were collected from lines 1d and 78bd of the IFS. These values were provided in U.S. dollars, and therefore had to be further converted into domestic currency values. For this modification the end-of-period exchange rate was used. To adjust for trend effects over time the variable was divided by the GDP or GNP of each country (depending on availability).

For most countries, i.e., Italy, France, Belgium, Ireland and Denmark, continuous quarterly GNP data were not available for the whole period. For France and Italy quarterly GDP data was substituted and for the other countries, Belgium, Ireland and Denmark, quarterly changes were roughly inferred from yearly data. As far as available, the GNP data were taken from the IFS, line 99a in domestic currency. The quarterly GDP data for France and Italy were obtained from International Economic Development, and United Nations, Direction of Trade (Washington, D.C.: United Nations, 1964-1980), March 1973-December 1980; and International Monetary Fund, Direction of Trade Statistics, January 1981-June 1986.

After the ratio of reserves over income was constructed, the quarterly changes were calculated as log differences of these ratios. Those provided the final variables for the balance of payments.

The growth rates for the different countries were constructed from GNP and GDP values. The natural logarithms of these values were taken and the changes over time computed. From these growth values a GNP/GDP-weighted average of the growth rates for the other countries of the sample was subtracted to calculate the growth differential. This was necessary, because for the balance of payments world wide activities of a country are reported. For most countries in the sample, trade with the other European countries constitutes about half of the whole trade volume, therefore it seems justified to use this limited form to compute the rest-of-world data. It is expected that increases in the growth rate cause the demand for money to increase, too. With a constant money supply, the additional money demand must be satisfied from abroad. The money supply of the world will flow from where demand is relatively decreasing to where demand is


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relatively increasing, so that more growth relatively to the rest of the world means an improved balance of payments. The coefficient $b_1$ therefore should be positive.

The money variable included in the equation only reflects government policy. It measures the average level of high-powered money, computed by summing the level of currency held by the public plus the reserves of banks plus foreign reserves. To construct the average of the domestic portion, $1/2$ of the changes in currency and bank reserves during the quarter are added and changes in reserves or currency due to external causes are subtracted. Lines 14a and 20 of the IFS represent the level of currency outside banks and bank reserves. To the initial level at the end of the previous period, $1/2$ of the quarterly change in these numbers is added minus the quarterly balance of payments. Again the difference between the country's monetary growth and a rest-of-world variable is calculated. As described in the part on the balance of payments in chapter 2, a positive differential will worsen the balance of payments either through an increased level of expenditure or through adjustments only in the capital account. Therefore the sign of the coefficient $b_2$ should always be negative.

The trade balance variable is defined as a bilateral variable. The data were taken from the Direction of Trade
(International Monetary Fund and others) and from the Direction of Trade Statistics (International Monetary Fund). To simplify the data collection, the trade balance was constructed by subtracting the exports of country A into country B from the exports of country B into Country A for the trade balance of country A, and vice versa for country B. Again the variable was divided by GNP or GDP to adjust for time trends before quarterly changes were computed.

Because we are examining the bilateral trade balance, the growth rate and the monetary variable had to be bilateral in nature, too. These were constructed by subtracting the growth rate of country B from the growth rate of country A and by subtracting the monetary variable of country B from the monetary variable of country A.

As described in the part on the trade balance in chapter 2, the effect of the monetary variable on the trade balance will depend on whether money is viewed as net wealth or not. According to Miles,** if money is not viewed as net wealth, the monetary variable should have no effect on the trade balance. Therefore the coefficient $a_3$ should be statistically indistinguishable from zero. A positive growth differential according to Miles will lead to a deterioration of the trade balance through relative price increases and substitution and income effects of

**Miles, Devaluation, p. 60.
demand and supply. The coefficient $a_i$ should be negative according to Miles.

Another variable, not incorporated in the balance of payments, but necessary for the trade balance is government consumption. If income effects result from a government spending policy, then these effects will be incorporated in the growth variable for the balance of payments. However, for the trade balance, the purchasing of goods by the government is of direct importance. The variable is constructed from line 91f of the IFS divided by GNP or GDP. It is hypothesized that increased government consumptions will worsen the trade balance due to increased imports. The coefficient $a_i$, therefore, is expected to be negative.

The Exchange Rates

The exchange-rate fluctuations within the EC were reported in the IMF Survey of the International Monetary Fund. Not all countries included in this study were continuous members of the block-floating (1973-1978) and the EMS (since 1979). For instance, Ireland joined the EMS in 1979. However, equations for the whole period were estimated for the balance of payments and the trade balance. During the period of block-floating, only two realignments occurred.
Table 1

Realignments in the EMS From 1979 to 1983

<table>
<thead>
<tr>
<th>Currency</th>
<th>I1 79</th>
<th>I1 79</th>
<th>I1 81</th>
<th>I1 81</th>
<th>I1 82</th>
<th>I1 82</th>
<th>I1 83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgian Franc</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-8.5%</td>
<td>-</td>
<td>+1.5%</td>
</tr>
<tr>
<td>Danish Krona</td>
<td>-2.9%</td>
<td>-4.8%</td>
<td>-</td>
<td>-</td>
<td>-3.0%</td>
<td>-</td>
<td>+2.5%</td>
</tr>
<tr>
<td>French Franc</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-3.0%</td>
<td>-</td>
<td>-5.75%</td>
<td>-2.5%</td>
</tr>
<tr>
<td>Deutsche Mark</td>
<td>+2.0%</td>
<td>-</td>
<td>+5.5%</td>
<td>-</td>
<td>+4.25%</td>
<td>+5.5%</td>
<td></td>
</tr>
<tr>
<td>Irish Pound</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-3.5%</td>
</tr>
<tr>
<td>Italian Lira</td>
<td>-</td>
<td>-</td>
<td>-6.0%</td>
<td>-3.0%</td>
<td>-</td>
<td>-2.75%</td>
<td>-2.5%</td>
</tr>
<tr>
<td>Dutch Guild.</td>
<td>-</td>
<td>-</td>
<td>+5.5%</td>
<td>-</td>
<td>+4.25%</td>
<td>+3.5%</td>
<td></td>
</tr>
</tbody>
</table>

Note: -: devaluation +: revaluation
Calculated as the percentage change against the group of currencies whose bilateral parities remained unchanged in the realignment.46

The Deutsche Mark was twice revalued, in the first quarter of 1973 by 3 percent and in the second quarter of 1973 by 5.5 percent. These revaluations only concerned the Belgian Franc, the Danish Krona, the French Franc, and the Dutch Guilder. Other realignments in the EMS since 1979 are shown in Table 1.

The table shows clearly that for some countries the evaluation of the effects on the trade balance and on the balance of payments turns out to be very difficult,


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because several realignments occur shortly after one another. Individual effects on the balances, therefore, are difficult to observe. For the investigation of the balances the scale of each realignment was relatively unimportant. One could only expect that the effect would be more pronounced for big changes.
CHAPTER V

OBTAINING THE RESIDUALS

Estimation of the Regression Equations

A first step towards the solution of the problem is the estimation of the regression equations. Miles suggested that an exchange-rate variable would not affect the trade balance. We tested for this by estimating equation (10) with the exchange-rate variable for the trade balances of Belgium and France. The exchange rate was incorporated as follows:

\[
\Delta \left( \frac{TB_1}{Y_1} \right) = a_0 + a_1 \Delta (g_1 - g_j) + a_2 \Delta (M_1 - M_j) + a_3 \Delta (G_1 - G_j) + a_4 \Delta ER_i
\]

The exchange rate used was the rate of the currency of country i against the currency of country j. In all but one of the twelve regression equations the coefficient for the exchange rate was statistically not different from zero.

For the balance of payments a similar equation was estimated:

\[
\Delta \left( \frac{BP}{Y} \right)_i = b_0 + b_1 \Delta (g_i - g_j) + b_2 \Delta (M_i - M_j) + b_3 \Delta ER_i
\]
Here the exchange rate was incorporated as the rate of the currency of country $i$ against the SDR, obtained from line ae of the IFS. Three countries were investigated and for one the coefficient on the exchange-rate variable indicated a positive effect of the exchange-rate on the balance of payments.

Due to the inconclusiveness of the above results, the exchange rate was left out in the equation and an indirect method for testing for the effect of exchange-rate changes on the trade balance and the balance of payments was used. Regressions specified by equations (8) and (9) were estimated using quarterly data for seven countries from the beginning of 1973 to the end of 1985. First it was determined whether serial correlation (up to the 10th quarter) existed. The equations were re-estimated and correction for autocorrelation applied using the Yule-Walker method. The obtained regression equations are reported in the appendix.

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"For some countries, i.e., Belgium and Ireland, completed data were only available up to the end of 1984.

"For further reference on the Yule-Walker method see: Theodore Wilbur Anderson, The Statistical Analysis of Time Series (New York: Wiley, 1971.) It was never necessary to correct for autocorrelation beyond the fourth quarter."
Residuals Test

These regression equations were the basis for further investigations. A residuals technique was applied to provide further information about the existence of a J-curve effect. The estimated coefficients for the growth rate, the monetary variable and for government expenditure were used to standardize the balance of payments and the trade balance for these domestic effects. Actual values over time between 1973 and 1984 were used with the estimated coefficients to obtain fitted values for the trade balance and the balance of payments. Residuals were constructed by subtracting the fitted values from the actual values. These residuals then can be regarded as caused by variables other than growth, money and expenditures. One of the other variables that may explain the residuals are changes in the exchange rate.

An examination of the residuals around the time of the change in the exchange rate yields information about the behavior of the trade balance and the balance of payments, respectively. Basically three important possible developments have to be considered. The following description refers to possible behavior of the balances after a devaluation, or the reverse after a revaluation.

First, a permanent improvement of the balances would be shown by large positive residuals at or shortly after a
devaluation and smaller residuals later on. First a large positive change would occur in the balance, which cannot be explained by the included variables like growth, money or expenditure. Later there would be only little change, indicated by small residuals. When a revaluation is observed, the same should be true vice versa. One can also postulate a possible deterioration of especially the trade balance. For that, first large negative residuals should prevail, and later on small residuals should be observed.

Second, a temporary improvement of the balance would be shown by large positive residuals initially and large negative residuals later on. This would indicate first an improvement and then a worsening. If the sum of the positive and the negative residuals approximates zero, then the balances show no change in the longer run.

Third, the most interesting case for this study is the J-curve effect. This effect can be observed through residuals that are first large and negative and then large and positive. This would indicate that the balances first worsen and then improve. An eventual improvement would be shown, if the sum of the positive residuals is greater than the sum of the negative residuals. After a revaluation the same could be expected in the reverse; large positive residuals followed by negative residuals.
For the present study twenty-one bilateral trade balances were investigated. A total of eighty-nine realignments of the exchange rates were examined in relation to the residuals. For the trade balance the residuals for each country were examined in the quarter shortly after the realignment. The number of J-curves was counted and the length of the period in which the trade balance did worsen was observed. In addition to that, the length of the whole J-effect was calculated as concluding when the residual changed in sign for the second time after the realignment. The positive and negative residuals after the realignment were summed up to infer whether a final worsening or improvement of the balances occurred.

For comparable time periods around the quarters of the realignment averages were computed for the length of the downward sloping part of the J-curve and for the length of the whole J-effect. An average across countries and over time can be computed. The countries, then, can be divided into groups with similar trade patterns. It was investigated, if there are special patterns in the development of the trade balances to be observed for these groups.

The balance of payments was investigated in addition to the trade balance. Seven countries were examined: Denmark, Belgium, France, Germany, Ireland, Italy and the
Netherlands. Calculations similar to those made of the trade balance above were made of the balance of payments to investigate the existence of a J-curve.
CHAPTER VI

RESULTS

Estimation of the Equations

As a first step, the regression equations for the trade balance and the balance of payments were estimated. For each country, Belgium, Denmark, France, Germany, Ireland, Italy and the Netherlands, one regression equation was estimated for the balance of payments and six bilateral regression equations were estimated for the trade balances.

As in the study of Miles,48 hardly any significance for the coefficients is found. Nevertheless, the signs of the coefficients usually turned out as expected. For twelve out of twenty-one equations the coefficient $a_3$ is negative, however only two of them are statistically different from zero (France/Germany at the 6 percent level and France/Netherlands at the 3 percent level). Nine out of twenty-one equations result in a negative sign for the coefficient $a_2$, but only one is significantly different from zero at the 9 percent level (France/Germany). The coefficient $a_3$ is not statistically different from zero as

48Miles, Devaluation.
expected. These estimated coefficients were later used to produce fitted values for the trade balances.

For the balance of payments the coefficient $b_2$ is statistically different from zero, and negative at the 7 percent level in six out of seven cases. Only in the case of Italy is a relatively low t-value (1.194) obtained. The coefficient $b_2$ is usually indistinguishable from zero, but in one case it is statistically less than zero at the better than 1 percent level.

The Residuals Test

The above estimated equations were then used for the residuals test. The sign of the residuals around a devaluation or revaluation was the most important point. In addition, also the size of the residuals was taken into consideration. First, it was observed if the residuals were negative directly after a devaluation or positive directly after a revaluation. If the residuals showed these signs and were of considerable size, then a J-curve effect was assumed. The length of the worsening period or the improvement period, respectively, was then measured by counting the quarters from the first quarter after the realignment up to the next change of sign. The total length of a prospective J-curve was measured by counting the quarters from the first quarter after the devaluation.
or revaluation up to the second change of sign. (For further explanation see Table 2.)

The quarter of the second change of sign and the quarter of the realignment were left out for several reasons. The quarter of the realignment was neglected, because sometimes a realignment occurred in the last part of the quarter and it did not seem sensible that any effect could then be observed for this quarter. Furthermore, consistency in the observations was necessary to calculate the average lengths, therefore the quarter of the second change of sign was not included either.

Table 2

Residuals of the Trade Balance Denmark/Germany

<table>
<thead>
<tr>
<th>Quarters</th>
<th>Residuals</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I 83</td>
<td>0.0022819</td>
<td>- quarter of devaluation</td>
</tr>
<tr>
<td>II 83</td>
<td>-0.0007749</td>
<td></td>
</tr>
<tr>
<td>III 83</td>
<td>-0.0003581</td>
<td></td>
</tr>
<tr>
<td>IV 83</td>
<td>-0.0015748</td>
<td></td>
</tr>
<tr>
<td>I 84</td>
<td>0.0007949</td>
<td>- first change of sign</td>
</tr>
<tr>
<td>II 84</td>
<td>0.0002420</td>
<td></td>
</tr>
<tr>
<td>III 84</td>
<td>-0.0000716</td>
<td>- second change of sign</td>
</tr>
</tbody>
</table>

In addition to that, it was determined if there occurred a final improvement or a final worsening of the balances. For that, the last residual (second change of...
sign) had to be omitted. It seems sensible to regard any developments after the second change of sign as not directly affected by the devaluation and as not being relevant for the J-curve effect, because, by definition, the J-curve is a short-run phenomenon. However, the conclusions about a final worsening or a final improvement of the balances can only be preliminary, because these long-term developments cannot be observed with these very short-run oriented data. Nevertheless, some information about the final effect is included here.

When the realignments of one kind occurred too closely after one another, it was sometimes difficult to draw any conclusions about a possible J-curve. Nevertheless, if a curve seemed likely, the observations were attributed to the first realignment that occurred. This way, lagged exchange-rate changes were taken into consideration, too. However a definite conclusion about the length of the J-effect could then not be drawn, it might be shorter than stated here. When there were different realignments closely together, no conclusions could be drawn at all. This instance occurred once in the trade balance of Belgium with Italy.

For the twenty-one estimated trade balances for seven countries, eighty-nine realignments were investigated. Five of them for the trade balance of Belgium with Italy, did not yield any information, because the realignments
were too close together. This was true for some others, too, but they could not be eliminated that clearly. For the remaining eighty-four realignments a J-curve effect could be observed in twenty-seven cases or in 32.1 percent of the sample. The lengths of the worsening or improvement periods of these effects ranged from one quarter up to five quarters, with an average across countries and over time of three quarters. The whole J-curve, as defined above was four quarters long on the average in a range between two to nine quarters. In eleven cases or 40.7 percent out of the twenty-seven J-curves, the originally expected effect of a final worsening after a revaluation or improvement after a devaluation seems to occur.

For the seven countries twenty-one realignments were examined for the balance of payments. Six occurrences of a possible J-curve could be counted which would be 28.6 percent. The average length of the worsening and improvement period was four quarters with a range of two to seven quarters. The total effect seems to last about five and a half quarters. However, for two observations no results could be obtained. For one observation the concerned realignment was towards the end of the observation period and no additional data were available. For the other observation the residuals stayed positive after the revaluation. Here the range of the total effect
was between four and seven quarters. For the balance of payments the final effect never occurred in the predicted direction. After a devaluation the balance worsened further and after a revaluation the balance always improved.

As obvious from Table 3, it was only attempted to evaluate a final development for the J-curves. For the other observations this was impossible, because the lengths of the effects could not be stated clearly in these cases.

Table 3
Number of Observed J-Curves

<table>
<thead>
<tr>
<th></th>
<th>TB</th>
<th>Percent</th>
<th>BOP</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of J-curves</td>
<td>27</td>
<td>32.1</td>
<td>6*</td>
<td>28.6</td>
</tr>
<tr>
<td>of which with expected final effects</td>
<td>11</td>
<td>13.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No. of initially expected final developments</td>
<td>29</td>
<td>34.5</td>
<td>7</td>
<td>33.3</td>
</tr>
<tr>
<td>No. of initially unexpected final developments</td>
<td>3</td>
<td>3.5</td>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>No. of random developments</td>
<td>25</td>
<td>29.8</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>100.0</td>
<td>21</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Two of the instances counted as J-curves could as well be counted as unexpected developments, because a final opposite effect could not be observed.

Note: TB: Trade Balance, BOP: Balance of Payments
The small number of initially unexpected developments after realignment may be attributed to the difficulty to distinctly differentiate between J-curves and this development.

Some of the above results, especially the high number of random developments might be explained by expectations. Expectation of a devaluation or revaluation could change people's behavior. Several possible developments can be distinguished in the case of the trade balance. First, payments for import contracts that are written in domestic currency could occur faster than otherwise. The reverse is true for export contracts written in domestic currency. The buyer will wait as long as possible with the payment, because after a devaluation he will have to give less of his own currency for the same good. Less inflow of money and the desire to pay for imports as fast as possible could lead to a worsening of the trade balance even before the actual devaluation occurs. The J-curve will start as soon as news about a possible devaluation is spread, which could be one or two quarters before or even in the quarter of the devaluation.

For the balance of payments this kind of development is even more likely, because of the greater vulnerability of the capital and money market to expectations. In anticipation of a devaluation, money will flow out of a country to avoid losses. Later, when the new exchange
rates come into effect, money probably will flow back into the country. Anticipation of a devaluation in this case might even make the devaluation more urgent.

The trade balance in this study shows twenty-one instances where the residuals indicate a J-effect, that seems to occur before the realignment. Out of these, fourteen cases probably give rise to a very short-lived curve that was not considered before. The balance of payments shows ten instances in which the J-curve might have occurred one or two quarters before the realignment, six of them seem to show a J-curve of short duration, that was not discovered before. Overall, it seems that the figures about the J-curves given above are too low. For the trade balance the total number of J-curves would increase to forty-one and for the balance of payments to twelve. In both cases about 50 percent of the observations in the sample show a J-effect.

Another point to consider is, that it can be expected that larger realignments yield larger effects on the trade balance and the balance of payments than smaller ones. Furthermore, it seems reasonable, that a realignment will be more powerful for the country which is directly concerned, than the simultaneous effect for its trading partners.

However, when the realignments were grouped by size the same results were obtained as before. Considering
only realignments that were larger than 6 percent, the sample of the trade balance data was reduced to fifty-six observations. Out of these, twenty (35.7 percent) show a J-curve effect, but not necessarily a strong one. Seven observations of immediate reactions are made. The rest of the sample does not show any specific pattern for the residuals. It cannot be observed that for larger realignments the residuals result in stronger J-effects or stronger immediate effects. Considering the few even larger realignments, for instance for Belgium, nothing else is discovered. There is no difference between countries that are directly concerned by a realignment and their trading partners.

The same is true for the balance of payments data, where the sample is reduced to thirteen observations. There too, only the realignments larger than 6 percent were included. Four J-curves result and three immediate reactions.

**Examination by Groups of Countries**

Finally, it was examined if significant patterns for different groups of countries could be observed. Here, especially the different export and import goods were considered. For some agriculturally specialized countries like Ireland and Denmark, most of their exports consist of agricultural products. For highly industrialized
countries such a clear pattern is not obvious. Especially the industrialized countries in the EC also show a high productivity in the farm sector. Therefore imports and exports will be well mixed, but clear patterns might be observed in the trade with less developed EC countries, from which the import of agricultural products will prevail.

In 1976 the agricultural sector provided 15.3 percent of the exports for France, 20.5 percent for the Netherlands, 32.7 percent for Denmark and 41.6 percent for Ireland. In Germany agricultural products constituted only 4 percent of the exports, 7.4 percent in Italy and 9 percent in Belgium/Luxembourg. For these countries also the different specializations have to be taken into consideration. Italy mainly grows fruits, olives, wine and rice, the Netherlands specialize in meat, butter, cheese and vegetables, and Denmark and Ireland produce meat. Wheat and wine are the main crops of France.

Furthermore it is necessary to say something about the degree of industrialization. In 1975 Germany was producing over 50 percent of its GDP in the industrial sector. Luxembourg also had a percentage almost that

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49 Dieter Menyesch and Henrik Uterwedde, Europa im Vergleich: Daten zur Wirtschafts- und Sozialstruktur der EG-Länder, Politik im Vergleich, no. 9 (Berlin: Landeszentrale fuer Politische Bildungsarbeit, 1980), p. 56.

50 Ibid., pp. 59-60.
high, 48.9 percent. Italy was producing 43 percent of its GDP through industry, whereas the Netherlands, France and Belgium were only producing 40 to 42 percent of their GDP in the industrial sector. The lowest percentages were shown by Denmark, 37 percent, and by Ireland, 32.5 percent. The countries with the most weight of the EC-countries in the OECD were Germany, France and Italy. Germany alone produced 11.7 percent of the whole OECD industrial production in 1977, France 7.1 percent and Italy 4.4 percent.61

From the above basically three groups of countries can be distinguished. Germany, France and Italy are highly industrialized with relatively little export of agricultural products. The Netherlands and Belgium/Luxembourg are well industrialized, but the agricultural sector plays an important role in their exports. Denmark and Ireland are least industrialized and basically live on their agricultural production. Nevertheless, these groups are not homogeneous. Whereas France and Germany basically produce and export machines and equipment, Italy specializes in food and consumer products. This is also the area of specialization for the Netherlands and Belgium, whereas Luxembourg produces mainly iron, steel and coal. Due to their agricultural concentration, Ireland and Denmark mainly specialize in

61 Ibid., pp. 71-73.
food processing. Therefore it seems sensible to distinguish just between two main groups, the bulk of the industrialized countries and the two agriculturally oriented countries Denmark and Ireland.

For the balance of payments of Denmark, two J-curves in four realignments could be observed of rather long durations. The whole effect lasted six quarters or more. Ireland, however, does not show any J-effects, but there was also only one realignment that was to be considered. For the four revaluations of Germany, always an immediate worsening of the balance of payments seems to occur. Only for the Netherlands two out of three observations seem to show a J-curve effect, however, they are not as long as for Denmark.

For the trade balance France, Germany and Ireland show the most occurrences of J-curves. Expressed in percentages, 36.4 percent of the realignments for France show a J-curve, 39.3 percent for Germany and 40 percent for Ireland. Italy and the Netherlands show a percentage close to 30 percent, which is about the average across countries, as calculated above. Sharply below the average percentage are Denmark and Belgium. The occurrences of the J-curves for France and Germany can be explained by the nature of their production. Both countries specialize in machinery and equipment, where long-term contracts are

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52 Ibid., p. 73.
the rule. The size of the contracts and the long time periods needed for production are the reasons for that. In addition, France also produces grain and wine, where contracts up to one year are likely. The same is true for Ireland’s meat production. A closer investigation shows especially for Germany the long duration of the J-effect compared to the average calculated earlier. For the German trade balance the total J-curve is on the average five quarters long with a range of three to nine quarters (the average across countries was only four quarters).

Table 4
J-Curves by Countries for the Trade Balance

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Realignments</th>
<th>No. of J-curves</th>
<th>Percent</th>
<th>Average Total Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>19</td>
<td>5</td>
<td>26.3 %</td>
<td>4.4 quarters</td>
</tr>
<tr>
<td>Denmark</td>
<td>33</td>
<td>7</td>
<td>21.2 %</td>
<td>4.4 &quot;</td>
</tr>
<tr>
<td>France</td>
<td>22</td>
<td>8</td>
<td>36.4 %</td>
<td>3.3 &quot;</td>
</tr>
<tr>
<td>Germany</td>
<td>28</td>
<td>11</td>
<td>39.3 %</td>
<td>4.9 &quot;</td>
</tr>
<tr>
<td>Ireland</td>
<td>20</td>
<td>8</td>
<td>40.0 %</td>
<td>3.8 &quot;</td>
</tr>
<tr>
<td>Italy</td>
<td>23</td>
<td>8</td>
<td>34.8 %</td>
<td>4.1 &quot;</td>
</tr>
<tr>
<td>Netherlands</td>
<td>23</td>
<td>7</td>
<td>30.4 %</td>
<td>4.0 &quot;</td>
</tr>
<tr>
<td>Total</td>
<td>168</td>
<td>54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table includes all realignments, irrespectively if it is just the mirror image of another realignment, because each country has to be considered completely.
Few J-curves could be observed for Belgium/Luxembourg. Perhaps this is the result of relatively free capital flows. This is the case for Luxembourg as it is the center of the Euromarket. In a system, were capital flows play a larger role than trade, a J-curve effect is unlikely, since capital adjustments to new exchange rates occur much faster. For details see Table 4.

Table 5
J-Curves by Countries for the Balance of Payments

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of Realignments</th>
<th>J-curves</th>
<th>Percent</th>
<th>average total length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Denmark</td>
<td>4</td>
<td>2</td>
<td>50.0 %</td>
<td>&gt;6.0 quarters</td>
</tr>
<tr>
<td>France</td>
<td>3</td>
<td>1</td>
<td>33.3 %</td>
<td>7.0 &quot;</td>
</tr>
<tr>
<td>Germany</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ireland</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Italy</td>
<td>4</td>
<td>1</td>
<td>25.0 %</td>
<td>4.0 quarters</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3</td>
<td>2</td>
<td>66.6 %</td>
<td>&gt;5.0 &quot;</td>
</tr>
</tbody>
</table>

Total: 21  6

Note: > greater than--the total length was not available for all curves.

A conclusive examination of the data for the balance of payments for the different countries is not possible, because not enough realignments could be observed. For the
Netherlands two out of three realignments resulted in a J-curve. Belgium, Germany and Ireland show no curve at all, even though for Germany four realignments were examined. As in the case of Belgium, it may be that fast adjustments in the capital accounts are responsible for this. See Table 5 for further details.

For both, the trade balance and the balance of payments, in about a third of the realignments, a J-curve effect seems to occur. The average length for the total effect seems to be a little bit shorter for the trade balance (four quarters) than for the balance of payments (five and a half quarters), however, the result for the balance of payments has to be interpreted with care, because of the small sample size.

Besides the structure of exports and imports, the price elasticities for exports and imports provide valuable information about the J-curves. Low price elasticities in the short-run for both, imports and exports would give rise to such a phenomenon in the case of a realignment. In most cases the observed J-curves are supported by the price elasticities for manufactured goods, as compiled by Deppler and Ripley. The authors investigated the short-term and long-term responses of imports and exports to relative price changes for several

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countries. The short-run response is defined as the quantity change a year after the price change, and the long-run response is the quantity response from one to three and a half years after devaluation. Deppler and Ripley showed that the short-term responses were generally smaller than the longer-term responses. Overall the exports seemed to react stronger to price changes than the imports, and in some cases the exports also showed a strong initial price response.

Table 6
Relative Price Elasticities for Manufactures

<table>
<thead>
<tr>
<th>Country</th>
<th>Imports</th>
<th></th>
<th>Imports</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short-term response</td>
<td>Long-term response</td>
<td>Short-term response</td>
<td>Long-term response</td>
</tr>
<tr>
<td>Belgium/Luxembourg</td>
<td>0.47</td>
<td>-</td>
<td>-1.42</td>
<td>-1.60</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.19</td>
<td>1.44</td>
<td>-0.83</td>
<td>-0.10</td>
</tr>
<tr>
<td>France</td>
<td>0.82</td>
<td>-</td>
<td>-1.58</td>
<td>-0.39</td>
</tr>
<tr>
<td>Germany</td>
<td>0.39</td>
<td>0.51</td>
<td>-0.03</td>
<td>-0.63</td>
</tr>
<tr>
<td>Netherlands</td>
<td>-</td>
<td>-</td>
<td>-0.14</td>
<td>-1.73</td>
</tr>
</tbody>
</table>

Data for the elasticities were available for several

**Ibid., p. 180.**

**Ibid.**
of the countries under investigation. In several cases, these estimates support our earlier findings.

For example, in the German case we saw many devaluations resulting in a J-effect. The price elasticities for German imports and exports are rather low in the short-run but clearly improve in the long-run according to the estimates derived by Deppler and Ripley (see Table 6.)

For the Netherlands only the export elasticity estimates were available. The low short-run value and larger long-run value suggest that the trade balance will first deteriorate but subsequently improve after devaluation. This supports our earlier findings.

For France on the other hand, the elasticities are not supportive of our earlier findings. The short-term responses of quantity to price changes for imports and exports are both very strong. This suggests that the trade balance will respond favorably in the short-run to a realignment. We found, however, the J-effect to be very prevalent in the French data.

Overall, the data on the elasticities sometimes support and at other times do not support our findings about the J-curve. Perhaps because Deppler and Ripley's estimates were derived from trade in manufactured goods and ignored agricultural trade, the elasticity estimates
should not be used to draw conclusions about overall trade flows.
CHAPTER VII

SUMMARY, CONCLUSION AND CRITIQUE

The subject of the study was to investigate the effects of realignment in the exchange rate between countries on the trade balance and the balance of payments. Of special interest was the so-called J-curve effect on the trade balance. Because of the advantages for this investigation, the European Community was chosen as the subject for the tests. The trade balance and the balance of payments of seven members were examined, which were also members in the European Monetary System with its system of pegged exchange rates.

The applied method was a simple regression of several variables that might influence the balances: monetary growth, income and government expenditures. In a residuals test the influence of exchange-rate changes was accounted for. The actual movements of the balances were compared to fitted values constructed from the estimated regression equations. The use of quarterly data was justified by the short-run nature of the J-curve.

In approximately one third of the cases a development like the J-curve was observed for the trade balance and the balance of payments. In addition, the average length
of the curve was examined. It seemed to be four quarters for the trade balance and five and a half quarters for the balance of payments. Especially the results for the balance of payments has to be interpreted with care due to the small sample size.

It was tried to examine with the help of trade data and elasticities for manufactured goods, under which circumstances J-curves occur. France and Germany consistently showed a J-curve effect, which was explained by their specialization on machines and equipment in their trade. For Germany also the price elasticities for imports and exports support these findings. The Belgium/Luxembourg data did not result in any J-curves. This was explained by the active capital and money market in Luxembourg, that cause faster adjustments in the accounts. It was also regarded as the reason for the fast adjustments in the balance of payments of Germany where no J-curves could be observed. In Ireland agriculturally specialized exports seemed to be responsible for the J-curves.

The results were basically consistent with earlier studies. There too, an average length of the J-curve of one year was assumed. It became clear that there can be a wide variation in the lengths of the curves. Certain conditions are a prerequisite for J-curves to exist and be observed. Considering the special circumstances that are
necessary, it seems reasonable when only a third of the realignments show a J-effect.

In previous studies the J-curve was regarded solely as a problem of the trade balance, and only trade effects are considered as explanations for this phenomenon. The present study shows some results for the balance of payments, too. The observed J-effects were even longer than for the trade balance. Two explanations are offered. First, even financial flows don't adjust as fast as usually expected, because old contracts have to be fulfilled. Second, in anticipation of a devaluation money might flow out of the country, and only later on an adjustment to the new situation takes place. For revaluations the reverse would be true. Anticipation of a realignment can also be the reason for J-curves to occur before or simultaneously to a change in the exchange rate.

Despite some statistical deficiencies, the results seem to adhere to the theoretical expectations. In the regression equations the estimated coefficients for the variables do not always support the theoretical expectations. In light of these deficiencies the results have to be interpreted carefully. Nevertheless, it seems that short-term influences of realignments on the trade balance and the balance of payments could be observed.

Some other influences on the trade balance and the balance of payments could not be incorporated, due to data
limitations. This especially concerns quantitative and qualitative trade restrictions, that still exist even within the EC. It could also be beneficial to incorporate expectations into the model. Some of the results indicated that there might be some scope for J-curves to occur earlier than traditionally expected.

Despite the deficiencies, the results that were obtained seem encouraging. Some of the difficulties that were encountered could be eliminated, and a further examination of the J-curve should be interesting. Because of limited work on the J-curve, future studies would be helpful in further evaluating this phenomenon. Since balance of trade and payments problems still persist, a better understanding of the J-curve will continue to be of professional research interest.
APPENDIX

Trade Balance

\[ \Delta \left( \frac{TB_i}{Y_i} \right) = a_0 + a_1 \Delta (g_i - g_j) + a_2 \Delta (M_i - M_j) + a_3 \Delta (G_i - G_j) \]

Regression Equations of the Trade Balance

<table>
<thead>
<tr>
<th>Country</th>
<th>B/DK</th>
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<th>B/G</th>
<th>B/IR</th>
<th>B/IT</th>
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<td>Y-W</td>
<td>Y-W</td>
<td>Y-W</td>
<td>Y-W</td>
</tr>
<tr>
<td>( a_0 )</td>
<td>-0.000012</td>
<td>-0.00019</td>
<td>-0.000036</td>
<td>-0.000034</td>
<td>-0.00053</td>
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<tr>
<td>(0.085)</td>
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<td>(-0.224)</td>
<td>(-1.396)</td>
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<tr>
<td>( a_1 )</td>
<td>0.00202</td>
<td>0.00275</td>
<td>0.0029</td>
<td>-0.00089</td>
<td>-0.00507</td>
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<tr>
<td>(0.797)</td>
<td>(0.186)</td>
<td>(0.227)</td>
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<tr>
<td>( a_2 )</td>
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<td>0.00748</td>
<td>-0.00723</td>
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<td>-0.00528</td>
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<td>(0.203)</td>
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<td>(-0.578)</td>
<td>(0.335)</td>
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<tr>
<td>( a_3 )</td>
<td>0.00738</td>
<td>0.1308</td>
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<td>-0.01057</td>
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<td>(0.877)</td>
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<td>(-1.715)</td>
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<tr>
<td>DW</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.47</td>
<td>0.32</td>
<td>0.35</td>
<td>0.50</td>
<td>0.37</td>
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Continued

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<thead>
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<th>Country</th>
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<td>OLS</td>
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<td>Y-W</td>
</tr>
<tr>
<td>a₀</td>
<td>0.000044</td>
<td>0.000024</td>
<td>-0.00081</td>
<td>-0.00019</td>
<td>-0.000203</td>
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<tr>
<td></td>
<td>(0.103)</td>
<td>(0.022)</td>
<td>(-1.008)</td>
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<tr>
<td>a₁</td>
<td>-0.00828</td>
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<td>0.01374</td>
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<tr>
<td>a₂</td>
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<td>0.0002</td>
<td>-0.00201</td>
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<td>(-.724)</td>
<td>(-.499)</td>
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<tr>
<td>a₃</td>
<td>-0.01035</td>
<td>0.00179</td>
<td>0.0565</td>
<td>-0.00039</td>
<td>-0.00269</td>
</tr>
<tr>
<td></td>
<td>(-.131)</td>
<td>(0.077)</td>
<td>(1.431)</td>
<td>(-.098)</td>
<td>(-.304)</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>2.11</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R²</td>
<td>0.56</td>
<td>0.25</td>
<td>0.05</td>
<td>0.46</td>
<td>0.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
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<th>F/G</th>
<th>F/IR</th>
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<td>Y-W</td>
<td>OLS</td>
<td>Y-W</td>
<td>Y-W</td>
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<tr>
<td>a₀</td>
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<td>-0.00016</td>
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</tr>
<tr>
<td></td>
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<td>(0.333)</td>
<td>(-.842)</td>
<td>(-.907)</td>
<td>(0.754)</td>
</tr>
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<td>a₁</td>
<td>0.00536</td>
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<td>0.00069</td>
<td>-0.00046</td>
<td>-0.00254</td>
</tr>
<tr>
<td></td>
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<td>(-1.924)</td>
<td>(1.145)</td>
<td>(-.211)</td>
<td>(-1.715)</td>
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<td>a₂</td>
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<td>-0.00214</td>
<td>-0.00039</td>
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<td>-0.00097</td>
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<tr>
<td></td>
<td>(-1.534)</td>
<td>(-.622)</td>
<td>(-1.063)</td>
<td>(-.750)</td>
<td>(-1.483)</td>
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<tr>
<td>a₃</td>
<td>0.02839</td>
<td>-0.03953</td>
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<td></td>
<td>(1.036)</td>
<td>(-2.172)</td>
<td>(0.526)</td>
<td>(0.011)</td>
<td>(-.111)</td>
</tr>
<tr>
<td>DW</td>
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Notes:
- Y-W: Yule-Walker method
- OLS: Ordinary least squares method
- DW: Durbin-Watson statistics
- B: Belgium
- FR: France
- G: Germany
- IR: Ireland
- IT: Italy
- DK: Denmark
- ND: Netherlands

The figures in brackets are t-statistics.

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Balance of Payments

\[
\Delta (BP/Y)_t = b_0 + b_1 \Delta (g_t - g_h) + b_2 \Delta (M_t - M_h)
\]

Regression Equations of the Balance of Payments

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Notes: see above.


"Mystery of the Lazy J." Wall Street Journal, 8 April 1986, p. 32.