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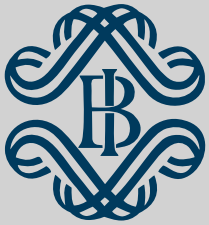
by Cristina Mastropasqua and Stefano Vona



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THE US CURRENT ACCOUNT IMBALANCE AND THE DOLLAR: THE ISSUE OF THE EXCHANGE RATE PASS-THROUGH (*)

(*) The draft of this paper was presented at a seminar held at the Bank of Greece in June 1988 and at the Department of Political Economy of the University of Rome in January 1989; our thanks go to the participants for their useful comments. We are also particularly grateful to Professor W. Branson for his criticism and advice during the various phases of the paper's preparation, and to our colleagues of the Research Department, L. Bini Smaghi, S. Micossi and G. Tullio for their helpful suggestions on earlier drafts. Moreover, we benefitted from the comments of Professor P. Baffi, J.A. Frenkel, C. Gola and an anonimous referee. Finally, we wish to thank J. Smith for his valuable help in reviewing our English.

1. Introduction

In the first half of the eighties economists devoted a considerable amount of resources to try to explain the persistent tendency of the exchange rate of the dollar to appreciate. More recently the emphasis of the analysis has shifted on the following two issues: (i) why the US current account and trade imbalances have not been redressed despite the enormous depreciation of the dollar, occurred since March 1985, and (ii) which policy actions should have to be followed for fostering the adjustment process.

Research on the second issue has contributed to clarify the link between fiscal rebalance and exchange rate changes, leading to the conclusion that they are complement, rather than substitute for each other, in the policy strategy for correcting current account imbalances (Krugman, 1987; Branson, 1988). This result is important for the debate among the authorities of the G-5 and G-7 countries on how to cope with the adjustment of the current account imbalances of the three largest industrial countries.

Studies concerning the first issue, which is of a micro-economic nature, center on the analysis of the relations between exchange rates, import and export prices, and trade flows. In this paper we shall be looking primarily at the first of the relations mentioned above, that between exchange rate and (import) prices. In the literature the subject has been recently examined through theoretical models based upon the hypothesis that the process of adjustment to exchange rate changes has been characterized by "hysteresis".

One strand of this approach stresses the changes in the sectoral composition of supply during a real exchange rate cycle. In particular, when a large depreciation follows a huge and prolonged appreciation, the displacement of domestic supply by foreign supply during the first phase

reduces the ability of the domestic producers to exploit the real exchange rate depreciation in the second phase, because of barriers to entry of various nature. Consequently, the gains in price competitiveness needed to riequilibrate the trade balance would have to be larger than those that produced the imbalance (Biasco, 1986). In other words, a number of domestic producers in sectors where price elasticity is highest are likely to be driven permanently out of the market. If this hypothesis is correct, one should observe a reduction in the aggregate price elasticities of both imports and exports in the depreciation phase.

The other strand, which leads to similar conclusions, follows from the model presented by Baldwin (1986) and developed by Baldwin and Krugman (1986 and 1987), and Baldwin (1988a and 1988b), where the impediment to the return of domestic supply to the initial level is found in the resistance to exit of foreign firms. This approach to "hysteresis" is based upon the "beach-head" model, which will be described in Section 4. Accordingly, foreign producers that incurred fixed, sunk costs - for example, in setting up a sales network - to enter the domestic market when the real exchange rate of the home country appreciated, will try to maintain their market shares when it depreciates. This results in a deeper competition, due to the increase in the number of firms operating on the domestic market, and a consequent reduction in prices and profit margins. This is how the "beach-head" model explains hysteresis in import prices. Expressed in domestic currency these come down during the appreciation phase, but do not rise to the same extent during the depreciation phase. Consequently, the price competitiveness of domestic producers first deteriorates and then only recovers partially, thereby helping to explain why the recent fall of the dollar has not yet resulted in a significant reduction in the US trade deficit.

This paper addresses some of the issues of this last strand of research. Although a rigorous test is

difficult to be performed, we find hardly any evidence in favour of the hypothesis of hysteresis in US import prices during the recent dollar cycle. In fact, foreign manufactures are not found to have moved their prices asymmetrically in response to the appreciation and the depreciation of the dollar in the period 1980-87. The long delayed reduction of the US trade deficit does not seem to originate from a change in the behaviour of foreign exporters in each phase of the dollar cycle. Moreover, some results of our analysis suggest that dollar depreciation is effective in correcting the US trade deficit.

Apart from the introduction, the paper consists of five Sections. Section 2 provides a brief description of the US current and trade accounts, and singles out what appears to be the most relevant factors in determining their behaviours in the eighties. Section 3 examines the "pass-through" issue, and gives a synthetic account of the relevant literature. Section 4 critically reviews the recent literature on hysteresis. Section 5 presents the results of our econometric work on the dimension of the pass-through from dollar changes to the US import prices of manufactures and on its stability over time. Finally, in Section 6 we review the major findings and conclusions of the paper.

2. Factors in the deterioration of the US current account

At the beginning of the eighties the current account balance of the United States was in small surplus; in 1987, after a persistent deterioration, it registered a record deficit of 154 billion dollars (around 3.5 per cent of GNP); in 1988 it improved by some 20 billion. The deterioration since 1980 is more than accounted for by the trade balance in manufactures, which turned from a 19 billion surplus in 1980 to a 154 billion deficit in 1987 (Table 1).

Table 1

CHANGES IN US CURRENT ACCOUNT BALANCE AND IN ITS COMPONENTS; 1980-1987

(billion dollars)

	level 1980	Year-on-year changes 1981	1982	1983	1984	1985	1986	1987	level 1987
Current balance (fob-fob)	2	4	-15	-38	-60	-12	-23	-15	-154
Trade balance (fob-fob)	-25	-3	-8	-31	-45	-10	-22	-15	-160
of which (1): Non-manufactures	-47	3	11	2	-4	-2	11	9	-17
Manufactures	19	-7	-17	-27	-47	-43	-32	-9	-154

Decomposition of changes in nominal US manufactures trade balance
(year-on-year changes, billion dollars)

	1981	1982	1983	1984	1985	1986	1987	Cumulative changes
Manufactures (2)								
Change in nominal balance	-7	-17	-27	-47	-23	-43	- 9	-173
of which:								
Export volumes (3)	-6 (6)	-22 (-3)	-7 (7)	8 (17)	1 (10)	3 (6)	15 (10)	-8 (53)
Import volumes (3)	-12 (-12)	-1 (-1)	-25 (-13)	-52 (-24)	-32 (-11)	-35 (-13)	-15 (-9)	-172 (-83)
Terms of trade	13	8	6	-4	7	-10	-15	5
Residual	-2	-2	-1	1	1	-1	6	2

Sources: Richardson (1987); US Department of Commerce, Survey of Current Business; Economic Report of the President, 1987.

(1) Exports fob, imports cif.

(2) Exports fob, imports cif. Decomposition of changes in balances is based on the following identity:

$$B(2) - B(1) = |X(2)-X(1)|.PX(1) - |M(2)-M(1)|.PM(1)$$

"Export volumes" "Import volumes"

$$+ |PX(2)-PX(1)|.X(1) - |PM(2)-PM(1)|.M(1)$$

"Terms of trade"

$$+ |PX(2)-PX(1)|.|X(2)-X(1)| - |PM(2)-PM(1)|.|M(2)-M(1)|$$

"residual cross-product"

(3) The figures in brackets are the contributions that might have occurred, had the US export volumes followed the development of world merchandise export/import volumes (total and of manufactures).

The terms of trade effect for manufactures, although obviously negative in 1986 and 1987 when the dollar depreciated by about 35 per cent, did not contribute to the cumulative deterioration which occurred over the whole period. Moreover, the adverse terms-of-trade effect that emerged in 1986 was smaller than the negative quantity effect. In short, the usual J-curve effect is not a convincing explanation of the sluggish adjustment of the US deficit, at least during the first 6-7 quarters of dollar depreciation.

US export volumes decreased from 1981 to 1983 and then recovered back to the 1981 level at the end of last year. Since world trade in manufactures increased substantially, US firms suffered a huge loss of export market share at constant prices (from 12.7 per cent in 1980 to 8.3 per cent in 1986). However, the negative effects on the trade balance recorded in the first three years were largely offset in the following period, and the overall effect was only moderately negative (Table 1). The near doubling of import volumes of manufactures between 1980 and 1987 (Figure 1) explains virtually all the current account deterioration, with an estimated impact of more than 170 billion dollars. The importance of this growth should not be overstated, however, both because the contribution of import volumes in such decompositions is nearly always negative (imports at constant prices only shrink during recessions) and because the "mechanical nature" of the exercise entails the risk of the results being potentially misleading. Hence, they require interpretation and judgement.

On the one hand, the export volume effect (Table 1) is not negligible, as the results of the decomposition tend to show. Indeed, if US producers had maintained their 1980 export market share (at constant prices), their exports in 1987 would have been about 50 billion dollars more than the actual value. Hence, their "imputed contribution" to the worsening of the trade balance of manufactures is not at all

negligible.

On the other hand, the net effect of the growth of import volumes should be compared with some benchmark value approximating what the increase would have been "in normal circumstances", i.e. without such a sharp deterioration in the price competitiveness of US industry. Assuming that the ex-post elasticity of manufactures with respect to domestic demand was 1.8 (the average of the years 1976-1982) instead of 3 (the "apparent" elasticity for the period 1983-87), it is possible to calculate the corresponding growth of imports at constant prices in the latter period and obtain their negative contribution to the trade balance as the difference compared with the actual values. The results of this exercise are given in brackets in Table 1 and let us argue that the "extraordinary" part of the increase in import volumes in the period 1983-87 caused a deterioration in the trade balance of about 92 billion dollars, or a little more than half the total deterioration (173 billion dollars).

Obviously, these are only indicative figures; more precise evaluation of the quantitative effects requires the use of elasticity parameters estimated econometrically. The results of such exercises nonetheless vary widely.[1] In particular, the differences concern the importance of (i) the deterioration in price competitiveness and (ii) the growth rate of the US economy relative to those of the other industrial countries in causing the sharp rise in the volume of imports and curbing the increase in the volumes of manufactured exports. However, what is important here is the conclusion, common to all the major econometric models, that price competitiveness played an important role in determining

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1. For a review of the performance of the major econometric models of the US economy, see Brookings Institution (1987).

trade volumes in the period 1981-1985/6.[2]

The recent behaviour of US trade flows, in volume terms, seems to have shown an unexpected delay in the response to the improvement in US price competitiveness (Figure 1). This impression partly derives from the way in which the real exchange rate of the dollar is often calculated.

In fact, the different economic significance of the various price indices which can be used in the calculations, coupled with the different coverage of competititor countries cause the indicators of the dollar's real effective exchange rate to diverge (needless to say, the divergences may also originate from different weighting schemes). Calculated on the basis of producer/wholesale (p/w) prices of manufactures, the real exchange rate of the dollar vis-à-vis the major industrial countries' currencies indicates that the price competitiveness of US industry at the end of 1987 was 4 per cent above the level of 1978, having more than compensated for the huge deterioration which occurred between the end of 1980 and the beginning of 1985.[3]

However, p/w prices tend to provide an estimate of the "underlying competitive position" of domestic production as a whole; they provide an "ex-ante" measure which approximates the development of total unit costs in the production of tradeable goods. The prices of traded goods may differ from those of tradeable ones because in an imperfectly competitive setting (see Section 3), firms may decide to vary their profit margins to pursue specific market strategies.

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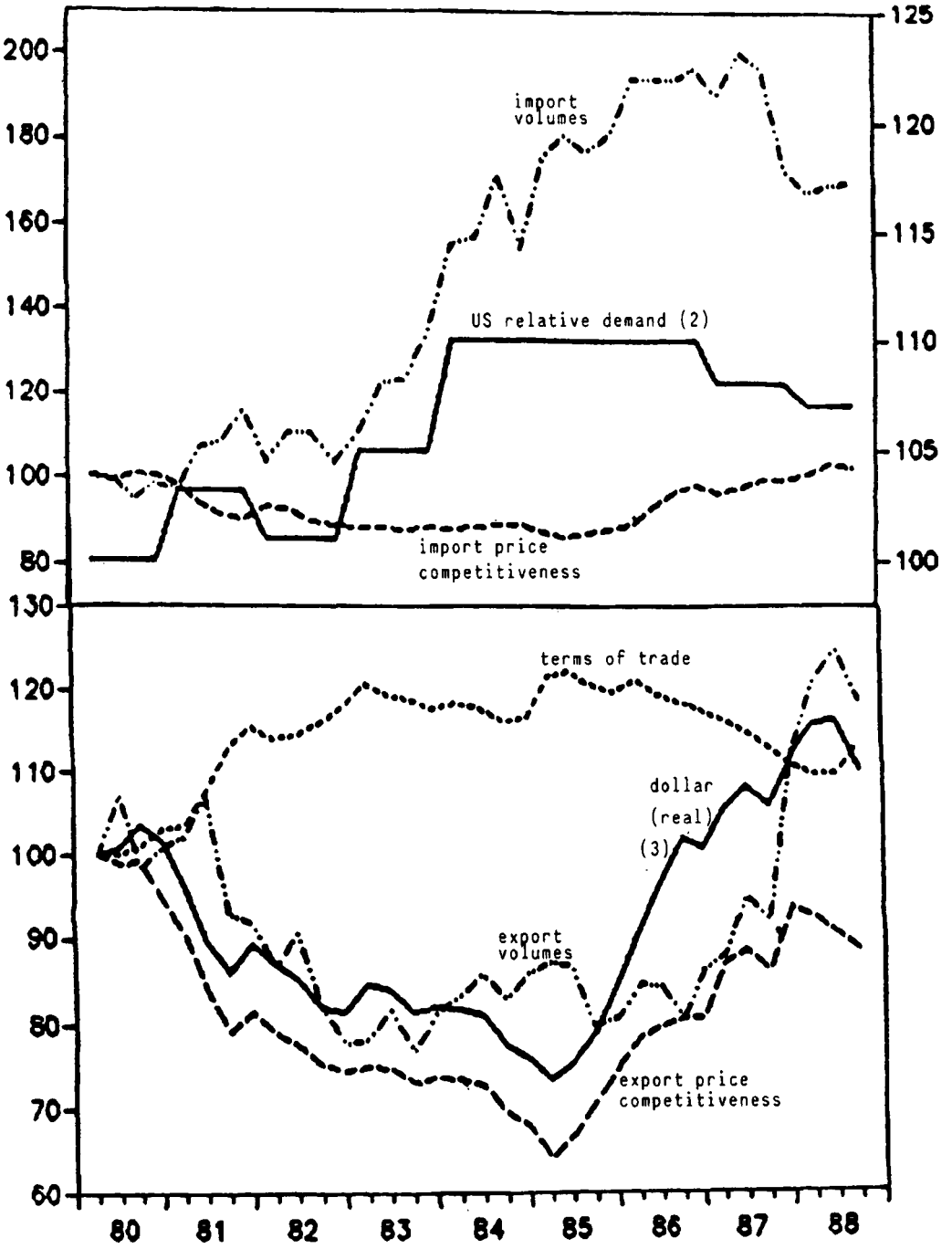
2. Recent single-equation estimates provided by Krugman and Baldwin (1987) show that the sum of import and export price elasticities is larger than one. See also the aforementioned Brookings Institution (1987) paper.

3. The inclusion of the four major Asian NICs (Hong Kong, Taiwan, South Korea and Singapore) shows, however, that at the end of 1987, the real exchange rate of the dollar was returned to the 1978 level.

US TRADE OF MANUFACTURES: VOLUMES AND PRICE COMPETITIVENESS OF IMPORTS AND EXPORTS (1)



Source: IMF, OECD, Banca d'Italia.

(1) Import price competitiveness is calculated as the ration of US import unit values to US producer price index of manufactures; export price competitiveness is calculated vis-à-vis 13 industrilized countries. Terms of trade also refer to manufactures.

(2) US real demand growth relative to the rest of OECD (right-hand scale).

(3) Vis-à-vis 13 industrialized countries, deflated with relative producer prices of manufactures.

These may last beyond the short-run, although convergence of the two types of prices under discussion is to be expected in the long run.

The divergences between the dollar's real exchange rate based on p/w prices of manufactures and those based on unit values of exported industrial goods are shown in Figure 1. As regards the comparison of the index based on p/w prices with the competitiveness of exports, during the appreciation phase both indices measure a similar deterioration (30 per cent the former, 35 per cent the latter), while in the following phase of sharp depreciation of the US currency they show quite different improvements. On the basis of p/w prices, the gain of competitiveness for US producers was almost 10 per cent larger than the previous deterioration; while in terms of export unit values, it was 7 per cent smaller.

This difference may be due to: (i) different product compositions of exports and domestic production (both for the US and for competitors); and (ii) different strategies followed by US producers in pricing domestic sales and exports. In particular, the recent large depreciation of the dollar may well have enabled US producers, and especially exporters, to restore their profit margins, which were presumably squeezed during the large and prolonged real appreciation of the dollar, and forced foreign producers to accept lower profit margins to avoid an excessive loss of price competitiveness in the buoyant American market. Such strategies probably contributed to the improvement in US competitiveness falling short of the nominal depreciation of the dollar.

They are particularly evident in the development of the competitiveness of the US producers in their home

market,[4] where they have a high degree of monopoly power because of the large number of big companies operating there and the large market share of US producers (almost 90 per cent in 1983 as opposed to 77 per cent for other 12 important OECD countries).[5] In this case, the exporters to the US market seem to have made extensive changes in their profit margins to reduce the impact of the swings in the nominal exchange rate of the dollar on their competitiveness vis-à-vis domestic producers. Evidence of this strategy having been followed comes from the comparison of the index of import price competitiveness (upper part of Figure 1) with the real exchange rate of the dollar based on w/p prices (lower part of the same figure): the former varied much less than the latter. As we shall see in Section 5, the inclusion of a price interaction term in the determinants of US import prices is crucial for assessing the presence of a change in the behaviour of exporters from foreign countries in the recent years.

Figure 2 permits US import prices of manufactures to be compared with their "shadow import prices", i.e. the prices which would have been charged if foreign producers had simply "added" the dollar change to their export prices in national currencies.[6] Clearly, foreign producers kept the prices of their exports to the US more or less stable in dollar terms while the dollar was appreciating mostly,

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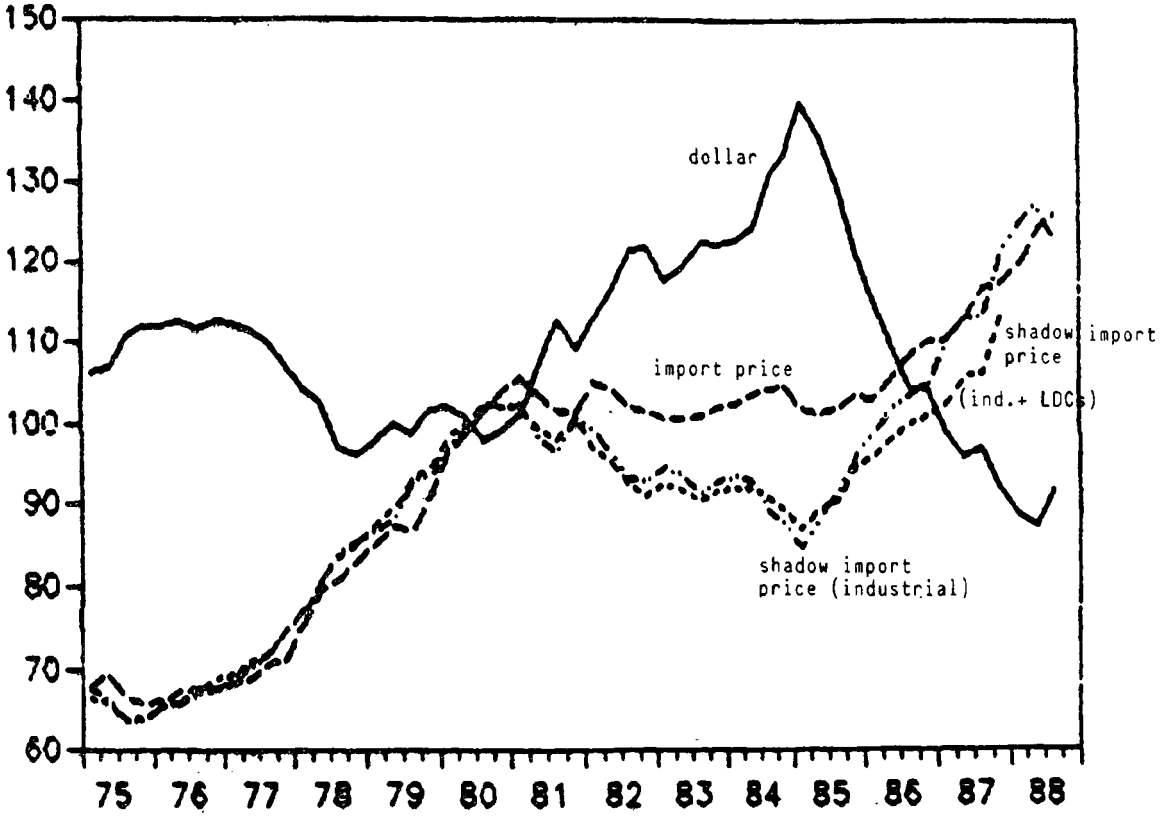
4. From the start of the dollar's decline in March 1985 until the end of 1987 US manufacturers' export prices grew faster than those charged in the domestic market. Between the first quarter of 1985 and end-1987 the former rose continuously, albeit slow by 5.6 per cent, while the latter declined until the third quarter of 1986 and then returned to their initial level.

5. In Brodin and Blades (1986).

6. Calculated using the unit values of the exports of manufactures of the eight major exporters from the industrial area to the US.

Figure 2

IMPORT PRICES, SHADOW IMPORT PRICES AND THE EFFECTIVE NOMINAL EXCHANGE RATE OF THE DOLLAR (1)



Source: IMF, OECD, UN, Banca d'Italia.

(1) Unit values of US imports of manufactures; the shadow import price is an average of export unit values of Canada, Japan, Germany, France, Italy, UK, Belgium, Netherlands, LDCs weighted with their import shares in the US market: the dollar effective exchange rate is calculated vis-à-vis these countries.

preferring higher unit profits to the potential improvement in price competitiveness implicit in the shadow import prices. After the dollar began to depreciate, in the second quarter of 1985, import prices increased far less than would have been warranted by the extent of the fall. Foreign producers probably used the extraordinary large profit margins they had enjoyed in the previous period to contain the loss of price competitiveness. The gap between the shadow price and the actual price had nonetheless closed by the end of last year (Figure 2). This may imply that further nominal depreciations of the dollar will tend to translate more fully into real depreciations, since foreign exporters have exhausted the scope for reducing prices in their currency.

These considerations are particularly relevant for the current debate about the level the dollar has to reach in order to best promote the correction of the US current account deficit. They show that the answer crucially depends upon the price strategies of US and foreign producers, since these strategies are an important factor in determining the actual change in price competitiveness following a change in the nominal effective exchange rate.[7]

3. The exchange rate-price relationship: theoretical explanations based on "general models"

The degree of exchange-rate pass-through on import prices Pm can be expressed in simple mathematical terms as

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7. There are, of course, other factors to be considered, such as the development of relative unit costs, the impact of exchange rate variations on domestic prices and the price elasticities of trade flows. However, our interest is confined to the relationship between exchange rate changes and US import prices, which the price strategies discussed above appear to have modified substantially in the recent years of large dollar swings.

follows:

$$(1) \qquad \frac{d\,Pm}{dt} = \alpha \frac{d\,e}{dt} \qquad 0 \leq \alpha \leq 1$$

The pass-through coefficient, α, measures the degree of responsiveness of import prices to exchange rate changes. When the import price, expressed in the national currency of the country considered, changes proportionally with the exchange rate (e) variation, $\alpha=1$; when Pm varies less than proportionally, $0<\alpha<1$; finally, if Pm does not change at all, $\alpha=0$. If one is interested in the response of other prices, e.g. domestic prices, to the exchange rate, the impact of import price changes on the prices which are of primary interest can be evaluated by first estimating the α parameter in (1).

The expected value of α depends upon the several factors and circumstances which govern the movement of the export prices of foreign countries in response to the exchange rate variation (de).[8] The simplest case is that of a purely competitive market structure, where each country is small and producers sell homogeneous goods. In response to a variation of the exchange rate, domestic and foreign producers will continue to sell at the given world price (in foreign currency; $\alpha=0$); the profitability of domestic producers will change while their price competitiveness will not because they will modify their prices by the full amount of the exchange rate change. In the long run domestic profit margins may return to the original level if domestic costs are fully indexed to prices and/or new producers enter the market. In this "Cassellian" framework, small countries

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8. In our simple definition of pass-through in respect of nominal exchange rate changes, both mark-ups and relative production costs influence the pass-through dimension. When the real exchange rate is considered only mark-up changes become relevant.

cannot change their competitiveness through the exchange rate.

At the other extreme there is the standard "Keynesian" (Mundell-Fleming) model, in which countries are completely specialized in production while the two goods are differentiated and, thus, not perfectly substitutable. With fixed wages and mark-ups, import prices respond in full to exchange rate variations: $\alpha=1$ in equation (1).

In the latter case the import price increase that follows a devaluation in one of the countries may be less than proportional to the amount of the depreciation. This conclusion derives from the pass-through being dependent upon the demand and supply elasticities of foreign exports. In fact, following Branson (1972) the price elasticity with respect to the exchange rate is given by the following equation:

$$(2) \qquad \frac{dPm/Pm}{de/e} = \frac{1}{1-dx/sx}$$

where dx and sx are the elasticities of demand and of supply respectively. The pass-through would be equal to 1 only if the supply elasticity were equal to infinity.

In the case of a devaluation in a country like the US, which cannot be considered small in comparison to the rest of the world, the supply elasticity of foreign exports can reasonably be assumed to be finite (at least in the short run). Already this relatively simple model can, thus, explain why the pass-through from the dollar exchange rate to the US import prices may be less than complete.

More recently, the literature on the pass-through issue has been developed by using models of imperfectly competitive markets. However, in this area the number of economic models which can be considered is very large, and the results tend to differ according to the model used. Some of these models are reviewed in Dornbusch (1987). Among

these, an extended version of the Dixit-Stiglitz model seems the most promising for the explanation of the observed sluggish response of trade, and especially import prices, to exchange rate variations, since we are interested in the behaviour of import prices of differentiated products (manufactures).

The Dixit-Stiglitz model assumes imperfect competition à-la-Chamberlin, which excludes strategic interaction between firms in their pricing, and constant mark-up over costs (due to the assumption of a symmetric structure of the market, i.e. equal elasticity of substitution among variants). Dornbusch extends this theoretical setting to the assumptions (i) that firms are large enough to affect the industry price and (ii) that they use conjectural variations to react to the "perceived" change in the industry price term.

These modifications of the Dixit-Stiglitz model make it possible to derive the (inverse) demand curve for individual firms with a variable mark-up (α') over unit labour costs (w):

$$(3) \quad p_i = \alpha' w; \quad \alpha' \equiv 1/[1-1/c(1-\varepsilon)]$$

where c is the elasticity of substitution among variants. $\varepsilon \equiv (dP/P)/(dp_i/p_i)$ is the elasticity of the aggregate price with respect to p_i and "captures the strategic interaction between firms as perceived by the individual price-setting firm. The term is a function of relative prices and the conjectural variation"[9] (Dornbusch, 1987 pp.99-100).

Because ε is a function of relative prices it is possible to show that the price strategy followed by each firm (i the foreign and j the domestic one) is dependent upon

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9. The firm's conjectural variation is assumed to be a parameter $\sigma=d(\ln p_i)/d(\ln P)$ (where P is the aggregate price), ranging between zero and one.

that chosen by its competitors. Their interaction can thus be expressed in terms of the two following "price reaction functions":

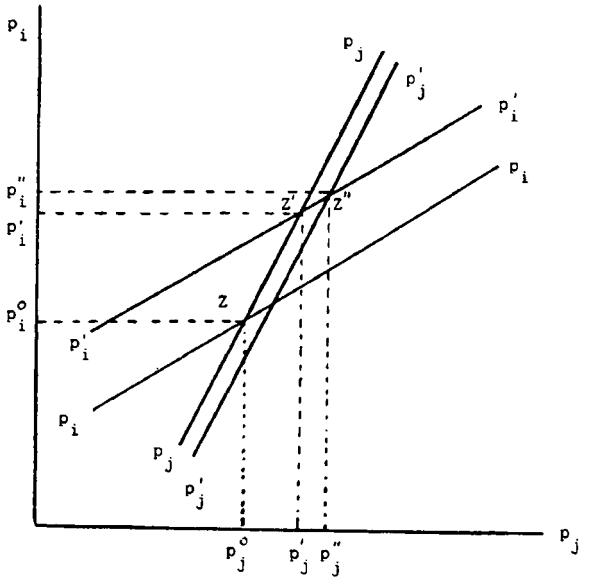
(4) $p_i = F^*(p_j/p_i, \sigma, c)ew^*$

(5) $p_j = F(p_i/p_j, \sigma, c)w$

The response of the relative price (p_i/p_j) to an exchange rate change can be derived from a simplified geometrical presentation through a linear approximation of equations (4) and (5) (lines p_ip_i, p_jp_j in Figure 3).

A devaluation of the domestic currency raises the production costs of firm i expressed in currency j (ew^*). Firm i raises its price p_i less than proportionally to the exchange rate, to limit the unfavourable change in its relative price. Following the increase in the industry price P, firm j increases p_j and causes a new response of firm i, and so on. At the new equilibrium z' both p_i and p_j are greater, but p_i has increased relative to p_j.[10]

Figure 3



10. This requires that dp_j/dp_i in equation (5) be less than one, i.e. that the slope of schedule p_jp_j in Figure 3 be greater than one.

It can also be assumed that the domestic firm j uses the increase in competitiveness due to the reduction of (p_j/p_i) to make a further increase in p_j and, consequently, in its profits. The p_jp_j schedule would then shift to $p_j'p_j'$ and the new equilibrium point would be Z".

This model is able to explain the price behaviour of foreign exporters described in the previous Section. Foreign producers increased their mark-ups over costs when the dollar appreciated but not to the point that would have left their competitiveness unchanged. In other words, they divided the potential gains in competitiveness deriving from the strong dollar into two parts: one made up of higher profit margins and the other of actual competitiveness gains. In this way they increased both unit profits and market shares. When the dollar depreciated they brought their profit margins back to the "normal" level (by reducing their mark-ups), limiting the loss of price competitiveness to a fraction of the fall in the dollar exchange rate. This behaviour results in a less than complete pass-through of exchange rate changes to US import prices.

However, the model does not embody any asymmetric behaviour in the exchange rate-price relation. Rather it suggests that the sluggish adjustment of the US trade balance to the depreciation of the dollar is, essentially, no more than the twin phenomenon of the equally sluggish deterioration when the dollar appreciated. To get a different response of prices to the exchange rate changes in the appreciation and in the depreciation phases it is necessary to derive a mechanism through which the structural parameters of the model (c and/or ε) respond differently to an appreciation and to a depreciation of the exchange rate. Such a result is provided by the model discussed in the next Section.

4. The exchange rate-price relationship: results from the models based upon the hysteresis hypothesis

The asymmetric view of the adjustment process is based on the theoretical models of hysteresis. However, before examining this literature, it needs to be stressed that the available evidence on asymmetric effects does not seem conclusive. In general, two important results on the response of US trade to price changes need to be borne in mind. First, all the available estimates of trade-volume price elasticities show that the Marshall-Lerner conditions are satisfied. Second, trade volumes react with long lags to changes in price competitiveness. In particular, the fact that imports continued to grow at a high rate well into 1986, even though the dollar was depreciating from the first quarter of 1985 onwards, is only a weak indication of asymmetry in the adjustment of quantities to real exchange rate changes. Even if there is agreement about the importance of the lagged effects of competitiveness on import volumes, the estimates of the length of the lags differ widely from one model to another, as reported in the Brookings Institution Workshop of March 1987 (Discussion paper no. 58; Table V-1), which shows mean lags varying from 0.2 to 2.0 years. If the estimates on the long side were correct, much of the puzzle about US import volumes of manufactures would disappear.

More evidence is needed, however, on the recent development of trade volumes. In particular, one cannot reject the possibility that the combination of booming US domestic demand in 1983-85 and dollar appreciation changed the expenditure elasticity of imports of manufactures in volume terms, possibly because bottlenecks impeded the adaptation of supply to the rapidly increasing demand. US production and domestic sales did in fact expand considerably in the upswing of 1983-85 and capacity utilization rates rose

to high levels in many sectors. Moreover, the current and expected loss of price competitiveness and profitability may have discouraged prompt adaptation of US supply to the rise in domestic expenditure. All in all, the expenditure elasticity of imports may have risen. This hypothesis is consistent with some "hysteresis" in the adjustment process, but not necessarily, or not only, with the kind of "hysteresis" considered by the currently available models, which focus primarily on the exchange rate-import price relationship.

Because the depreciation of the dollar is relatively recent, the literature on the econometric search for structural breaks in the import volume equation is limited. Richardson (1987) has shown that this equation (in the specification used in the OECD interlink model) significantly underpredicts import volumes in the period 1983-85.[11] This, of course, is a sign that some important changes may already have occurred during the appreciation of the dollar, a result which is not consistent with the hysteresis hypothesis. More recently, Krugman and Baldwin (1987) have used import and export equations for non-oil US trade estimated in the period 1977:2-1985:1 (quarterly data) to forecast the 1985-86 behaviour of trade flows. This exercise results in substantial overprediction of the export equation and underprediction of the import one, thus indicating a possible break in the equation in the period of dollar depreciation, a result which supports the hysteresis hypothesis.

This discussion suggests that further evidence on asymmetry in the response of US trade to changes in the dollar is required to support the view that a model based on "hysteretic behaviour" is really what is needed to explain the recent development of US trade.

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11. By far the most important determinant of import growth in the OECD model is the increase in domestic demand.

Bearing these reservations in mind, we will briefly review the "beach-head" model.

The original purpose of this model, as developed by Baldwin (1986), was to explain the causes of hysteresis in trade volumes. Further work on this subject (Krugman and Baldwin, 1987), and especially (Baldwin, 1988a and 1988b) extends the hysteresis hypothesis to prices by linking the volume and price effects.

The basic result of the "beach-head" (henceforth B-H) model is that large exchange rate shocks change the relationship between the exchange rate, on the one side, and trade volumes and prices, on the other, by modifying the structure of the market.[12]

The model is built upon a Spence (1976) and Dixit-Stiglitz (1977) theoretical framework (henceforth S-D-S) adapted to imperfect competition in a partial equilibrium setting. "Foreign and home firms engage in Cournot competition in the domestic market for a particular good with each firm selling a different S-D-S variety. Home and foreign production costs ..... are linear homogeneous in output. Firms must also incur a fixed, sunk market-entry cost, F, which reflects the cost of the firm-specific and market-specific assets that are required to sell in the market. For example, F could represent the costs of setting up a distribution and service network, of establishing a brand name through advertising, or of bringing the foreign product into conformity with domestic health and safety regulations. The results would go through as long as at least part of F is sunk". (Baldwin, 1988a, pp. 2-3).

After a firm has established itself in a market it has to pay fixed maintenance costs (G), which are assumed to be smaller than F and to be necessary in order to remain in

---

12. Note that, conceptually, Baldwin's papers develop from the Dornbusch model described earlier, by letting the structural parameters vary.

the market. Both F and G are independent of the exchange rate. Since the B-H is multiperiod, firms have to take intertemporal decisions, which depend crucially on the process whereby exchange rate expectations are formed. Baldwin assumes that firms perfectly anticipate the future behaviour of the exchange rate. Finally, owing to the Chamberlinian basis of the S-D-S model, Baldwin includes the total number of varieties sold in the home market by both domestic and foreign firms in the inverse demand function, which is identical for all firms.

By assuming firms follow a profit-maximising strategy and calling the firm's expected flow of discounted profits S, it is possible to derive the entry (6) and exit (7) conditions for domestic and foreign firms, in period t; they are respectively (variables with asterisks refer to foreign firms):

(6) $S_t > F \; ; \quad S_t^* > F$

(7) $S_t < 0 \; ; \quad S_t^* < 0$

This implies a gap between entry and exit conditions, which leaves room for a variation in the number of firms in the market in the period-by-period equilibria. For instance, an appreciation of the exchange rate of the home country would lead to the fulfillment of condition $S_t^*>F$ before $S_t<0$; hence foreign firms would enter the domestic market while domestic firms would not exit.

Baldwin examines a variety of cases to show that this effect would only occur if the exchange rate change was large enough. In these circumstances, the increase in the total number of competitors would represent a change in market structure, with consequences on quantities and prices.

In particular, the latter effect emerges from the following equation, which links import prices to the exchange rate:

$$(8) \qquad P_t = \frac{1}{1-1/\varepsilon[m_t, y_t]} \; c_t^* \; e_t$$

where c* are the marginal costs of foreign firms in their currency and e is the exchange rate. The perceived elasticity of demand, ε, is a function of the number of varieties sold in the domestic market, m, and of the level of production, y. A large appreciation leads to an increase in m because foreign firms enter the domestic market, thus increasing the number of varieties available. "The price falls due to the marginal cost reduction (lower e reduces foreign costs measured in home currency), and to the market structure change (more competition forces down profit margins). After the overvaluation passes, the marginal costs return to their original level. However, m is still higher so the post-shock price is permanently lower than the pre-shock price. This is hysteresis". (Baldwin, 1988, p. 7).

The B-H model is undoubtedly an interesting attempt to provide theoretical explanations of empirical phenomena. It nonetheless has some important limits.

The exit-entry conditions of equations (6) and (7) generate asymmetric responses to exchange rate shocks in the case of one industry with a high F, and only one domestic and one foreign firm. It is doubtful, however, whether this result still holds in the case of a multi-industry model in which the level of F varies from zero (contestable markets) to high levels (oligopolies).

Baldwin and Krugman (1986) recognize that in this situation the idea that only large exchange rate changes produce permanent effects may be vitiated. They examine the "special case" in which industries' sunk costs differ substantially and the levels of the exchange rate that induce entry and exit move strictly together across industries. The authors claim "that in the more general case the result will be only somewhat softened by aggregation" (p. 11.).

However, this view is not entirely convincing. In particular, the entry of foreign firms in the appreciation phase is likely to be a continuous process. Firms in industries with zero sunk-entry costs are located very close to the entry point. Consequently a "small" appreciation of the exchange rate would be sufficient to put the process in motion. While the appreciation proceeds, the process will gather strength because it becomes profitable to enter for other, higher sunk-cost industries. All in all, the discontinuity Baldwin and Krugman show in this phase seems to depend heavily on the "special assumptions" they make.

Nonetheless, some discontinuity is conceivable in the depreciation phase, because the exchange rate has to move enough to produce a price reduction that will impinge on the incumbent firms in the industry with the highest maintenance costs, where the exit process will start. Any further depreciation would reinforce the exit process with firms in lower maintenance cost industries being pushed out of the market.

Notwithstanding this problem, the B-H model's basic result is confirmed: when the exchange rate returns to its initial level, the number of firms in the market is greater. The prevailing price is now lower than in the absence of hysteretic behaviour.

More important than the above weakness is the failure of the B-H model to extend the analysis from imports to exports, when it would be legitimate to expect some kind of "reverse hysteretic effect". In a two-country world, as a consequence of an appreciation of the home country's currency, there would be a smaller reduction in the volume of exports of the home country than in the case of no sunk entry costs, because domestic firms exporting to foreign markets would be better able to resist the repercussions of the appreciation. This effect would combine with the permanent increase in import volumes on which Baldwin focusses. The deterioration of the trade balance resulting from the

appreciation would not necessarily be larger than in a non-hysteretic model; consequently, the adjustment induced by the subsequent depreciation would also be smaller. Hysteresis therefore does not seem entirely convincing as an explanation of America's difficulty in restoring trade balance (at constant prices), notwithstanding the fall of the dollar (in both nominal and real terms) to a level below that ruling before the sharp appreciation of the 1981-85 period.

Despite these shortcomings, the B-H model is important because it highlights the structural consequences of exchange rate shocks, and stresses that these depend on the scale of the shocks, an issue originally touched upon by Orcutt's (1950) seminal work.

The B-H model is difficult to test because its theoretical results crucially depend upon changes in market structure (the m parameter), which cannot be easily measured. However, it is possible, following Baldwin (1988a)[13] to derive a testable hypothesis: as a consequence of the large appreciation of the dollar in the early eighties a structural break should have occurred in the pass-through from the exchange rate to import prices. By further developing the B-H model, Baldwin derives a testable functional relation between import price and the costs of foreign producers, where the constant term is a function of the m parameter and, therefore, the coefficient to be tested for structural change.

Using different proxies (wholesale prices, consumer prices, unit labour costs) for the costs of foreign competitors, Baldwin found statistical evidence of a break in the pass-through relation near the start of the dollar's

13. It is worth noting that in two working papers circulated on the same date, Baldwin derived different testable implications from the B-H model.

appreciation.[14]

However, contrary to Baldwin's conclusion, this result does not appear to be consistent with the hypothesis derivable from the B-H model, since this clearly stresses that only large exchange rate changes cause a significant modification in market structure. Consequently, the break should have occurred well into the dollar appreciation period, e.g. after the second half of 1983.

5. The pass-through from the exchange rate to import prices: new empirical results

The previous discussion has revealed the crucial importance of both the dimension of the pass-through from the exchange rate to the import price and its stability through the dollar cycle in affecting the adjustment of the US trade balance. Consequently, we have estimated the pass-through coefficient of exchange rate changes on import prices to check whether its value has been less or equal to one and, further, to test for the presence of instability.

We have estimated two alternative specifications for the pass-through equation: the first is an ad-hoc one (eq. 9, and a variant, eq. 10), while the second (eq. 11) can be formally derived from the profit maximising behaviour of the firm.

Our first specification is fairly similar to those

14. Because the test is satisfied at several points between 1980:3 and 1983:1, he is not able to discriminate exactly the period when the break occurred.

used by Mann[15] and Helkie and Hooper, although while they include non-oil primary commodities prices into the dependent variable, we exclude them by using the unit values of manufactures and not those of non-oil imports as the dependent variable. We have considered the unit values of the imports of manufactures on their own, in the belief that this focusses the analysis on pricing behaviour in the imperfectly competitive markets where differentiated goods are traded, avoiding the unnecessary complication of referring to a bundle of goods (manufactures plus primary commodities) whose prices are formed under different market structures and homogeneity conditions.

We have estimated the following pass-through equation:[16]

$$(9)\quad \log(Pm_t) = a + \sum_{i=0}^{n} b_i \log(SIPDOL_{t-i}) + \sum_{i=0}^{m} c_i \log(PLDC_{t-i}) + e_t$$

---

15. The equation estimated in that study is of the following type:

$$\log(Pm_t) = \alpha + \sum_{i=0}^{n} \beta_i \log(E_{t-i}) + \sum_{i=0}^{n} \gamma_i \log(PC_{t-i})$$

$$+ \delta \log(CPI_t) + e_t$$

The behaviour of non-oil import unit values (Pm_t) is explained through a multilateral exchange rate weighted index (E), the prices of commodities (PC) and the consumer price indices of competitors (CPI) in their domestic currencies, using the same weighting system as for the construction of E.

16. In this and in the following equations the degree of the Almon polynomial and the maximum number of lags were determined by testing the Almon restrictions for each degree of the polynomial and a different number of lags. The final specification was chosen on the basis of the overall fit and the significance of lags.

where P_m are the unit values of US imports of manufactures (expressed in dollars); SIPDOL are the "Shadow Import Prices in Dollar Terms", which have been constructed by dividing SIP, the weighted average of the unit values of the exports of manufactures of the 8 countries which are the major US trade partners (in national currencies), by DOL, the weighted average of their dollar bilateral exchange rates; PLDC are the export unit values of manufactures of the less developed countries, which are provided by UN statistics already aggregated across countries and in US dollars. Accordingly, we would expect b_i and c_i, in equation (9) to be both greater than zero; they should sum (approximately) to one.

We used quarterly data; though in the case of PLDC we were unfortunately unable to find anything else than annual data before 1982. While we have obtained quarterly data for the period up to 1982 by interpolating the annual data with wholesale quarterly data kindly provided by Morgan Guarantee Trust, an unsurmountable problem remained in linking smoothly the two parts of this series. Hence, in all the regressions a dummy variable for the first quarter of 1982 had to be used. Notwithstanding this shortcoming, as we shall show below, the inclusion of the PLDC variable seems to be quite important for obtaining more reliable and consistent results.

We first estimated pass-through equation (9) over the period 1976:2-1985:1. This period allows us to examine a full dollar cycle and to compare the results of out-of-sample simulation exercise with the historical data.

The results of this first set of estimates are reported in Table 2. In the upper part, the estimated values of equation (9-I) show that the pass-through was complete in this period: statistically the sum of the coefficients of SIPDOL and PLDC is not significantly different from 1. The value of the former is very near, as it should be, to the

Table 2

USA - PASS-THROUGH EQUATION 9

	LAG	SIPDOL	SIPDOL2	PLDC	DU793	DU821	R^2_C	DW	STANDARD ERROR
	(1976:2 1985:1)								
I		.76	-	.27	-.03	.05	.66	1.73	.0124
		(2.16)	-	(2.16)	(-2.34)	(3.21)			
	0	.29 (3.1)	-	.18 (2.2)					
	1	.28 (4.5)	-	.09 (2.2)					
	2	.19 (2.6)	-	-					
	3	-	-	-					
	(1976:2 1987:3)								
II		.64	-	.34	-.03	.05	.62	1.69	.0121
		(7.0)	-	(3.69)	(-2.25)	(3.9)			
	0	.24 (3.2)	-	.23 (3.7)					
	1	.24 (5.2)	-	.11 (3.7)					
	2	.16 (2.7)	-	-					
	3	-	-	-					
	(1976:2 1987:3 - Instability of SIPDOL coefficient at 1982:2)								
III		.88	-.38	.24	-.04	.05	.66	1.82	.0115
		(6.7)	(-2.4)	(2.5)	(2.78)	(3.42)			
	0	.36 (3.3)	-.24 (-1.9)	.16 (2.5)					
	1	.32 (5.0)	-.14 (-2.4)	.08 (2.5)					
	2	.20 (2.4)	-.03 (-.3)	-					
	3	-	-	-					

Sources: IMF, UN.
The dependent variable is the US dollar import unit value of manufactures. SIPDOL is the US shadow import price (referred to eight major industrial exporters to the US), in dollars; SIPDOL2=0 until 1982 Q1, SIPDOL2= SIPDOL afterwards; PLDC is the LDCs' dollar export unit value for manufactures; DU793 is a dummy for 1979 Q3; DU821 is a dummy for 1982 Q1, R^2_C: corrected; DW: Durbin-Watson. Variables are expressed as log-differences; t values are reported in brackets. The presence of a structural break at 1982:2 is accepted at the 95 percent probability level; the value of the F (2.39) statistic is 3.35.

weight of manufactures imports from the industrial countries (about 72 per cent of the total). There is also a good matching between the PLDC coefficient and the weight of the imports of manufactures from the LDC, in spite of the measurement errors in the data and of the weighting procedure, which was not specifically designed for this exercise.[17]

Note that the inclusion of the LDC export prices of manufactures corrects the impression given by the results obtained by Mann that the pass-through was far less than one. For the 1965-1982 period she found a 60 per cent pass-through from E to Pm, with a lag of about two years.

A more recent paper by Helkie and Hooper (1987), provides an estimate of the pass-through coefficient that is larger (0.9) than that found by Mann, but confirms the lags of up to two years. However, our results show that the duration of the lagged effects, for which several polynomial approximations were tried by varying both the degree and the length, is far shorter than those found both by Mann and by Helkie and Hooper. In conclusion, over the 1976:2-1985:1 period the pass-through was complete and quite rapid.

We have also performed a test for the presence of structural breaks in the equation, using the dummy variables approach (see, for instance, Maddala, 1977, p. 136 and pp. 199-201). The lack of an evidence led us to look for a break in the overall 1976-1987 period, also because, as Figure 2 suggests, until the third quarter of 1987 US import prices of manufactures have risen much less than world export prices of manufactures in dollars. This is confirmed by the value of the pass-through coefficient of industrial exporters in equation (9-II) which is lower (.64) and highly significant. The PLDC coefficient however rises to .34, so that the

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17. In fact, the UN Statistical Office uses weights which reflect the importance of LDC in world trade of manufactures and not in US imports (see, UN, Monthly Bulletin of Statistics).

overall pass-through is still complete. The presence of instability was tested on all the estimated coefficients, but proved to be significant only for the SIPDOL variable. Among the several quarters used to find the breakpoint (around 1980-1983), 1982:2 gave the strongest statistical results. The F test confirms the hypothesis that a change in the pass-through occurred in the equation at the beginning of 1982. The coefficient of the dummy variable SIPDOL2 in equation (9-III) is the difference between the pass-through coefficient of the more recent period (1982:2-1987:3) and that of the more distant one (1976:2-1982:1). Since the difference was found to be -0.38, the coefficient fell sharply from 0.88 in the first period to 0.50 (according to the point estimate value of this coefficient).[18]

We have also tried to replicate the results, when the elasticities of Pm with respect to the price and exchange rate components of the shadow price SIPDOL are not constrained to be equal[19]. The estimated equation, is:

$$(10)\quad \log Pm_t = a' + \sum_{i=0}^{n} b_i' \log(SIP_{t-i}) + \sum_{i=0}^{m} c'_i \log(DOL_{t-i}) + \sum_{i=0}^{k} d_i' \log(PLDC_{t-i}) + e_t$$

The expected signs of the coefficients of the SIP and DOL variables are + and - respectively (due to the

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18. The difference between the coefficients is estimated with much less precision than for the first period, as revealed by the values of the t statistics.

19. The constraint is accepted in the period 1976:2 1985:1, while until 1987:3 the test response varies, according to the degree of the Almon-polynomial and to the number of lags.

definition of the exchange rate index, which increases in the appreciation phase). The estimates are shown in the upper half of Table 3. The fit of equation (10-I) improves only slightly compared with equation (9-II) in Table 2. The coefficients of the SIP and DOL variables differ quite substantially, while there is no significant change in the lag structure[20]. The nested test of parameter stability over time, carried out by using the dummy variables, always accepts the null hypothesis. We cannot therefore exclude, in view of the uncertain response of the test on the equality constraint on the coefficients of SIP and DOL that the latter is the cause of the instability of the SIPDOL coefficient in equation (9). Nevertheless, in period 1982:2-1987:3 (equation (10-II) in Table 3) the elasticity of the US import price with respect to the exchange rate decreased: from -.68 to -.54.

Further insights on the presence of instability of pass-through in equations (9) and (10) are provided by Figure 4. In the upper side, the observed values of the dependent variable Pm are confronted with the out-of-sample simulations of equation (9-I) of Table 2, those calculated through equation (9-II) and equation (9-III) (that includes the dummy variable SIPDOL2). The exclusion of the dummy variable leads to a systematic overprediction of US import prices, which is largest in the simulation exercise since 1985:2; it slightly corrects when the estimation period is extended to 1987:3; and disappears with the inclusion of the dummy variable that

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20. In any case, their values are difficult to compare with those of the constrained SIPDOL variable because of the variable nature of the mathematical relation linking them. In fact, b_i is a weighted average of b_i' and c_i', with time-varying weights:

$$b_i = \frac{b_i' \text{ dlog } SIP_t + c_i' \text{ dlog } DOL_t}{\text{dlog } SIP_t + \text{dlog } DOL_t}$$

Table 3

USA - PASS-THROUGH EQUATION 10

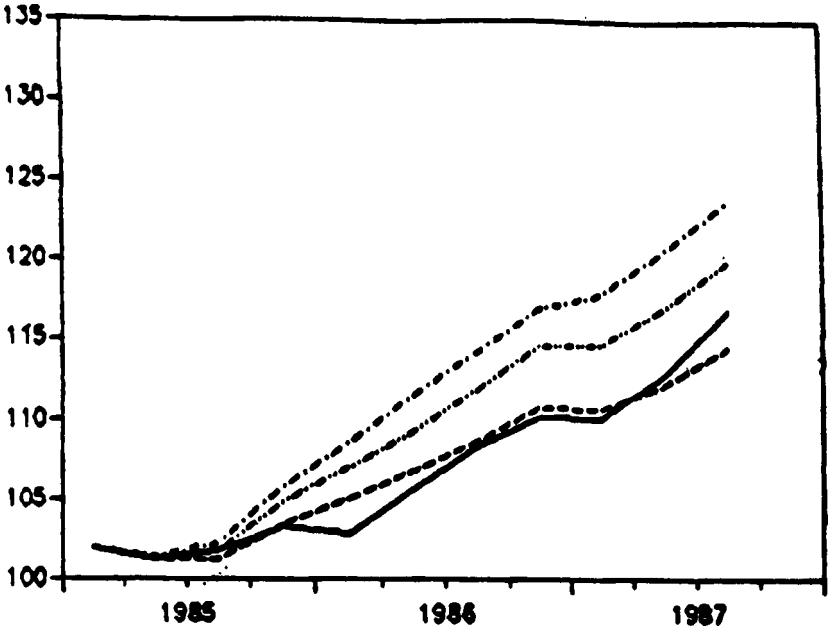
LAG	SIP	DOL	PLDC	DU793	DU821	R^2_C	DW	STANDARD ERROR
(1976:2 - 1987:3)								
I	1.0	- .68	.22	- .04	.04	.66	1.78	.0116
	(5.02)	(-6.56)	(2.08)	(-3.0)	(3.0)			
0	.49 (3.8)	- .24 (-3.6)	.14 (2.1)					
1	.33 (4.7)	- .26 (-5.5)	.07 (2.1)					
2	.18 (3.6)	- .18 (-3.5)	-					
(1982:2 - 1987:3)								
II	.81	- .54	.32	–	–	.66	2.0	.0087
	(3.21)	(-5.30)	(3.46)					
0	.35 (1.8)	- .19 (-2.6)	.21 (3.5)					
1	.27 (2.4)	- .18 (-4.4)	.11 (3.5)					
2	.18 (1.1)	- .17 (-2.3)	–					

Sources: IMF, UN.
The dependent variable is the dollar unit value of US imports of manufactures. SIP is the shadow import price of manufactures (referred to eight major industrial exporters to the US), in national currency. DOL is the nominal effective exchange rate of the dollar vis-à-vis eight industrial countries; PLDC is the dollar unit value of LDCs' exports of manufactures; DU793 is a dummy for 1979 Q3; DU821 is a dummy for 1982 Q1; R^2_C: corrected; DW: Durbin-Watson. Variables are expressed as log-differences; t values are reported in brackets.

Figure 4

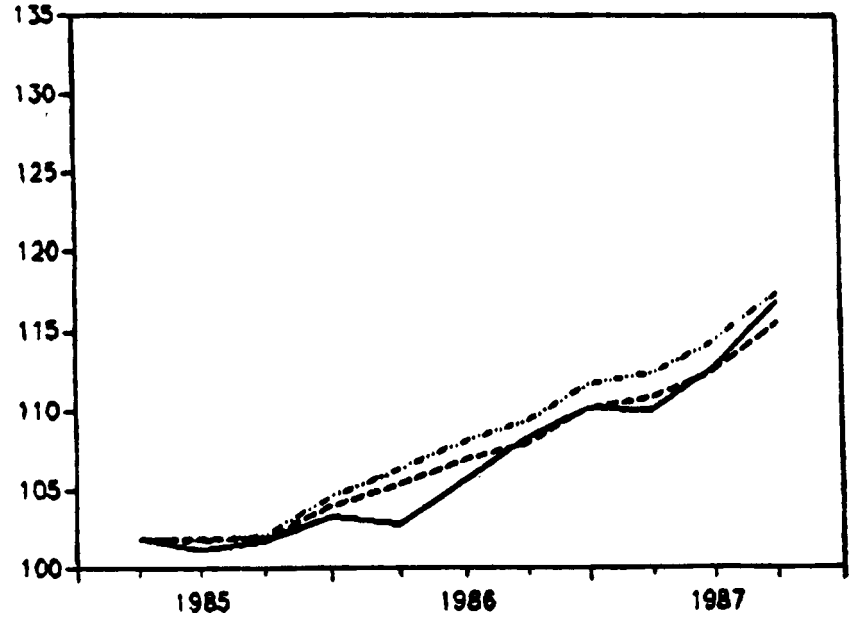
THE EXCHANGE RATE PASS-THROUGH IN THE US MANUFACTURING SECTOR 1985:1 - 1987:3
Actual, simulated and calculated PM

1. Pass-through equation 9



actual — calculated (eq. 10-II) — calculated (eq. 10-III) — simulated (eq. 10-I)

2. Pass-through equation 10



actual — calculated (eq. 11-1) — calculated (*)

(*) With the addition of a dummy variable DOL2: DOL2=0 before 1982:2; DOL2=DOL afterwards.

captures the instability of the pass-through coefficient.

As for equation (10), the lower side of Figure 4 shows the calculated Pm through equation (10-I) and by adding a dummy variable DOL2 which is zero until 1982:1 and equal to DOL afterwards. The overprediction disappears when instability is taken into account. The difference between the observed and calculated values is, however, much larger for equation (9) than for equation (10), which is consistent with the results of the F tests.

The second specification of the pass-through equation that we have estimated derives from the maximization of profit, in the currency of the importing country, by a foreign firm on an imperfectly competitive market, (see Deppler and Ripley, 1978; Spencer, 1984).

$$(11)\quad \log(Pm_t) = A + \sum_{i=0}^{n} B_i \log(PDOM_{t-i}) + \sum_{i=0}^{m} C_i \log(PUSA_{t-i}) + D_i \sum_{i=0}^{k} \log(PLDC_{t-i}) + e_t,$$

PDOM is a weighted average of production costs of exporters in dollar terms, proxied, as is common in the literature, by producer prices in the 8 major industrial trade partners of the US; PUSA is the price of domestic competitors (US producer price). Under the assumption of decreasing marginal costs for firms, perfect competition on factor markets and less than perfect competition on the goods market, import price elasticities with respect to cost and competitors' price sum to one (cfr. Deppley and Ripley, 1978, p. 153). However, since the PDOM variable doesn't include LDC exporters to the US, if the PLDC variable is introduced into equation (11), we have that $\Sigma B_i + \Sigma C_i + \Sigma D_i = 1$.

We estimated equation (11) over the period 1976:1 -

1987:3, using ordinary least squares (OLS) and two-stage least squares (TSLS). The price set by domestic competitors on the US market (PUSA) is in fact related to that of foreign exporters (PMUSA), as shown, for example, by the model presented in Section 3 of Dixit-Stiglitz, with interaction among firms. However, given the higher than average share of the domestic market owned by the US producers of manufactures (90 per cent, see Section 2), we would expect them to be 'price-makers'. The similarity of the OLS and TSLS estimations (Table 4) in fact suggests that this may be true, since the simultaneity bias is very small. The coefficients are all highly significant and sum to one. The elasticity of import prices with respect to the dollar costs of industrial exporters, is around .50, lower than that calculated with respect to the shadow import cost (equation 9-I) and the PLDC coefficient is .20, a value quite close to that of the LDCs' share in US imports of manufactures.

The values of the coefficients seem to suggest that industrial exporters assign a weight of about sixty percent (which is also their actual pass-through) to the target of restoring their profit margins. A forty percent-weight is assigned to the target of maintaining competitiveness vis-à-vis domestic producers, to defend their share of the US market.[21] The parameters of equation (11) are stable over the

21. A similar assumption on the relevance of both targets on profit margins and market shares is made by Froot and Kemplerer (1988) to explain the phenomenon of price discrimination in relation to exchange rate changes (pricing-to-market).

Table 4

USA - PASS-THROUGH EQUATION 11
(1976:1 - 1987:3)

	LAG	PDOM	PLDC	PUSA	DU821	R^2_C	DW	STANDARD ERROR
(OLS)								
I		0.49	0.19	0.35	0.05	0.55	2.0	0.013
		(4.38)	(2.62)	(2.48)	(3.7)			
	0	0.20 (4.4)						
	1	0.15 (5.1)						
	2	0.09 (4.4)						
	3	0.06 (1.6)						
	4	-						
(TSLS)								
II		0.50	0.17	0.37	0.05	0.52	2.0	0.014
		(4.3)	(2.24)	(2.1)	(3.3)			
	0	0.18 (3.0)						
	1	0.14 (4.2)						
	2	0.10 (2.3)						
	3	0.07 (1.8)						
	4	-						

Sources: IMF, OECD, UN.
The dependent variable is the dollar unit value of US imports of manufactures; PDOM is a weighted average of domestic producer prices in dollars, in the eight countries; PLDC is the dollar unit value of LDCs' exports of manufactures; PUSA is the US producer prices index; DU821 is a dummy for 1982 Q1; R^2_C: corrected; DW: Durbin-Watson. Variables are expressed as log-differences; t values are reported in brackets. The reduced form of PUSA (TSLS) was estimated on log-differences, by using US unit labour costs, dollar unit values of US imports of raw materials and the deviation of US real domestic demand from its trend as regressors together with PDOM and PLDC.

eighties. This result is given by the cusum squares test[22] developed by Brown, Durbin and Evans (1975) to reveal the presence of instability in the vector of parameters over time. Compared to the Chow test, the cusum squares test has the advantage of locating the time period when the structural break occurs and therefore requires no "a priori" knowledge of its occurrence. According to the test, parameter instability takes place when the cusum squares statistic (see the previous footnote) crosses the confidence band. Figure 5 shows the cusum squares plots of equations (11-I) (OLS) and (11-II)(TSLS).[23] In both cases they remain in the confidence band drawn for a 95 per cent probability level, approaching the upper margin at the end of 1979 and at the beginning of 1982. The Chow tests performed in the neighbourhood of the two periods appear to reject the instability hypothesis.

Table 5 shows the estimation results for the period 1982:2 - 1987:3. Compared with the entire period, the import price elasticity with respect to the dollar costs of industrial exporters (PDOM) is slightly lower and its speed of adjustment slows to 2.7 quarters (compared with 2 quarters

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22. We have performed the cusum squares test because it is more powerful than the cusum test. The former uses the recursive residuals w_t (the series of standardized one-period-ahead forecast errors), whose distribution is known. The statistic

$$s_r = \Sigma_{k+1}^{r} w_t \; / \; \Sigma_{k+1}^{n} w_t \; ; \qquad r : k+1,\ldots,n,$$

(where k and n are respectively the number of parameters and of observations), is distributed within a confidence band, for a given probability level, if the stability hypothesis is true (cf. also Johnston, 1984, Ch. 10).

23. In both cases the test was performed on regressions without the dummy variable (DU821); otherwise, the number of parameters would have changed from 1982 onwards, together with the margins of the confidence band. As a result of the exclusion of DU821, the coefficient of PLDC loses its significance and the standard error of the regression increases.

Figure 5

EQUATION 11 : CUSUM SQUARES AND CONFIDENCE BANDS

(at 95 per cent probability level)

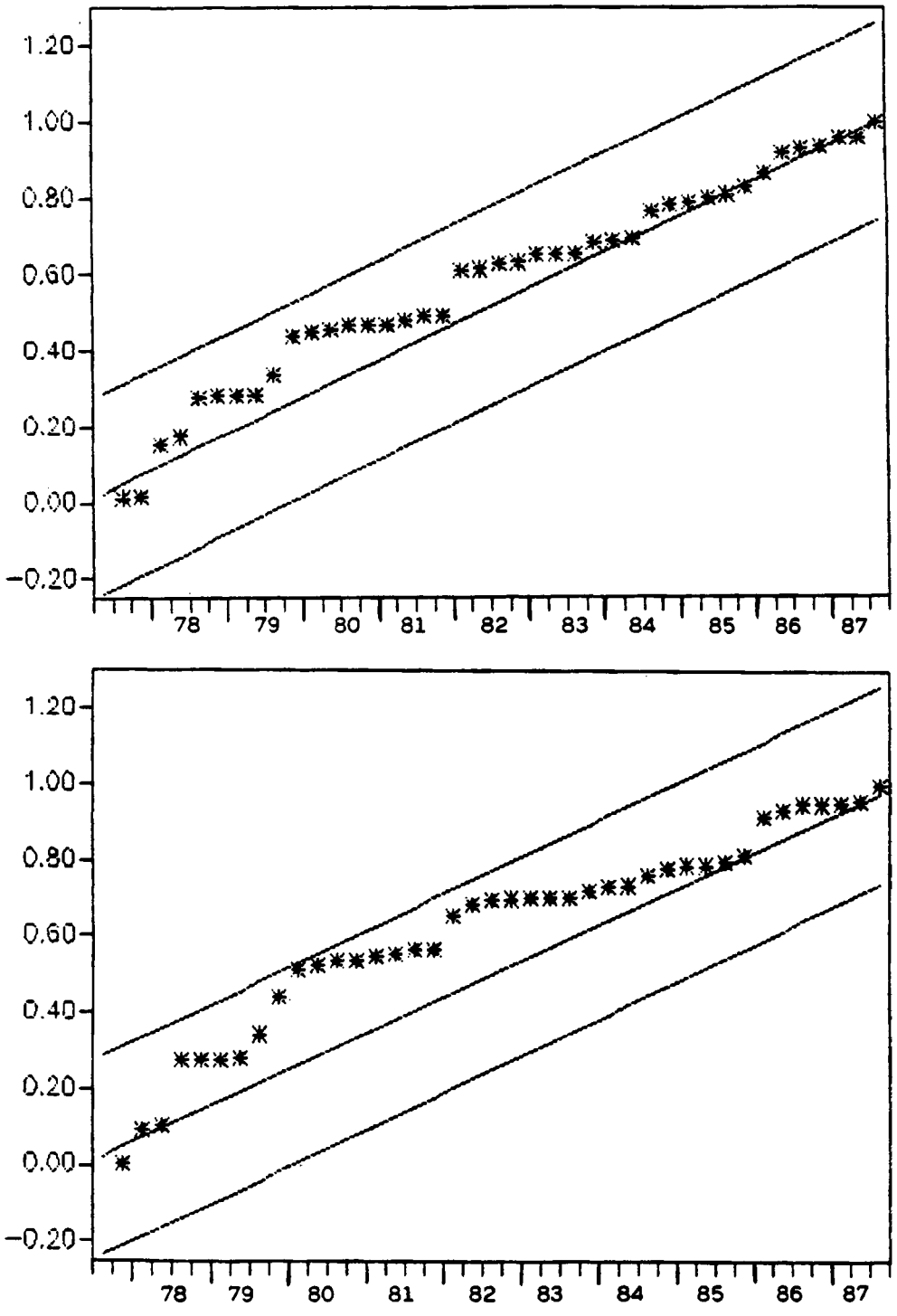

Table 5

USA - PASS-THROUGH EQUATION 11 (1)
(1982:2 - 1987:3)

LAG	PDOM	PLDC	PUSA	DU821	R^2_C	DW	STANDARD ERROR
(OLS)							
I	0.48 (6.33)	0.19 (3.52)	0.33 (4.15)	-	0.67	2.2	0.09
0	0.12 (3.5)						
1	0.11 (5.2)						
2	0.10 (6.3)						
3	0.08 (3.5)						
4	0.06 (1.8)						
(TSLS)							
II	0.46 (5.0)	0.16 (3.2)	0.38 (4.55)	- (3.3)	0.66	1.9	0.09
0	0.12 (3.8)						
1	0.10 (5.0)						
2	0.09 (6.4)						
3	0.08 (3.8)						
4	0.07 (2.1)						

Sources: IMF, OECD, UN.
The dependent variable is the dollar unit value of US imports of manufactures; PDOM is a weighted average of domestic producer prices in dollars, in the eight countries; PLDC is the dollar unit value of LDCs' exports of manufactures; PUSA is the US producer prices index; DU821 is a dummy for 1982 Q1; R^2_C: corrected; DW: Durbin-Watson. Variables are expressed as log-differencesces; t values are reported in brackets. The reduced form of PUSA (TSLS) was estimated on log-differences, by using US unit labour costs, dollar unit values of US imports of raw materials and the deviation of US real domestic demand from its trend as regressors together with PDOM and PLDC.
(1) The sum of the coefficients (except DU821) was constrained to 1.

in the entire period). The elasticity with respect to US prices shows a negligible increase (from 0.37 to 0.38) in the TSLS estimations and a decrease (from 0.35 to 0.33) in the OLS estimations. A stable relation between import prices, production costs and US prices was also found by Ohno (1988) and Feenstra (1987). The latter estimated an equation similar to (11) for some categories of import goods. However his pass-through coefficients are higher than ours and those of US prices are not always significant.

6. Conclusions

According to our analysis, the deterioration of US current account during the 1980-87 period was mainly due to the behaviour of exports and imports of manufactures, in volume terms. Both the worsening of price competitiveness associated with the appreciation of the dollar and the fast growth of domestic demand have played an important role in the overall deterioration. The modest and slow reduction of the deficit since the dollar depreciated in March 1985 does not seem attributable to a structural break in the exchange rate/import price relation. In fact, all along the dollar cycle, the changes in the nominal exchange rate has been translated into import price competitiveness variations only to a very moderate extent.

Our results lend support to the notion that through the dollar cycle of appreciation-depreciation, foreign firms have allowed mark-ups over costs to vary, so as to smooth the sharp changes in price competitiveness associated with exchange rate movements. In doing so, they could use the large room created by profits during the dollar appreciation to reduce export prices in their currency during the recent period of dollar depreciation. This strategy can be interpreted within the theoretical framework of imperfect competition with interaction among producers, and it gives rise to a pass-through coefficient of exchange rate changes on import prices lower than one.

In sum, our empirical results provide hardly any evidence of a change in the pricing strategy of foreign exporters during the recent dollar depreciation, such as to weaken the effectiveness of the exchange rate change in reducing the US trade deficit.

Furthermore, the results of our estimates and tests seem to point to the following conclusions.

(i) Pass-through variations are almost entirely due to the policy strategies of exporters from the industrial countries, confirming that producers in LDCs have much less market power.

(ii) In the period of dollar depreciation between 1976 and 1980 the behaviours of US import prices and the shadow import prices from industrial countries(SIPDOL) were similar; with the inclusion of LDCs' world export prices, the overall pass-through was larger than 1.

(iii) Since the dollar appreciated, in particular after 1982, the pass-through from SIPDOL was lowered, indicating that foreign producers did not let the dollar prices of their exports to the US vary to the full extent of the dollar change. Further results show that exporters of industrial countries divided the potential gains of the dollar appreciation (losses of depreciation) in two parts: larger profit margins and gains in price competitiveness (smaller margins and losses in price competitiveness).

(iv) While there was some weak support, from an ad-hoc equation, to the idea that a structural break in the exchange rate/import price relation occurred, we did not find evidence of instability in the coefficient of the price reaction function of foreign exporters to the US (equation (11)) between 1976 and 1987; there is therefore no evidence that their pricing strategy changed during the large dollar appreciation. Our results on the whole do not provide support for the B-H model or, more generally, to the hypothesis of hysteresis in import prices and seem to be more consistent with the Dornbusch (1987) model described in Section 3.

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