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EFFECTIVE DEVALUATION AS AN EXPORT INCENTIVE IN LESS DEVELOPED COUNTRIES

Jonathan W. Eaton

Harvard University

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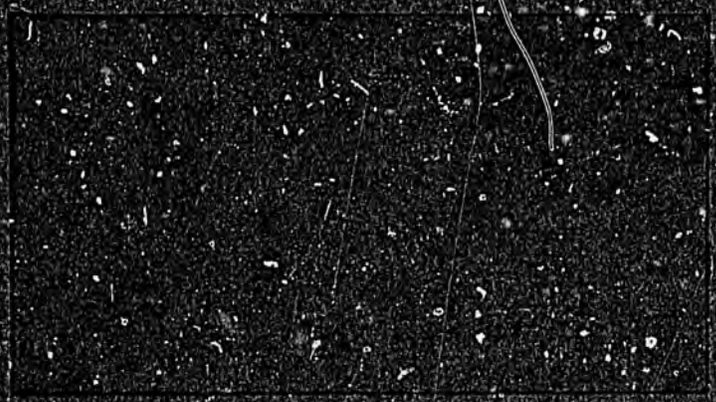

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by

Jonathan W. Eaton

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DEVELOPMENT RESEARCH GROUP,
Center for International Affairs,
Harvard University
Cambridge, Massachusetts.

Abstract

This paper presents the results of regression analysis performed on time series of minor exports and real effective exchange rates to estimate export supply elasticities in seven less developed countries. Part II discusses the rather formidable econometric problems encountered in such analysis and how they may be dealt with. Part III presents the results of the analysis itself from which three major conclusions are drawn: (i) minor exports are in general responsive to variations in real effective exchange rates; (ii) response to devaluation occurs largely within the year in countries where inflation usually eliminates the effect of devaluation in the long run; (iii) other factors associated with time have played a more important role in explaining exports in most countries than have exchange rate variations. Part IV discusses the significance of these results for various policy issues such as the balance-of-payments, export promotion, protection, and the two-gap model.

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EFFECTIVE DEVALUATION AS AN EXPORT INCENTIVE IN LESS DEVELOPED COUNTRIES*

I. Introduction II. The econometrics of Elasticity Estimation III. Export Supply Elasticities in Seven Less Developed Countries IV. Export Supply Elasticities in Balance-of-Payments and Development Policy

I. Introduction

Considerable investigation into the magnitude of demand and substitution elasticities in international trade has taken place since the second world war. Only quite recently, however, has the question of the elasticity of the supply of exports been examined in depth. Part II of this paper discusses the econometric problems encountered in the estimation of such parameters in international trade while Part III attempts to enlarge our knowledge of the responsiveness of exports to promotion through the price system by presenting the results of time series analyses performed on export and exchange rate data for seven countries.

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Elasticities in international trade have been of interest to balance-of-payments theoreticians for two centuries. More recently, as theoretical and empirical research into the problems of economic development has taken place, the implications of supply and demand elasticities for development strategy have become of major concern. Part IV of this study briefly summarizes the implications of elasticities in international trade to issues in balance-of-payments and development theory.

II. The Econometrics of Elasticity Estimation

Whether or not elasticity estimation through time series analysis is worthwhile in view of the econometric problems involved has been a topic of debate during the past two decades. This section discusses the major estimation problems encountered in the analysis of Part III and the author's attempts to overcome them.

A. Specification and Explanatory Variables

Authors have experimented with a number of different specifications with various explanatory variables in attempts to estimate export supply relationships (9), (22), (27). In the regressions below the dollar value or quantum index of non-major exports served as the dependent variable and the exogenous variableswere the real effective export exchange rate and in some cases a trend variable and excess capacity index. Exports and the exchange rate were introduced in logged form be-

cause: (1) this specification is consistent with the supply function derived from a Cobb-Douglas production function; (2) this form is most commonly employed in such studies; and (3) experiments with semilogged and unlogged specifications did not yield better results and are less easy to interpret.

An attempt was made to introduce exports as a ratio to income as a dependent variables. The results were less satisfactory except for Brazil and are excluded from the discussion below.

Balance-of-payments theory suggests that the response to devaluation will be greater when some productive resources of the devaluing country lie idle. Furthermore, several individual country studies note export expansion during periods of capacity underutilization (5), (7), (27). An attempt was made to capture this effect by using as an explanatory variable a proxy for excess capacity obtained by taking the distance between actual income in any year and a point corresponding to that year on a straight line connecting two "peak-year" incomes. This variable was significant in explaining exports at the 5 per cent confidence level only in Korea and the results are usually not included in Part III. A less crude measure of excess capacity is provided by Felix (7) for Argentina, however, which seems to have some explanatory power.

B. Lagged Responses

A source of bias in the estimation of time series analy-

sis is the possible misspecification of the timing of a response to a change in price. Orcutt (23, p. 125) expresses concern that failure to take the long-run reaction to a change in price might result in the serious underestimation of the true elasticity.

Serious autocorrelation frustrated attempts to estimate delayed responses with distributed lag specifications (8). In the case of Brazilian non-coffee exports where serial correlation was not problematic, however, the Koyck specification indicated that 90 per cent of the response to a change in the real exchange rate occurred within the year. Furthermore, current values ot the exchange rate explained exports better than lagged values in all countries except Pakistan.

C. Autocorrelation and Missing Variables

Autocorrelation presents a serious problem in the estimation of elasticities in international trade as it does in almost any time series analysis. In every country except Brazil and Pakistan equations uncorrected for the trend have Durbin-Watson statistics outside the 5 per cent confidence level.

This result frequently reflects the absence of explanatory variables associated with time. Including the trend variable usually increases the R^2 statistic significantly and improves the Durbin-Watson statistic. Furthermore, this addition frequently changes the supply elasticity and its significance considerably. The extreme cases are Argentina for 1956-59

where adding time makes the elasticity go from slightly below zero to almost two, and Pakistan where the introduction of the trend produces the reverse effect.

The trend does not always seem entirely adequate to correct the autocorrelation/missing-variable problem and its presence introduces the danger of multicollinearity. Following Hildreth and Lu as cited by Christ (4, p. 486) an alternative attempt was made to overcome the problem by taking "quasi-first differences" and "searching" with a Golden Section Search procedure between 0 and 1 for the value of $\bar{p}$ that minimizes the sum of squared residuals of the dependent variable in the equation

$$X_t - \bar{p}X_{t-1_t} = a + b(R_t - \bar{p}R_{t-1})$$

where X_t is exports in year t (logged) and R_t is the exchange rate (logged), thus obtaining a maximum-likelihood estimator for the autocorrelation coefficient $\bar{p}$ and an unbiased estimator of the elasticity $\bar{b}$. Estimates of the first-order autocorrelation coefficient generally ranged between 0.80 and 1.00.

D. Identification

Any attempt to estimate supply or demand relationships with regression analysis encounters the problem of simultaneity bias. In the estimation of a supply relationship, for example, "random" deviations from the supply schedule may not be independent of price but reflect the demand relationship, violating the assumption of the least squares model that the error term

is independent of the explanatory variable. The presence of simultaneity bias will result in the underestimation of either demand or supply elasticities.

Two circumstances alleviate the identification problem in the estimation of supply schedules. As Klein (15) has noted the bias in the estimate of the supply schedule tends toward zero as the demand elasticity approaches infinity. The elimination of export categories for which the country in question provides a large share of total world supply from the analysis below makes the familiar "small-country" assumption a reasonable one. Estimates of the demand elasticities for the minor exports of the countries in question range upwards from 5 (1), (12), making the assumption of infinitely elastic demand a reasonable approximation.

Even if demand were inelastic, however, the problem would be alleviated if shifts in the demand schedule are large relative to those in supply (16). This condition is fulfilled in the estimation of elasticities in international trade when price variation results primarily from changes in the rate of exchange. This is illustrated by the system of supply and demand equations below:

$$p^D = a + bQ^s \qquad (1)$$

$$rp^I = c' + d'Q^d \qquad (2')$$

$$p^D/r = a' + b'Q^s \qquad (1')$$

$$p^I = c + dQ^d \qquad (2)$$

$$rp^I = p^D \qquad (3)$$

$$Q^s = Q^d$$

and $c' = cr$, $d' = dr$, $a' = a/r$, and $b' = b/r$. Equation 1 relates export supply to deomstic price and equation 2 relates demand for exports to international price. Equation 1' presents the supply schedule as perceived by the buyer in international prices while 2' is the demand schedule perceived by the export supplier. Devaluation, an increase in r, causes the buyers' perceived export supply curve to shift downward. At the same time, the demand curve perceived by the suppliers shifts upward. In other words, the demand curve shifts on the domestic-price/quantity plane while the supply curve remains constant; the opposite is happening on the international-price/quantity plane.

The exports analysed below exclude commodities which were subject to large fluctuations in international price during the period under consideration, suggesting that the primary source of price variation was change in the real effective export exchange rate.

II. Export Supply Elasticites in Seven Less Developed Countries

In this analysis supply elasticites were estimated by regressing time series of exports against time series of real effective export exchange rates. Many LDC's, including all those in the present sample, subsidize "non-traditional" ex-

ports. Although individual schemes differ from country to country several practices are quite common: (1) tariff exemptions or "drawbacks" for imports used directly or indirectly in the production of such exports; (2) "easier" credit for export industries; (3) the exemption of export earnings from profit and excise taxes; (4) permitting exporters to sell all or a portion of foreign exchange earnings in the "free" exchange market; (5) direct subsidy payments.

The availability of exchange rate series taking into account the effect of such export incentives was the major constraint on the number of countries in the sample. Series for three Asian and four Latin American countries, reflecting the painstaking work of a number of country experts, were available for the present study. Although the countries included in the analysis vary considerably in level of development, size, and resource endowment they have in common industrial bases of some magnitude and histories of balance-of-payments problems and devaluation.

In order to take into account changes in cost the series used in this study have been deflated by the wholesale price index or other available measure of the overall price level. The deflated series indicate that the rise in the domestic price level has eliminated most or all of the effect of nominal devaluations and export incentive schemes. The only country to

have achieved substantial real devaluation over an extended period is Pakistan.

Although the "real" exchange rate should reflect changes in international prices as well, the necessary data is difficult to obtain for many categories of exports. Only the authors who compiled series for Argentina, Israel, and Korea made adjustments for international prices.

Similarly, the dependent variable should reflect the "real" amount as opposed to the current dollar value of exports. An export quantum index was used for Brazil and Korean and Israeli exports were deflated by a world price index. In other cases, however, the necessary data was not available or of very poor quality. As Leamer and Stern point out "when only a crudely constructed price index is available, it may be preferable to use the current-value variable and avoid the error introduced by deflating by the crude price variable." (16, p.9) Furthermore, world prices of the categories of exports considered in this analysis appear to have been relatively stable in the post-war years, and, because of the small country assumption devaluation on the part of the individual countries under consideration will not affect world prices.

Regressions for individual countries are discussed below on a case-by-case basis. A number of generalizations can be made on the basis of the results, however.

In general, the estimated equations indicate that minor and manufactured exports respond to changes in the real effective exchange rate, and that the response is rapid and in many cases quite large. Elasticities greater than or near unity were found for Argentina, Brazil, Chile, Colombia, and Pakistan.

As noted in Part II current values of the real effective exchange rate were in most cases more significant in explaining exports than lagged values. The lack of long-run response to develuations over and above that which appears in the initial year is not surprising in those countries where no trend toward real devaluations has taken place. Exporters will expect domestic inflation to eliminate the increase in real export receipts in the long run. Under these circumstances it would be irrational for them to make anything but short term commitments to increasing exports in response to a devaluation. Lagged values of the exchange rate are more successful in explaining export variance in Pakistan where the level of inflation has been moderate and real devaluation has occurred.

The coefficient of the trend variable is significantly positive at the 1 per cent level in all countries except Brazil and Israel in the case of citrus exports. Time obviously accounts for a large number of factors which increase demand, such as the formation of LAFTA, or shift the supply schedule rightward, such as the introduction of new technology.

A. Argentina

Felix (7) presents regressions which suggest that excess capacity and LAFTA concessions are the major determinants in Argentine non-traditional manufactured exports while the role of the exchange rate is minor.[1/] This result may reflect the fact that Felix introduces the exchange rate in lagged form and does not include a trend.

Following Felix, separate regressions were run for non-traditional exports to all areas and for exports to areas outside the Latin American Free Trade Area. The second group did not differ significantly from the first and are excluded from the present discussion.

Equations 1 and 2 seem to confirm Felix's hypothesis that the real effective exchange rate plays a secondary role in explaining the export level. When 1955 is excluded from the sample and a trend variable introduced, however, the magnitude of the elasticity and its significance increases dramatrically. Felix's LAFTA concession index, again in lagged form, reduces the size and significance of both the other explanatory variables.

[1/] Felix (7) has estimated the real effective exchange rate for "non-traditional manufactured exports" for the period 1955-68 which is used in this study. He has adjusted the nominal rate by the "drawback" on tariffs paid for imported inputs and the reintegro or tax exemption available to exporters. This series was deflated by the Argentine-U.S. industrial price ratio. Felix also provides yearly data on the constant dollar value of this category of exports as well as a capacity utilization index and the number of LAFTA concessions by year for this period. The data used in this study is presented in an appendix to this paper.

"Quasi-first differencing" yields a rather high elasticity estimate but does not suggest a very significant role for excess capacity.

Table 1
Argentine Non-Traditional Manufactured Exports

Equ # D-W/p	R^2 SEE	exchange rate	capacity util.	LAFTA Cons.	time	Const.
1955-68						
1	.0101	-0.39				12.21
0.28	(0.79)	(0.35)				(2.46)
2	.0045	0.11				0.32
p=.98	(0.39)	(0.21)				(0.53)
1956-68						
3	.1695	-2.15				20.18
0.53	(0.73)	(1.50)				(3.13)
4	.9268	2.13	-2.66*		0.18	10.70
1.42	(0.24)	(3.29)	(2.51)		(5.95)	(2.10)
5	.9466	0.95	-0.19*	0.19*		6.34
0.73	(0.20)	(1.89)	(0.17)	(7.21)		(1.33)
6	.2147	1.56	-0.84			0.38
p=0.97	(0.38)	(1.37)	(0.57)			(1.56)

(Figures in parentheses are t ratios.)
*lagged one period.

The fact that, in Felix's words, "the various regression coefficients steal explanatory power from each other" obscures the role that the individual variables play. Clearly the trend and LAFTA variable, which is highly collinear with time, are highly significant. The LAFTA index is slightly more significant but less successful in correcting for autocorrelation. The role of excess capacity is unclear. Introducing the LAFTA vari-

able or "quasi-differencing" reduces its explanatory power significantly from that suggested by equation 4.

When the period 1956-68 is analyzed, the exchange rate appears to play a fairly significant part in determining exports. The inclusion of 1955 reduces the significance of the elasticity because the real exchange rate doubled between 1955 and 1956 while the level of non-traditional manufactured exports showed almost no change. This may result from the economic upset that followed the overthrow of the Peron regime in 1955; or it may suggest that the export supply elasticity is non-constant: that it is greater for small variations in the exchange rate than for large. Such a conclusion would not seem unreasonable if the effect of devaluation operated in the short run through changes in capacity utilization, as argued by Sheahan and Clark for Colombia (27). Total capacity would then place a ceiling on the short-run increase in exports resulting from a rise in the real exchange rate.

B. Brazil

Estimates of export supply elasticities have been made by von Doellinger for the period 1963-68 with quarterly data (5) and by Bergsman with the yearly data used below for the period 1946-66 (1, p. 251).[2/] The first study included a num-

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[2/] Bergsman has compiled a yearly time series of the real effective exchange rate for Brazilian non-coffee exports for the period 1946-68 taking into account the low interest loans and import duty "drawbacks" available to exporters after 1965 as well as export taxes and the changes in the wholesale price

(Continued on next page)

ber of explanatory variables not available to the present writer and obtained elasticity estimates significant at the 10 per cent confidence level between one-half and two-thirds. These results may underestimate the supply elasticity and its significance for two reasons. First of all, production indices for export industries were included as explanatory variables and were found to have a strongly positive effect on exports. They are likely to be collinear with the exchange rate and reduce the apparent significance of the latter variable. Secondly, von Doellinger does not present any investigation of lagged relationships between the exchange rate and exports. Although response to devaluations may occur within the year exporters may not react entirely within the quarter. Bergsman, on the other hand, presents an equation which estimates a significant elasticity near one. Not surprisingly, the equations estimated here support this result.

Equation 1 yields an elasticity estimate close to 1 which is significant at the 1 per cent confidence level. Furthermore, the Durbin-Watson statistic implies that the relationship is relatively free of serial correlation. Including time as an independent variable in equation 2 does not contribute significantly to the explained variance of exports or affect the

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index. (1, p. 45) Data on Brazilian non-coffee exports, taken from Bergsman (1, p. 100) and the IMF (11), indicate that, in contrast with the other countries analyzed in this study, the growth of Brazil's minor exports has been slight.

estimate of the elasticity. Equation 5, in which the dependent variable is exports as a ratio to income, also yields elasticity close to 1. The significantly negative trend coefficient reflects the increase in autarky in Brazil during the period. Equation 3 indicates that lagged values of the exchange rate explain exports less well than current values. That the current value is most influential is further confirmed by the Koyck specification in equation 4 which suggests that 90 per cent of the response to a change in the real effective exchange rate occurs within the year.

Table 2
Brazilian Non-Coffee Exports: 1947-67

Equ. # D-W/p	R^2 SEE	exchange rate	exports (t-1)	time	Const.
Dependent Variable=log(exports)					
1.	.6701	1.03			0.21
1.93	(0.15)	(6.37)			(0.28)
2	.6705	1.04		-0.00	0.16
1.94	(0.16)	(5.57)		(0.14)	(0.19)
3	.5288	0.91*			0.76
1.56	(0.18)	(4.74)			(0.86)
4	.6679	0.90	0.11		0.24
2.11	(0.90)	(3.68)	(0.56)		(0.30)
Dependent Variable=log(Exports/GDP)					
5	.8087	1.03		-0.05	-4.21
1.71	(0.16)	(5.36)		(8.85)	(4.49)

(Figures in parentheses are t-ratios.)
*lagged one period

C. Chile

By itself the exchange rate explains less than 10 per cent of the variance of Chilean non-copper exports.[3/] The trend steals most of its explanatory power and is highly significant. "Quasi-first differencing" yields an elasticity estimate slightly lower than 1 and a first-order autocorrelation coefficient of 0.79.

Table 3
Chilean Non-Copper Exports: 1955-69

Equ. # D-W/p	R^2 SEE	exchange rate	time	Const.
1	.0940	1.02		-1.68
0.26	(0.18)	(1.12)		(0.27)
2	.8721	0.37	0.04	2.37
1.57	(0.07)	(1.01)	(8.18)	(0.96)
3	.2091	0.87		-0.11
p=.79	(0.09)	(1.63)		(0.14)

(Figures in parentheses are t-ratios.)

D. Colombia

Analyses of the response of minor exports to variations in the real effective exchange rate have been made by Musalem (22), and Urdinola and Mallon (29) with yearly data and by Sheahan and Clark (27) and Nelson, Schultz, and Slighton (24)

[3/] A time series of the real effective exchange rate for non-copper exports during 1955-68 was compiled by the author on the basis of data provided by Jul (13). The nominal exchange rate was adjusted for the "drawback" paid exporters for tariffs paid on imported inputs and deflated by the IMF price index for home and imported goods. Data on the dollar value of non-copper exports for the period are also taken from Jul.

with quarterly data. Although these studies differ in period, definition of exports, and estimations of the exchange rate coefficient all seem to indicate that the response of minor exports to devaluations is fairly significant.

Table 4
Colombian Minor Exports

Equ. # D-W/p	R^2 SEE	exchange rate	time	Const.	QUARTER DUMMIES II	III	IV
1956-69 (yearly observations)							
1	.5756	2.34		6.77			
1.26	(0.35	(4.02)		(6.06)			
2	.8538	0.92	0.08	8.85			
0.99	(0.22)	(1.94)	(4.59)	(10.78)			
3	.1814	0.48		0.24			
p=.98	(0.23)	(1.49)		(4.04)			
1958-67 (quarterly observations)							
4	.1014	1.12		-2.57	0.16	0.06	0.05
0.23	(0.46)	(1.79)		(0.86)	(0.80)	(0.30)	(0.25)
5	.8806	0.56	0.14	-0.69	0.17	0.05	0.04
1.51	(0.17)	(2.39)	(14.90)	(0.63)	(2.18)	(0.69)	(0.59)
6	.0659	0.72		-0.03			
p=.90	(0.23)	(1.59)		(0.14)			

(Figures in parentheses are t-ratios.)

The present study uses data on Colombian minor exports (exports other than coffee and petroleum) compiled on a yearly basis for 1956-69 by Musalem (22) and on a quarterly basis by Nelson, Schulz, and Slighton (24) and the IMF (11). Despite the assertion by Nelson et. al. that "Sheahan has shown conclusively the necessity of using quarterly data," (24, p. 211) the results of the analysis on the two sets of data lead to

similar conclusions.

In agreement with the findings of Sheahan and Clark, lagged values of the exchange rate did not contribute significantly to explained export variance even with quarterly data.

The trend, when introduced, absorbs much of the explanatory power of the exchange rate and is highly significant. The "quasi-first-differenced" equations probably estimate the elasticity most accurately. Overall, the results suggest an elasticity somewhere between one-half and one.

E. Israel

Halevi (9) has estimated the effect of the real effective exchange rate on Israeli industrial and total exports. His results suggest a significant elasticity around one-half.

Using Halevi's exchange rate data[4/] the present author ran regressions summarized below for the period 1950-69 and, following Halevi, for individual decades. The results indicate that much of the explanatory power of the exchange rate is absorbed by the trend when it is introduced. "Quasi-first differencing" does, however, yield a significantly positive exchange rate for the sixties.

[4/] Time series of real effective exchange rates for a number of categories of exports have been compiled by Joseph Baruh and are presented by Halevi (9). Data on exports in constant dollars are provided by the IMF (11).

Table 5
Israeli Exports

Equ. # / D.-W.	R^2 / SEE	exchange rate	time	Const.
	Total Exports 1950-69			
1	.5329	2.37		-5.52
0.14	(0.64)	(4.53)		(2.33)
2	.9883	0.21	0.15	2.73
1.23	(0.10)	(1.77)	(25.73)	(5.44)
3	.0001	0.01		0.29
p=.97	(0.12)	(0.05)		(4.86)
	1950-59			
4	.8678	1.33		-1.42
1.25	(0.19)	(7.25)		(1.76)
5	.9642	0.20	0.14	2.76
2.44	(0.11)	(0.72)	(4.34)	(2.60)
	1960-69			
6	.0686	1.32		-0.17
0.14	(0.36)	(0.77)		(0.02)
7	.9934	-0.03	0.12	4.33
1.59	(0.03)	(0.21)	(31.26)	(5.88)
8	.4182	0.47		0.43
p=.92	(0.04)	(2.08)		(4.67)
	Citrus Exports 1950-69			
C1	.3370	0.52		4.33
1.36	(0.50)	(3.03)		(27.43)
C2	.3371	0.50	0.00	4.32
1.37	(0.51)	(1.33)	(0.58)	(15.5)

(Figures in parentheses are t-ratios.)

When citrus exports are looked at separately, however, the exchange rate coefficient is not affected by including the trend. Its apparent drop in significance in equation C2 un-

doubtedly results from the introduction of multicollinearity. The elasticity for citrus exports is higher than that for total exports when correction is made for the trend, suggesting that agricultural commodities are not necessarily less responsive to price variations than other types of exports.

F. Korea

The response of total Korean exports to variations in the real effective exchange rate during 1958-70 appears to have been slight.[5/] Only in equation 3 is the exchange rate coefficient significant at the 5 per cent confidence level and the implied long-run elasticity is less than one-third. In equation 3 excess capacity has a small but significantly positive coefficient, suggesting that during times of deficient domestic demand Korean exporters turned unused capacity toward production for export.

The effect of the trend variable is overwhelming, reflecting the fast and steady growth of Korean exports which averaged

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[5/] Data on incentives for all exports in the Republic of Korea have been compiled by Kim for the period 1958-70 (14). Alongside frequent devaluations Korea has attempted to encourage exports by allowing exporters to sell earnings on a free market for foreign exchange and through exemptions on internal taxes and tariffs, interest rate subsidies, and direct subsidy payments. Kim has computed the effect of these subsidies on the price of foreign exchange during this period and has adjusted his series by the wholesale price index of Korea and the wholesale price indices of Japan and the United States, Korea's major export buyers.

32 per cent in the period. By itself, time explains over 99.7 per cent of the variance in exports during 1958-70. This suggests a strong dynamic element in the determination of Korea's comparative advantage; the introduction of new capital and technology in an economy where factor costs and the exchange rate were favorable to the development of new exports.

Table 6
Korean Exports: 1958-70

Equ. # D-W/p	R^2 SEE	exchange rate	exchange rate (t-1)	excess capacity	time	Const.
1	.0136	-1.57				13.71
0.10	(1.36)	(0.39)				(0.60)
2	.9980	0.17			0.34	1.42
2.06	(0.06)	(0.91)			(71.0)	(1.31)
3	.9992	0.42	-0.13	0.04	0.33	-3.96
2.83	(0.04)	(2.99)	(1.02)	(4.69)	(85.16)	(4.00)
4	.1720	0.30				0.28
p=.98	(0.09)	(1.37)				(8.14)

(Figures in parentheses are t-ratios.)

G. Pakistan

Pakistan is exceptional among the countries analysed for two reasons: industrialization has taken place at a considerable pace without serious inflation and, although in the period under consideration only one formal devaluation has occurred, there has been a trend toward real devaluation over some of the period in equestion. Pakistan's success at industrialization and devaluation may reflect the elastic labor supply typical of

the surplus labor economy (6), (18). The low level of development, agricultural orientation, and high population density of the country suggest that this model of the developing economy may indeed describe Pakistan.

Lewis (17) has estimated the effect of export taxes and the export bonus scheme on the effective price of foreign exchange for exports of cotton yarn and cloth, jute manufactures, and other manufactures separately for 1951-66 (17, p. 96). During this period exports of these categories grew at 40, 32, and 13 per cent respectively.

As the equations below imply, the elasticity estimate in the case of manufactured exports other than cotton and jute products is sensitive to the specification of the equation. The trend in equation 3 steals most of the explanatory power of the exchange rate.

The lagged value of the exchange rate in equation 3 is more significant than the current value in the first equation and this specification is less affected by autocorrelation. As mentioned above price stability may account for the greater long-run effect of a devaluation in Pakistan.

Table 7
Pakistan's Manufactured Exports 1950-64

Equ. # D-W/p	R^2 SEE	exchange rate	time	Const.
Manufactured Exports other than Cotton and Jute Goods				
1	.4111	1.75		0.45
0.36	(0.48)	(2.89)		(0.42)
2	.5324	1.77*		0.47
1.02	(0.43)	(3.70)		(0.57)
3	.7875	-0.27	0.14	2.80
1.23	(0.30)	(0.45)	(4.41)	(3.28)
4	.3218	1.51		0.84
p=.07	(0.50)	(2.28)		(0.78)
Cotton Yarn and Cloth Exports				
C1	.8959	12.87		-19.09
1.56	(0.71)	(10.58)		(9.60)
C2	.9324	9.33	0.15	-14.55
1.39	(0.60)	(5.41)	(2.55)	(5.96)
Exports of Jute Manufactures				
J1	.7290	11.90		-16.38
1.11	(1.11)	(5.91)		(5.03)
J2	.9092	7.10	0.25	-10.65
1.27	(0.67)	(4.55)	(4.88)	(4.66)

(Figures in parentheses are t-ratios.)
*lagged 1 period.

The export supply elasticities estimated for cotton and jute manufactures are extremely high and significant at the 1 per cent confidence level. Including the trend reduces the elasticity and its significance but not by a substantial amount. Several characteristics of these industries explain their responsiveness to exchange rate variation. First of all, cotton

manufactures are frequently produced by the same entrepreneurs who export raw cotton and jute. Their decision to process these materials or sell them in raw form will depend strongly on the price of the manufactured products. A second factor in these results is the low fixed cost in these industries and consequent ease of adjusting capacity utilization.[6/] Thirdly, an elastic supply of labor suggests a low cost of varying labor inputs.

IV. Export Supply Elasticities in Balance-of-Payments and Development Policy

The elastic supply of minor exports that characterizes a majority of the countries examined in Part III has a number of implications for balance-of-payments policy and development strategy.

One ramification for countries facing a deficit, known since Hume (10), (21), is, of course, that devaluation of the effective exchange rate for minor exports is likely to improve the balance-of-payments. The small share of total exports this group represents in the exports of most LDC's limits its potential as a short-run "cure" for a deficit of significant size, however.

A second well-known implication for balance-of-payments policy is that a dual effective exchange rate may be prefer-

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[6/] I am grateful to Carl Gotsch for having pointed out these characteristics of the Pakistani cotton and jute industries to me in discussion.

able to exchange-rate overvaluation as a means of exploiting a monopoly position in a particular category of exports (28). In the immediate post-war period Brazil pursued the second policy to take advantage of her large share in the world coffee market at the unnecessary expense of minor exports (1). A dual exchange rate would have increased revenue from minor exports while allowing Brazil to exploit her monopoly position as a coffee supplier.

More recently, research into the theory of development in the open economy has raised a number of questions about the response of the imports and exports of less developed countries to price changes. A knowledge of export supply elasticities sheds light on a number of issues in development:

1. Theories of "export-led" growth and the economic success of Japan, South Korea, and Taiwan, which have exhibited rapid increases in non-traditional exports, have aroused considerable interest in export growth and diversification in less developed countries. The results presented in Part III suggest that export incentives and devaluation can spur minor exports at least in the short run.

2. "Import-substitution" as a development strategy has often led to a policy of protection in less developed countries. The distortion resulting from such policies has been pointed out, for example, by Bhagwati (2), Mallon (19), Power (25), and

Selowsky (26). The degree of distortion resulting from a given tariff level will depend directly on the elasticity of export supply. Elementary trade theory implies that "liberalization" will lead to proportionately greater "opening" of the economy when export supply is elastic.

3. The "two-gap" model of McKinnon (20) and Chenery and Strout (3) assumes that the elasticities of import demand and export supply in less developed countries are near zero. The first assumption derives from the hypothesis that the elasticity of substitution between domestic capital and imported inputs is zero: hence, achieving a particular growth target will require a certain import level. According to Chenery and Strout "linear relationships of the Harrod-Domar tradition" govern the growth process. (p. 682) Hence, if imported inputs are the scarce factor in production the supply of imports will determine the rate of growth.

The model considers the level of imports as exogenous, determined by exogenous export and aid levels. Chenery and Strout justify this assumption by asserting that "the development of new export products...is limited by productive capacity as well as by organizational and institutional factors." (3, p. 689) Together, these two assumptions of fixed import-output ratios and exogenous import supply imply that a less developed country cannot improve her balance-of-payments position without

sacrificing growth. A devaluation can neither decrease imports by leading to the substitution of domestic for imported inputs nor can it increase imports by increasing exports.

The "two-gap" model has been used extensively to estimate aid "requirements" on the assumption of fixed import coefficients and given export supply. Nelson (24, p. 191) has shown that allowing for substitution between domestic and imported resources may reduce such requirements considerably. Similarly, the high export supply elasticities estimated in Part III cast doubt upon the assumption that the export level is beyond the control of the less developed country. In either case the foreign exchange "gap" facing a less developed country is by no means a given. A policy of devaluation may lead to the substitution of domestic resources for imports in production and increase the availability of imports by encouraging exports.

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