EXPORT GROWTH AND IMPORT SUBSTITUTION

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An import substitution approach to development implies among other things, that the developing country finds it impossible to export at rates and prices sufficient to support an acceptable rate of growth of output. Thus the country devises policies that seek to break the dependence of sustained growth on exports, and to create an economy that can grow more or less independently of exports. That this is a difficult -- perhaps impossible -- task has been amply demonstrated in a number of the studies in this series [See especially 16]. Similarly numerous other observers (e.g. Chenery [5] and W.A. Lewis [12, pp. 38 ff.] have presented data that suggest that no developing country has long maintained an acceptable rate of growth of output significantly greater than the growth of its exports. It appears then that the neglect of exports may be one of the important reasons why so many of the countries whose development policies have been built around import substitution have apparently run into the troubles analyzed in other papers in this series. In short, one might say that the search for ways to modify the currently practiced import substitution strategy in order to make it into an effective guide to development policymaking must include a search for a clearer understanding of the determinants of exports

from developing countries, and of their role in the development process. It is the purpose of this paper to examine some aspects of these two broad issues.

Evidently an examination of all aspects of both these issues is beyond that which is possible in a paper of finite length. The present discussion therefore is built around two sets of rather specific arguments that are part of the package of ideas on which the import substitution strategy rests. These arguments are spelled out in Part I. In Part II a framework is presented that will permit -- at least conceptually -- an examination of these arguments. This theoretical framework is presented in some detail and in isolation partly because it is believed to be of use in itself and partly because the empirical investigations to follow cannot provide exact tests of the specific arguments. Parts III and IV are, as just indicated, concerned with an examination of a variety of data in the context of the framework of Part II. Finally, in Part V the results of this investigation are related to the import substitution strategy as it is described and analyzed in other papers in this series.

I The Problem

The purpose of this Part is to spell out the two sets of arguments around which the paper is built.

1. The first set of arguments has to do with the specific role that exports play in the development process. The simplest argument, and the one most frequently encountered, rests on the assumption that physical capital formation is at the heart of the process of economic growth. Developing countries have small capital goods sectors, and must rely on foreign supplies of capital. Exports of non-capital goods are important then because they permit the importation of capital, a good strategic to growth. Thus exports are a way of transforming non-growth producing products into products (physical capital) that are growth producing. The most important assumption in this argument is the link between physical capital formation and economic development. This link of course rests on arguments long established in the growth literature, and most clearly seen in the capital output ratio models of growth. From these arguments and assumptions it follows in a rather evident manner that the country that can export can grow, i.e. exports occur, capital is imported, and growth takes place. 1/

The preceding argument has been severely jeopardized by recent empirical research on the relative importance of the various sources of growth. This research suggests that in almost all the countries where GNP has grown more or less regularly over a long period of time, increased productivity of the inputs has contributed

more to this growth then have increased inputs. 2/ This evidence indicates that the link between capital formation and growth is less direct and, perhaps less important, than that implied by the approach described above. If the direct link between capital and growth is interrupted (or not very important), reduced also is the role of exports as a means of acquiring capital.

The argument may be carried further if two more assumptions are introduced. First, suppose that one found a convincing relationship between the rate of growth of exports and the rate of growth of productivity, a relationship not without economic logic. Secondly, suppose that there was no evidence to support the view that capital formation was an important carrier of sources of productivity growth. 3/ With these two assumptions plus the evidence that productivity growth accounts for a large proportion of the growth of GNP, an argument contrary to that stated above emerges. Now rather than arguing that a developing country grows because it can export (and hence import capital), the just enumerated assumptions suggest that because a country can grow it can export. More specifically, to the extent that a country can create an environment in which productivity growth is relatively rapid, that country will grow and will export. This means in effect that the sources of growth of output and

of export are the same. It does not mean, of course, that capital formation is not relevant to development nor that exports are not important, but rather that their role in growth is different from that summarized above. The exact role of capital formation in development in this model requires considerable examination, but such examination is not possible here.

Although this latter argument must be worked out in a more rigorous form, it is evident that the distinction between this argument and that previously noted has important implications for an understanding of the role of exports in growth and, indeed, the nature of the latter phenomenon.

2. The second set of arguments on which the present discussion will focus is a subset of the first. It has to do with the determinants of export growth. A body of thought exists which argues that developing countries have difficulty exporting because of the conditions of demand in the industrialized countries. The argument refers to income elasticities, to the nature of technological change, to tariff and wage policies, and to a variety of other factors that seem to work against the traditional exports of most of the developing countries. 4/ In effect the argument asserts that demand conditions in advanced countries are the basis of the unsatisfactory showing of the growth of exports from the developing countries, and

supply conditions in the latter pose no problem. When this argument is coupled with the notion that exports are essential as a means of facilitating capital formation, one may obviously conclude that the primary obstacle to development is to be found in the demand conditions of the advanced countries where the capital goods are produced. This combination of arguments is, indeed, one of the bulwarks of an import substitution strategy of development.

Contrary to this position, one might seek to explain the observed export difficulties in terms of supply problems in the developing countries. This would mean one of two not independent arguments: that the latter countries were absorbing domestically -- for any of a variety of reasons -- so much of their output that little was "left over" for export, or it would mean that the country had priced its exports out of world markets. The slow rate of growth of exports would then be due to factors that acted on the supply variables of the country 5/, rather than to demand obstacles in the importing countries. This latter argument would lead to an examination of the factors affecting both the level of internal demand and prices as a means of understanding export difficulties. Consideration of these factors has obvious links with the argument noted above having to do with the sources of growth. Especially relevant is the link between productivity growth and prices.

That these two sets of arguments are not independent has already been noted. That they are not linked in any precise way is also clear, and this fact makes it useful to separate them into two different sets. Also, of course, one can be interested in one of the issues and not the other, and the models and empirical materials to follow are meant to tell us something about each set considered together.

The basic difficulty in reaching a conclusion about which of the possible arguments outlined above is in fact "true" in the real world is that of "identification" in the broadest sense of this term. For example with respect to the supply-demand barrier to export growth, customary trade data do not enable one to test specifically alternative hypotheses. So also if one observes that a country has both a rapidly growing GNP and a high rate of growth of exports, one cannot ascertain directly from such data whether it is the high rate of growth of exports that produces the high rate of growth of GNP or whether there is a common factor acting to produce both. Still it does seem possible to consider a variety of kinds of data in a variety of contexts, and thereby "shed light" (in contrast to "test") on the validity of the arguments described. This battle of identification is not only a matter for empirical investigation, but is relevant in the

building of the theoretical framework. Indeed one of the objectives of the model building exercise in the next Part is to seek to isolate a variety of ways of looking at the data which will contribute to resolving the identification problem.

II The Framework

The purpose of this Part is to establish a series of models which will provide a general framework within which the two sets of arguments just discussed may be analyzed. In Parts III and IV an effort will be made to give some empirical content to these models, and one of the tasks here is to develop the models in a manner that does not preclude empirical investigation. Part A considers issues that bear on the capacity of a country to supply exports, and B demand for exports models are examined. The productivity issue is introduced at a number of places in the various models.

A. The Supply Side

1. We begin with the very simple case illustrated by Diagram 1. In that diagram dd is the domestic demand curve for

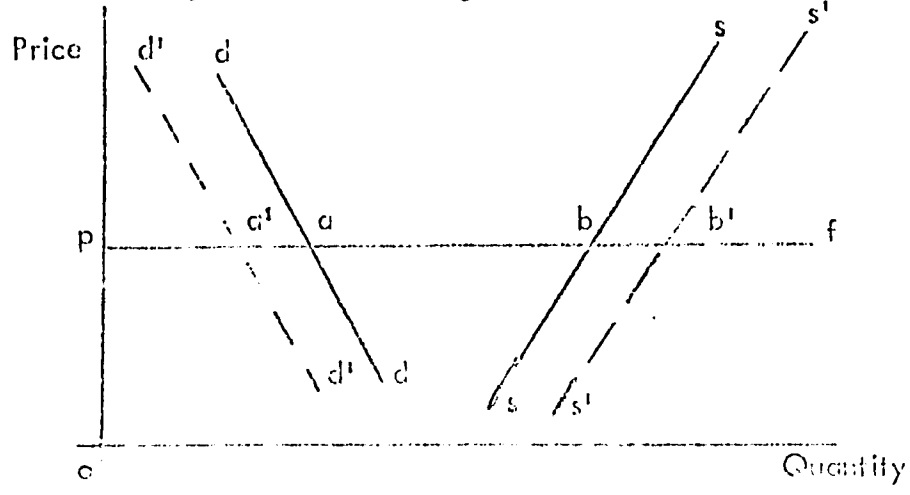

DIAGRAM 1

a single commodity, and pf is the foreign demand curve i.e. foreign demand is assumed to be perfectly elastic. The total demand curve facing the industry is daf. With the supply curve ss, equilibrium output will be pb at price Op. Of this total output pa will be absorbed domestically and ab exported. With the supply curve fixed, the quantity of output available for export depends on the level of domestic absorption. If, for example, dd were to shift leftward to dotted d'd' exports would increase by a'a.

The position of dd and its shiftability depend chiefly on the nature of the product. Suppose Diagram I refers to a manufactured consumer good that a developing country has recently begun to produce and to export. In this case then the chief determinant of the position of dd -- of the absorption rate -- is the rate of saving. If all exports are consumer goods, the proportion of output exported varies directly with the saving rate, and the behavior of the saving rate over time will enter into the explanation of the behavior of exports over time. Similarly when a group of countries is examined in a cross section analysis, exports are expected to be positively related to the saving rate. Diagram I also shows that given the level of domestic absorption, exports will vary directly with the level of output,

again both over time for one country and across countries in a cross section of countries. I.e. a shift in ss to s's' with dd unchanged will result in an increase in exports equal to the increase in output.

Of course all exports from developing countries are not consumer goods, and therefore the saving rate may not provide a very satisfactory guide to domestic absorption. A more general approach is along the following lines. Write Q as total output, X as exports, and A as domestic absorption only if the argument is limited to consumer goods. Then

$$Q = X + A$$

and

$$\Delta Q = \Delta X + \Delta A$$

and

$$\frac{\Delta Q}{Q} = \frac{\Delta X}{X} \frac{X}{Q} + \frac{\Delta A}{A} \frac{A}{Q}$$

1') $$r_x = r_q \; Q_x - r_A \; A_x$$

Where r_x, r_q, r_A refer to rates of growth of exports, output, and absorption and Q_x and A_x are Q/X and A/X respectively. Expression 1') holds by definition for a given country. For a cross section of countries, a regression of r_x on r_q and r_A will, with other information, throw some light on the average situation

in the group of countries with respect to their supply of and domestic absorption of exportables.

Data on domestic absorption are less readily available than data on output and exports, and a simple regression of r_x on r_q will tell us essentially the same thing as Expression 1'. If we write

$$1) \quad r_x = a + br_q$$

then a b greater than unity indicates that domestic absorption is growing less rapidly than exports, and thereby "releasing" an increasing share of total output to be exported. The b obtained from a cross section of countries will indicate the average degree to which the countries "release" output for export.6/ Equation 1 will be used in some of the later empirical work.

2. The assumption of a perfectly elastic foreign demand curve is crucial in the preceding argument, and of course eliminates by assumption foreign demand as an obstacle to increasing exports. For the manufactured goods of a developing country the assumption of a horizontal foreign demand curve is not unrealistic, but for all exports it surely is not an acceptable assumption. It is useful therefore to modify the previous model by assuming that foreign demand is less than infinitely elastic. Consider then Diagram II.

In this diagram the foreign demand -- ff -- is drawn vis-a-vis the vertical axis, and the total demand curve -- tt -- is the horizontal sum of dd and ff. At equilibrium price Op_1 domestic demand is p_1a and p_1b is exported and p_1c is total output. Now a shift leftward of the domestic demand curve to d'd' has repercussions a bit different from those examined in Diagram I. The quantity of product released for export by the decrease in domestic absorption cannot be exported at the prevailing price. The consequence of a reduction in the price of a country's exports on the quantity of exports is usually analyzed in terms of foreign demand elasticities. There is, however, a supply side of the question which is especially relevant in the present context.

Write n_d and n_f for the elasticities of d'd' and ff respectively, and E_s for the elasticity of the supply curve. Let D be the quantity demanded domestically after the decrease in domestic absorption, X be the quantity of foreign demand (exports), and S be the quantity supplied (= X + D) all at the initial

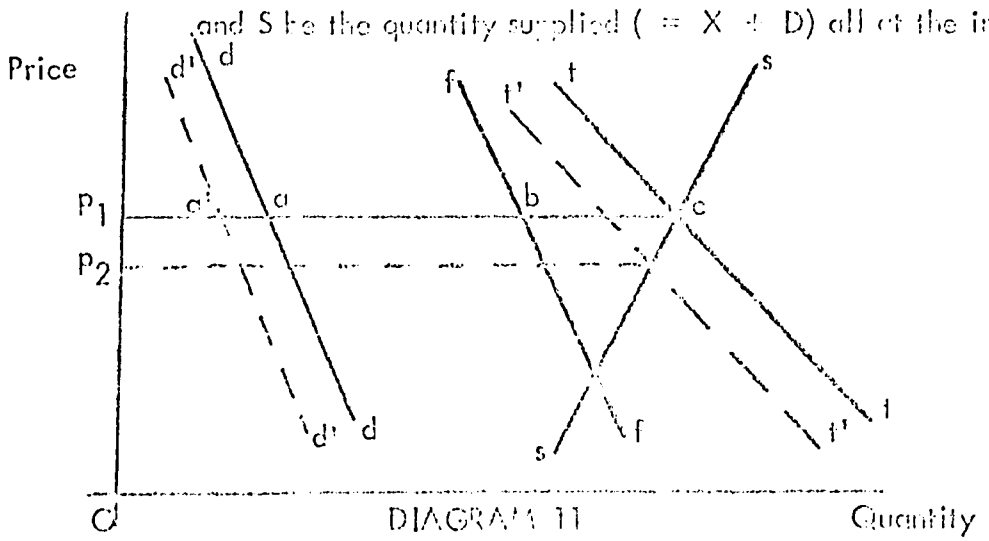

DIAGRAM II

price Op_1. Finally write R as the quantity released from domestic absorption (equals a'a in Diagram II). Then the new equilibrium requires the

$$\left[n_d \, .D + n_f \, .X \right] r_p = R - \left[E_s \, .S \right] r_p$$

$$2) \qquad \left[n_f \, .X \right] r_p = R - \left[E_s \, .S + n_d \, .D \right] r_p$$

The right hand side of Equation 2 measures the extent to which a decrease in domestic absorption accompanied by a reaction in domestic prices will release commodities for export. Evidently the greater E_s and n_d the less will this amount be.

The point may be put a bit differently by noting that from Equation 2, one may write

$$r_p = \frac{R}{\left[n_d \, .D + n_f \, .X + E_s \, S \right]}$$

Evidently then r_p is greater absolutely, the smaller is n_d and E_s. Thus a "high" n_d and E_s prevent the price from falling to the foreign market, so that a "high" n_f will not have an opportunity to wield its power.

Equation 1 may now be expanded to include the price effect (a rising or falling domestic price) that might accompany decreased (or increased) domestic absorption or a change in output. To do this, the right hand side of 2) is divided by the level of exports

at the initial price, and combined with Equation 1. This yields

$$3) \quad r_x = a + br_q + [E_s S_x + n_d D_x] r_p$$

where S_x and D_x are S/X and D/X respectively. Note that Equation 3 (as was Equation 1) is a supply equation. It measures the rate at which the country or group of countries supply exports in the face of a changing r_q and r_p. It is evident that if r_p is falling the price effect on r_x will be less, the smaller are the two elasticities, while if r_p were rising the (positive) effect on r_x is greater the longer the elasticities. Also the greater the proportion of output absorbed domestically the greater will be the price effect.

A devaluation accompanying the decrease in domestic absorption may change the picture just described, and eliminate the necessity for prices to fall. One can imagine a devaluation just sufficient to shift ff of Diagram II rightward enough to compensate for the leftward shift of the dd curve. 7/ In this event there would be no reduction in price from Op_1, and the foreign markets could absorb the total quantity of product released by the decrease in domestic absorption.

Suppose that the foreign demand curve is elastic over the relevant range so that an increase in the quantity of exports will also increase foreign earnings, then it is evident that

decreased absorption produces a larger increment in exports and in foreign exchange earnings when it is accompanied by devaluation than when it is not. Similarly a devaluation within decrease in domestic absorption will be less productive of increases in exports than will a devaluation accompanied by such a decrease. From this argument it may be concluded that the "right" exchange rate depends in part on the absorption rate, and the failure to adjust exchange rates consequent to the pursuit of policies aimed at reducing domestic absorption can account for the failure of the latter policies to produce the desired effects on exports. Devaluation in the present context removes the necessity of a reduction in domestic prices, and the consequent induced increase in domestic absorption that this reduction produces. Indeed, Equation 2 suggests that where E_s and n_d are both "high", devaluation will be necessary to prevent domestic demand and supply considerations from countering the effect of the decreased absorption.

3. Both of the preceding formulations assumed that the developing country could produce at prices which were competitive in the world markets. Obviously this is necessary if there are to be exports. In a country with a newly developed and protected sector --- usually, but not always manufacturing --- activities exist

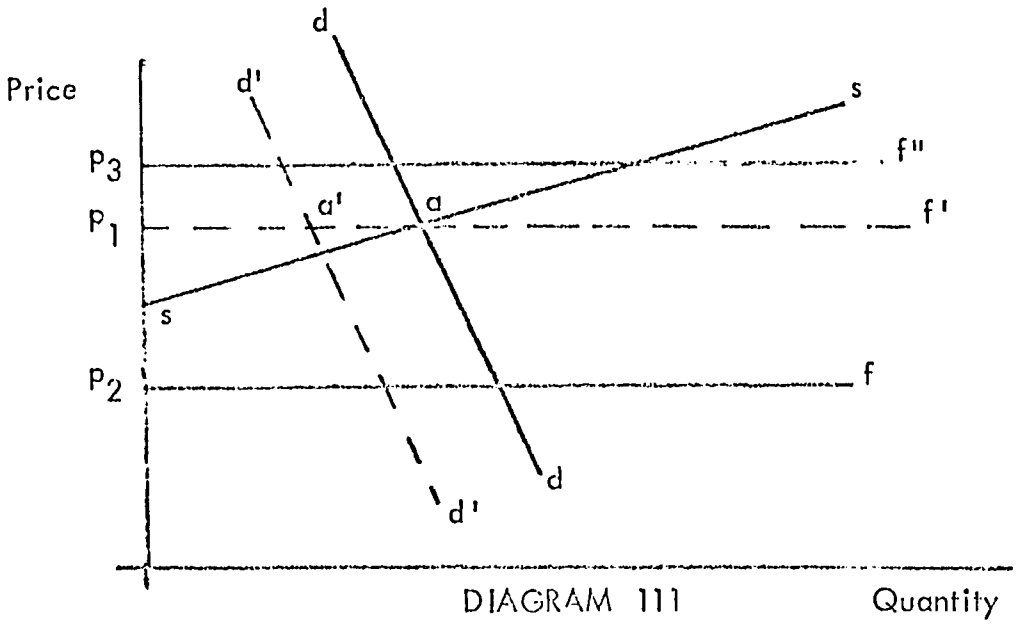

DIAGRAM III

which cannot export because their costs are too high. This situation has a special relevance in the present context.

In Diagram III the foreign demand curve is horizontal, but is below the supply curve at all points so that at no price will this activity export. At price Op_1 the sector is in equilibrium but is selling only in the domestic market. Now reduction in domestic absorption will not induce producers to export, although the domestic price does fall. Similarly an increase in output along the supply curve will not have any effect on exports. Evidently for price Op_1 to obtain in the domestic market, the sector must be protected from foreign competition.

The situation pictured in Diagram III means that for a given exchange rate the ratio of factor payments of this country to those in other countries (in this activity) exceeds the ratio of the productivities.8/

There are three possible ways to alter this situation so that exports can occur. Payments to the factors in this sector may be reduced. If the sector is paying going prices for its inputs, this is an unlikely way out. With unchanged factor payments an increase in productivity in these activities will also lower the supply curve. That this may happen over time is one rationale for protection, 9/ but in almost all cases it will be a long-term proposition at best. Increased productivity therefore is also an unlikely reed on which to build export growth in a short run. It will enter into the argument in a longer run context in the next section.

The third method is devaluation. In terms of local currency (as noted), a devaluation raises the foreign demand curve. A rate of devaluation that moved p_2f to P_1f' would create a situation where a decrease in domestic absorption would produce an increase in exports. Thus a shift of dd to d'd' accompanied by the indicated magnitude of devaluation would mean that exports would rise from zero to a'a. 10/ If devaluation is great enough to cause the foreign demand curve to shift to P_3f'', then even with the domestic demand curve at dd, exports (and foreign exchange earnings) rise and domestic absorption falls. These points suggest anew that the role of domestic absorption in the explanation of the growth of exports depends (as in Diagram II)

in part on the existence of an "appropriate" exchange rate and, more generally, the degree to which the country has avoided the mis-allocation of its resources.

Note the distinction between the objective of devaluation in this case and that in 2 above. Previously the chief objective was to overcome obstacles on the internal demand side, while here there is no demand problem but there are supply problems arising out of investment misallocations, in appropriate factor pricing, or possibly the application of some development strategies that include considerable lags (e.g. infant industry arguments) before their full fruits are realized. Devaluation may then be necessary or may be the most implementable means of correcting these distortions or of weathering the infancy of new activities.

The devaluation in the context of Diagram III does not provide products for export in the same sense that increased output and decreased domestic absorption do. Neither does the conventional elasticity analysis provide help. Rather, the devaluation corrects (or contributes to the correction of) internal distortions or the other problems noted above that impede the absorption and output variables from being effective. In an empirical investigation, therefore, a major question in applying the preceding equations is the assumption as to which diagram -- i.e. which set of assumptions -- is

applicable. Evidently policy implications vary among the models. The points raised in this section suggest that one must try to appraise why coefficients of the preceding equations are what they are, rather than simply estimating their values or adding more explanatory variables to the equations.

4. The analysis in sections 1 and 2 above introduced the effect of the growth of output on the growth of exports in a very simple way, namely the expression br_q. There are however other effects, and to examine such effects is the object of the present section. Consider one last diagram. In Diagram IV the supply curve is drawn as completely inelastic, but with a meaning slightly different from that attached to the conventional curve. The resources engaged in this activity in period one can, when fully employed, produce at a rate of output equal to OQ_1. With this capacity a price of Op_1 is necessary to yield a return sufficient to keep capacity intact over successive periods. I.e. in period one the market is supplied with OQ_1 no matter what the price, but if price is other than Op_1, efforts will be made to adjust capacity, and consequently the supply curve will shift for later periods.

In period one (shown by the solid lines) there is equilibrium in the domestic and foreign markets. Total output is OQ_1 of which

P_1a is absorbed domestically and P_1b is exported. The simplest development sequence would be one in which both demand curves and the supply curve moved rightward in the

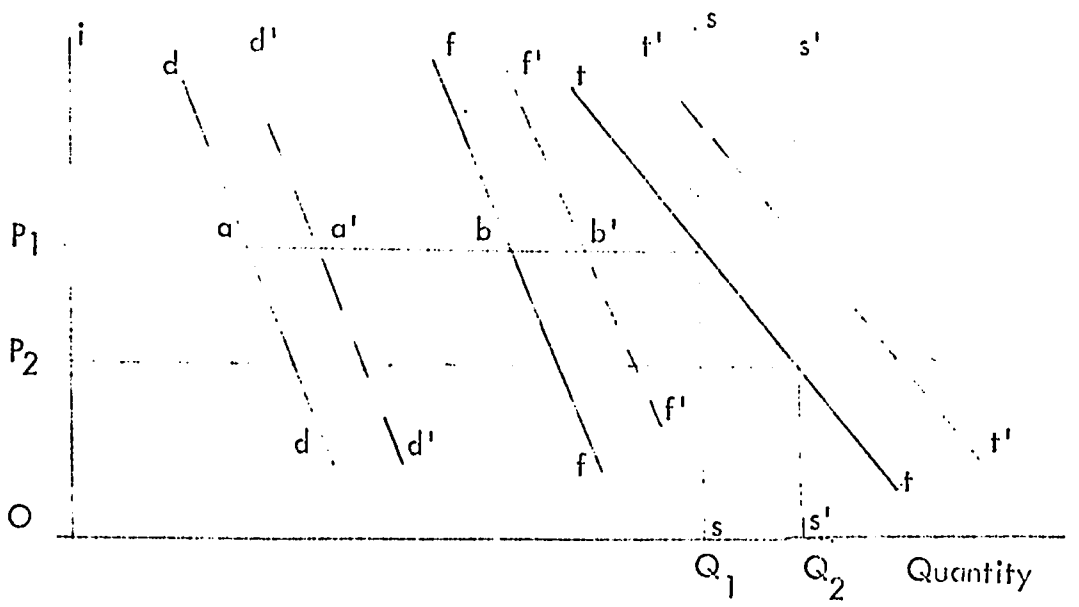

DIAGRAM IV

same proportion and output, exports, and domestic absorption all grow at the same proportionate rate. The second period situation is described by the dotted lines. Even with this simple sequence, however, one must ask <u>why</u> the supply curve shifts rightward. If it shifts only because more resources entered this activity, then Op_1 remains the long-run equilibrium price. If it shifts because of increased productivity of the resources already in the industry then Op_1 is above the equilibrium price, and additional resources should be attracted into this sector.

Suppose that ss shifts to s's' due to increased productivity only, and the demand curves remain in their original position. Market clearing price falls to Op_2. This is an equilibrum price if ff is of unitary elasticity over the relevant range. If the elasticity of ff exceeds unity, Op_2 exceeds the supply price, and resources will be attracted into the industry. The elasticity of ff is a weighted (weights are shares of output) average of the elasticity of dd and ff, and again a role of the elasticity of domestic demand becomes apparent. In this case a "high" elasticity of domestic demand can prevent the country from increasing exports by exploiting its productivity gains. Indeed, the situation could actually harm total exports if this sector attracts resources from activities where domestic absorption is less and the profitability of exporting higher.

Perhaps the most important way in which productivity growth enters the story is in terms of its effect on the position of the foreign demand curve. The position of the ff curve depends on a variety of factors in countries producing and exporting a product competitive with that to which the diagram applies. In particular it may be assumed that a more rapid rate of growth of productivity (reflected in a relative reduction in its price) in a competing country will push the ff curve of Diagram IV leftward or result in it moving rightward more slowly than it would if rates of increases were the same in all countries. Suppose for example that an industry finds

its foreign demand curve stationary or moving rightward slowly compared to world income. This may mean that the income elasticity of foreign demand is "low" -- a conventional demand argument -- or it may mean that productivity is growing more rapidly in competing countries than in the country of the diagram. If the latter country lowers its price in order to compete -- and to use all of its capacity -- it will find that the lower price does not cover costs. In the longer run, then, resources will leave this activity as its markets dwindle away.

This very result, however, may induce policies which result in the domestic demand moving rightward to take up the slack caused by leftward drift of ff. Consider Diagram IV again. Suppose the supply curve moves to s's' as new resources are added to this sector, and dd shifts to d'd' while ff stays put as competing countries lower their prices in response in increases in productivity. The industry now has capacity that it cannot utilize at cost covering prices. If devaluation is unacceptable, a policy of increasing money income within the country will shift dd rightward more rapidly in order to take up the slack created by the falling foreign demand. This means that the rate of growth of domestic absorption is speeded up, and the amount available for export reduced.

If productivity growth among the exportables of the developing country is keeping pace with that in competing countries, the results just described are more or less reversed. If productivity is rising more rapidly in the developing country than elsewhere, then the simplest effect would be analyzed in terms of changing prices. Equation 3 could then be used to examine the consequences or the rate of growth of exports. There may be a more complex effect as well. Improved quality of the product, better packaging and marketing techniques, more reliable delivery schedules, and greater product differentiation usually accompany -- indeed are part of -- increased productivity. Briefly, one may say that along with cost reduction are additional changes going along with productivity growth that make a product more suitable for the world market. This greater suitability would be reflected in a moving rightward of the ff curve. This point seems especially relevant for countries which are seeking to enter markets for the first time, to, in effect, outcompete existing suppliers. The measurement of this latter effect is, of course, difficult, and in the empirical investigation to follow a productivity index will serve not only as an index of cost reduction but of increased competitive power (in the sense just outlined) as well. Emphasis may be placed on the point that the position and indeed the elasticity of the ff curve is not exclusively a demand phenomenon.

These points help clarify the relationship, noted in Part I, as to the origins of the growth of exports and output. The arguments of this section obviously suggest a significant positive relationship between growth of export supply capacity and productivity. Nothing has been said of course about the origin of productivity growth, and the nature of this origin is crucial to the resolution of the issue defined earlier.

Summary This section has sought to isolate the factors that bear on the capacity of a country to supply exports. Emphasis was placed on the direct effect of rates of growth of domestic absorption and output, and a price effect. An important indirect role was given to allocation and distortions (especially as reflected by exchange rates) and the rate of growth of productivity.

B. The Demand Side

External demand issues can also be examined in terms of the preceding diagrams. An inelastic foreign demand curve impedes export growth based on price advantages, whatever the origin of these advantages. Similarly the position and shifts in the position of the ff curves are affected by specific policy measures in the importing countries as well as particular features of demand conditions, e.g. income elasticities, changing tastes, and the like. Evidently an increase in the tariff rate imposed by importing countries on an

export commodity will shift the ff curve leftward for countries exporting that commodity. As shown in the preceding section the ff curve shifts for other reasons as well, and the empirical problem is not only that of ascertaining how the shifts in this curve affect the rate of growth of exports, but also to try to explain why the shifts have occurred.

The usual form of an import demand equation has total income or output and price as explanatory variables. A simple regression of imports on total output assumes that as income changes, the composition of output and of domestic demand remains unchanged which in turn implies that relative prices of domestic products and between domestic and imported products remain unchanged and no change in trade policy occurs. Including price as an explanatory variable enables the relaxation of some of these assumptions by permitting the introduction of a price effect along with the output effect. So an import equation of the form of Equation 4 is frequently employed.

$$4) \quad r_m = A + Br_y + Cr_p$$

where r_m and r_y are rates of growth of imports and output, and r_p is a measure of the changing difference between the price level of the importing country and the "world" price level. The coefficient is therefore an elasticity of substitution between

foreign and domestic products and B is an income elasticity of demand for imports.

Equation 4 has two limitations. It does not tell us anything about import demand for the exports of an individual country or group of countries, a matter of prime interest in the present context. The second limitation has to do with the use of total output as an explanatory variable. It was noted earlier that the use of B as a demand parameter implied a number of things about the fixity of the composition of output, of trade policy, technology, etc. over time, at least as far as these factors affect the relationship between total output and imports. A modification of 4) that eliminates these difficulties is to use world imports in place of total output and a slightly different price variable. Thus

$$5)\quad r^{d}_{xi} = A' + B'r_{mw} + C'r_{pi}$$

where the equation now refers to the i^{th} country (or group of countries), and r_{pi} refers to the rate of growth of country i's price level relative to that of its competitors.

It is evident that 5) is more a measure of competitiveness than is 4), and the two equations are complementary, not substitutes. Equation 5 is useful in appraising a given country's performance relative to that of other countries. Equation 4, on the other hand, indicates something about the nature of the growth

of demand for imports in a growing economy.

Summary In this Section two forms of a demand equation for imports were developed. These equations when combined with the supply of export equations developed in Section A provide the framework within which the two sets of arguments outlined in Part I can be examined. One should note, in particular, that in seeking evidence on these arguments that parameter estimation -- even where possible -- is not enough. One must seek to explain why parameters are what they are or are different from some norm. Especially important is the explanation of the relevant links between the rate of growth of exports and developments in the rest of the economy. The task now is to try to give some empirical content to these various constructs.

III The Export Performance

The most obvious place to begin is with a brief examination of the actual export performance of the developing countries compared to that of the advanced countries. The comparison between performance and characteristics of developing and advanced countries will be employed in much of the analysis that follows. Such comparisons are useful in a variety of ways. They can suggest a kind of norm that might be used for discussion, they can suggest possible interpretations of calculated results, and can suggest additional

TABLE 1

Rate of Growth of Exports of Developing Countries

Country	PERIOD 1952-64	1951-59	1960-65
Brazil	- 1.0	.3	3.2
Ceylon	.9	2.8	.7
Argentina	3.5	- .6	6.6
Peru	9.0	6.6	12.8
Colombia	- 1.9	3.9	2.6
Chile	2.5	4.4	8.3
Jamaica	10.7	13.1	7.0
Costa Rica	2.4	3.6	7.1
Kenya	6.7	7.2	5.2
Ecuador	3.3	6.6	4.7
Korea	10.4	8.8	19.1
El Salvador	4.5	5.9	9.5
Ethiopia	4.0	9.7	12.5
Indonesia	- 2.5	.3	- 3.7
Ghana	2.3		.9
Nicaragua	6.1	10.2	11.2
Guatemala	3.1	4.0	11.1
Honduras	3.2	1.9	10.4
Panama	6.6	3.5	12.8
Pakistan	.5	.1	8.3
India	2.8	1.7	3.9
Philippines	5.8	2.8	9.9
Sudan	5.1	7.3	2.6
Mexico	3.7	5.5	7.1
Turkey	.7	5.2	7.3
UAR	1.8	- .5	3.7
Uruguay	- 3.7	-7.1	8.9
Nigeria	3.9		8.9
Thailand	4.8	2.7	11.3
China (Rep.)	10.0	6.6	19.8

Source: See Table 2.

TABLE 2

Rate of Growth of Exports of Advanced Countries

Country	PERIOD 1952-64	1951-59	1960-65
Austria	8.7	14.7	10.0
Australia	.4	4.2	8.8
Denmark	7.3	8.9	8.8
W. Germany	11.7	20.6	10.2
Finland	5.8	8.7	9.7
France	7.3	10.7	14.0
Canada	4.5	6.7	6.9
Greece	6.7	12.0	12.5
Israel	16.7	21.3	17.2
Italy	12.4	11.7	15.4
Japan	13.7	16.6	15.0
Netherlands	8.3	10.8	9.8
Sweden	7.3	8.2	9.0
Norway	6.7	9.2	8.4
Switzerland	7.2	10.2	10.0
New Zealand	3.0	3.6	4.1
South Africa	4.7	7.6	5.0
United Kingdom	4.2	6.8	5.0
United States	4.2	6.1	8.4
Belgium	7.0	6.6	10.6

Sources: Calculations for 1952-64 are based on data from the United Nations, Yearbook of International Trade Statistics, various issues. The rate of growth is computed from a least squares equation of the logarithms of exports as a function of time. The figures for the periods 1951-59 and 1961-65 are taken from Table 1 of the World Tables prepared by the Economics Department of International Bank for Reconstruction and Development. These growth rates are computed from terminal year data only, although the compilers note that if there were major changes in the growth rate over the period considered this fact would be noted. No such note was appended to the estimates included here. All growth rates were computed from exports measured in current United States dollar values. For Jamaica and Kenya the figures in the second two columns are for the period 1955-59 and 1961-65.

TABLE 3

Mean and Variation of Rates of Growth of Exports

Statistic and Period	Category of Country	
	Advanced	Developing
Mean Growth Rate		
1952-64	7.39	3.64
1951-59	10.23	4.16
1960-65	9.94	7.82
Variance		
1952-64	14.02	12.57
1951-59	22.99	15.97
1960-65	11.61	24.62
Relative Variation*		
1952-64	.51	.97
1951-59	.47	.96
1960-65	.34	.63

* Standard Deviation divided by the Mean.

Source: Calculated from the data of Tables 1 and 2.

hypotheses or formulations that can contribute in a variety of ways to the light shedding process previously noted. 11/

Tables 1 and 2 present evidence of the average annual rate of growth of exports of thirty developing countries and twenty advanced countries for three different post 1950 periods. The use of data from three separate periods reduces the likelihood of getting a misleading impression because of the peculiarities of the period, and it also provides more data on which to base the analysis.

In Table 3 some of the more obvious characteristics of these series are summarized. In each of the three periods the rate of growth of exports (r_x) for the advanced countries (A countries) is significantly (at 5 per cent levels) higher than that of the developing countries (D countries). There seems no doubt then that exports of A countries have been growing, on the average more rapidly than the D countries. This fact is important, but two further points are also relevant. The relative variation -- standard deviation divided by the mean -- is about twice as high for the D countries as for the A countries in each period. This larger variation for the D countries in r_x relative to the mean shows, of course, that there was substantially greater difference among the export performances of these countries than

for the A group. Since the D countries were all exporting to essentially the same group of countries, this large variation suggests that some countries had greater success than others in achieving an acceptable r_x. This one may say is inconsistent with an explanation of the lower rate of growth of exports of D than for A in terms of a common external demand barrier. If some countries were successful and others were not, then there is, at least, a presumption that the explanation of the behavior of exports is to be found in the internal policies of the exporting countries. The countries do export different products, and to the extent that products are set (i.e. countries cannot shift from one product to another very easily) then one may explain the divergent growth rates in terms of composition of exports. This would mean that the observed variation could be explained in terms of the composition of the export basket, which might be a matter of policy but probably has more to do with luck than policy.

If the countries in the A group that consistently achieved a very high r_x (Israel, Italy, Japan, and West Germany) were eliminated from the list, not only would the mean value of r_x for A be reduced, but also the differences in the relative variation of the two groups be increased. 12/ If one argued (see below)

that these countries were unusual -- i.e. different from other A countries -- the conclusions noted in the preceding paragraph are strengthened.

These four high r_x countries have one major characteristic in common. They are all "new" countries, in the sense that they were moving into new markets, outcompeting a number of more traditional suppliers. They were countries which in 1950 occupied a very small position in world trade, and subsequent to that date moved strongly into world markets. In terms of the diagrams of Part II, the ff curves of these countries appeared to be moving rightward more rapidly than for the other D countries. These countries were emerging -- or re-emerging -- into the trade network, and were doing this by outcompeting a number of rivals. 13/ In somewhat similar terms one may say that the D countries are seeking to emerge more fully into the trade network, but were much less successful than were these four advanced countries. The exports of the other D countries grew more or less along with world trade. 14/ The general picture then seems to be this: At least four of the A countries achieved obviously extra high rates of growth of exports, while most other A countries more or less rode along, i.e. more or less held their position, on world trade. The D countries lagged behind the A countries with respect to average rate of growth of exports, at the same time that they were

faced with a task similar to that of these four A countries, namely pushing their way into a larger role in world trade. Finally -- and this is of great importance -- the diversity in the performance of r_x of D was great enough that it is consistent with the conclusion that a great variety of diverse factors were at work rather than a few factors common to all countries.

This diversity of performance among D countries also characterizes specific categories of exports. In the decade 1952/53 - 1962/63 twenty-six developing countries had a mean rate of growth of manufactured exports of 10.8 per cent, 15/ and a relative variation of .65. For all minor exports the mean r_x was 7.8 per cent annum over the same period and the relative variation .94. Again then the evidence suggests a degree of variation of sufficient magnitude to support the argument summarized in the preceding paragraph.

IV Some Empirical Light Shedding

In this Part a more frontal assault on the two sets of arguments stated in Part I is undertaken. The analysis is, for the most part, built around a series of regressions. These regressions are meant to "shed light" directly on the arguments themselves, on the parameters of the various models of Part II, and on why these parameters are what they appear to be. Attention

is again called to the point noted earlier that formal techniques of statistical hypothesis testing cannot be employed, but it is believed that the complete set of analyses do tell us something about the important arguments set out in Part I.

Use is again made of a comparision of results for developing and advanced countries. Regressions (all are least squares) are shown in the usual manner with standard errors in parentheses below the coefficient to which it refers and $\bar{r}^2$ to indicate the squared coefficient of correlation corrected for degrees of freedom.

A The Supply Side

1. Exports and Output: Total. The first model worked out in Part I involved a simple relationship between the rate of growth of all exports and of GDP. The following equations are based on rates of growth for the decade of the 1950's.[16] Rates of growth of GDP (r_q) were calculated from the data presented in the United Nations National Accounts publications.

D Countries	A Countries
6) $r_x = .05 + .80\ r_q$	6') $r_x = 1.65 + 1.84\ r_q$
$(.44)$	$(.26)$
$\bar{r}^2 = .12$	$\bar{r}^2 = .71$

Several points may be made with respect to these results. The intercept, the regression coefficient, and $\bar{r}^2$ are all much higher for the A countries then for the D countries. The respective regression coefficients indicate that exports from A countries are, on the average, growing more rapidly than output, while those from D countries less rapidly.[17/] Thus for a given rate of growth of output r_x for A will be much higher than it is for D. Indeed the mean value of r_q was very nearly the same for the two groups of countries: 4.7 per cent for D and 4.4 for A.

The difference between the intercepts is also suggestive. The significantly positive intercept (1.64) for the A group indicates that even if GDP failed to grow at all, export growth would continue. I.e. a shift from domestic absorption to exports would take place. The zero intercept for the D countries on the other hand indicates that no such shift would occur. More generally the difference suggests that the D countries "come into" trade only as their output rises, while for the A countries their exports seem much more built in, much more a part of, their productive system rather than added on to it as it expands.

If the model underlying Equation 6 and 6' were known to be valid, these results would lead to a rather clear cut interpretation. The regression coefficient less than unity for the D countries would indicate that domestic absorption was the

"barrier" to increasing exports. Or to put the matter a bit differently: average r_q for the two groups of countries was about the same, average r_x was much higher for the A countries (9.74 per cent) than for the D countries (3.70 per cent). The difference in export performance than is explained in terms of the growth of domestic absorption and output. In the D countries domestic absorption was growing at a rate that resulted in the ratio of domestic absorption to total output rising, and consequently in the relative quantity "released" for exports declining. The opposite situation prevailed for the advanced countries. The intercept values in the two equations are consistent with this interpretation.

Two rather obvious points make this interpretation of Equations 6 and 6' open to question. In the first place the assumptions of the model that lead to these equations are evidently not completely realized -- prices did change over the period, foreign demand curves surely are not all completely horizontal, exports may have been consciously kept down to prevent price deterioration, and of course many other possibilities. Thus from general evidence it can be asserted that the simple model underlying these equations did not hold exactly.

The second source of doubt about the preceding interpretation of Equations 6 and 6' has to do with the explanatory power

of the equations as measured by the $\bar{r}^2$. Equation 6 explains about 12 per cent of the variation in rates of growth of exports of D countries and 6' over 70 per cent of the variation in r_x of A countries. This result suggests that there were a variety of factors other than r_q working on export growth in the D group that did not appear as important for the A group. In effect the difference in the $\bar{r}^{2}$'s indicates that the argument of the model is more appropriate for the A group than for the D group. If this is indeed the case, then to explain r_x for D a more complex model is required. Consider first however this same model applied to manufacturing.

2. Exports and Output: Manufactures. For reasons having chiefly to do with the nature of the product, the assumptions underlying the first model of Part II seem more directly applicable to manufacturing exports than to total exports. This assertion seem especially to be true for the developing countries. Rarely do these countries have a dominant market role in any manufactured export item, and shifts between domestic absorption and exports probably is easier for such products than it is for a natural resource dominated commodity basket. Equations 7 and 7' apply to the same groups of countries as did 6 and 6', but the variables -- r_{xm} and r_{qm} -- apply to manufactured products only. These equations are based on the ten year period 1952/53

to 1962/63 rather than the 1950-1960 period used for Equations 6 and 6'. Experiments with less complete data suggest that the results are not markedly different from what they would be for the 1950-60 period.

D Countries	A Countries
7) $r_{xm} = -22.84 + \underset{(1.11)}{5.29}\, r_{qm}$	7') $r_{xm} = 4.41 + \underset{(.35)}{.96}\, r_{qm}$
$\bar{r}^2 = .57$	$\bar{r}^2 = .26$

The picture conveyed by these equations is quite different from that suggested by the preceding two. For the D countries the regression coefficient of 5.29 indicates that exports are growing at a proportionate rate much higher than that of the output of manufactures. With this sized regression coefficient it would be difficult to argue that domestic absorption was a bottleneck.[18/] On the other hand the -22.84 value of the intercept does suggest an internal demand barrier of some kind. Output must grow at 4.32 per cent per year before r_{xm} becomes positive. The mean r_{qm} for the D countries was 7.32, well in excess of 4.32, and consequently average r_{xm} was a very large 15.88 per cent.

The situation then seems to be this: a fairly high rate of growth of output is necessary to satisfy domestic absorption, but once the point is reached where r_{xm} is positive, exports expand quite rapidly as output grows. This argument is con-

sistent with the first model of Part II, and may be explained in terms of a size of market hypothesis. In the developing countries manufactured output is heavily dominated by consumer durables, the demand for which appears quite elastic with respect to income at given price levels. Thus unless there is a rapid increase in the range of goods produced or possibly an increase in the equality of income distribution, the relatively small domestic markets are likely to be met by rates of growth of output well below those possible of achievement in newly industrializing countries. It would seem then that the "internal demand barrier" does exist in the case of manufactured exports, but is of a somewhat different form from that for total exports -- still assuming the assumptions surrounding Diagram I are applicable.[19/] The $\bar{r}^2$ of Equation 7 is .57 compared with .12 for Equation 6. This result confirms earlier stated expectation to the effect that this simplest of models is more applicable to manufacturers than to total exports. The value of $\bar{r}^2$ and of the regression coefficient give considerable support to the position that an effective way for developing countries to raise the rate of growth of manufactured exports is to raise the rate of growth of their output.

For the A countries also the equations for manufactures differ in important respects from the equation for total export

and output. The regression coefficient of Equation 7' is about unity compared to 1.84 for total exports, $\bar{r}^2$ is .26 compared to .71 earlier, and the intercept is 4.41 compared to 1.65. Why should these differences exist?

No specific explanation seems completely satisfactory, but two general comments may help. All three characteristics of Equation 7' suggest that for these countries it was not so much a matter of output growing rapidly, domestic absorption less rapidly, and hence output available for export rising steadily as seemed the case for the D countries. Thus r_{xm} grows at more than 4 per cent even if r_{qm} is zero, and the latter variable explains only about one-quarter of the variance of the former. It would appear that both exports and output were expanding together in a more or less specific pattern.

The second comment involves reference again to the A countries that have achieved extra high r_{xm}. These include the same four countries as were listed before -- West Germany, Italy, Japan, and Israel --- plus New Zeland.[20/] In these cases too the idea is suggested of countries entering, or re-entering, this trade network. New Zealand and Israel --- and to a lesser degree Denmark and Finland --- were finding their way into manufactured

trade for the first time, while Germany and Italy were engaging in their highly successful postwar recovery to re-establish their roles.

Thus a picture emerges somewhat along the following lines. Manufactured exports of most A countries expand somewhat more rapidly than output, but there appears no direct causal link between them -- the first model of Part II does not help much. The exports of some few of this group however are clearly growing much more rapidly than the main body. And, as was the case with total exports, a useful question now is why these countries seem to grow ahead of the pack.

3. The Role of Prices. The preceding empirical analysis was built on a model in which price changes were assumed to play no part. Evidently such a model is not generally applicable as prices do change, and the changes do affect the supply of exportables. Equation 3 of Part II shows that price changes affect the supply of exportables, both from the domestic output side and domestic absorption side. That equation calls for estimates of price elasticities of supply and of domestic demand for all exportables. Ideally one might proceed as follows: obtain estimates of E_s (elasticity of domestic supply) and n_d (elasticity

of domestic demand) for all individual exportables. From these compute a weighted average (weights would be the share of the commodity in total exports) for all exports. This weighted average would then be the E_s and the n_d for Equation 3.

Consider a simple illustration based on Diagram II and Equation 3, and applied say to manufactured items only. Suppose estimates put E_s and n_d at .3 and 1.2 respectively, and S_x and D_x at 2.5 and 1.5 Then an r_p of -2.0 per annum will reduce the rate of growth of the supply of exports by 5.1 percentage points. If, for example, Equation 7 was assumed to measure the net relationship (i.e. net of all other influences), and the above illustrative figures assumed applicable for the price effects, an r_{qm} of 7.3 would now produce an r_{xm} of about 10 per cent rather than 15. With the same assumed values, an increase in r_p of 2.0 per cent would raise r_{xm} by over 5 percentage points. With these, not obviously absurd values of the elasticities, it is evident that a price effect can be of considerable importance in affecting the supply of exportables.

There are of course major statistical difficulties. The estimation of the two elasticities is a huge hurdle that will not be undertaken in the present paper. Even if independent estimates of the elasticities were available, there are still the difficulties associated with taking any price effect out of

the coefficient of r_q in Equation 3. Ideally the coefficient of r_q measures the movement rightward of the supply curve relative to that of the domestic absorption curve net of any price effect. To do this is no simple matter.

Specific note should be taken of the fact that the r_p considered here has to do with changes in internal relative prices, not to general inflation or deflation. One must then hypothesize a change in the price of exportables relative to prices of non-exportables. This form of the assumption seems especially relevant with respect to the supply side of the export question. If for example policies are pursued to reduce domestic absorption of certain exportables then, (unless foreign demand is perfectly elastic) the price of these commodities must fall relative to the prices of other goods. It is the substitutability induced by this price change that n_d is meant to measure. Similarly E_s is meant to measure the supply response of these exportables when their price begins to change relative to prices of other goods.

Although estimates of the two elasticities are not available, it is possible to get a general notion of the order of magnitude of the price effect. For total exports the usual assumption is that the supply elasticity is quite small, perhaps even zero in the short run.[21/] Also in many developing countries

-- perhaps most--- n_d is probably quite low (e.g. less than .5) for many of the major export items. Domestic demand in the developing countries for minerals, raw materials, and most agricultural products will probably not change much in response to moderate changes in their relative prices. Finally, one frequently observes that a very large part of total output is exported, and hence the weights attached to the elasticities are also quite small. Under these assumptions the price effect on the supply side is something that may well be ignored. 22/

If one considers minor exports -- say total exports minus the two or three major export items --- or manufactures only the picture is surely quite different from that just given. The supply elasticity is greater than zero for many such products, and for some possibly in excess of unity. This assertion seems to follow from the nature of the product. Capacity is a vaguer concept here than in the case of minerals, agriculture, etc., and "overtime" is a more meaningful notion. Similarly "old" equipment is more frequently available, and can be brought into and taken out of use more readily in response to price changes. On the demand side an n_d in excess of unity is not unlikely. Most of these products are consumer goods, and a decline in their price (cet. par.) will enable many new people to enter the market. Similarly a rise in such prices will force many

people out of the market. Thus the value of n_d seems to depend on the size of the groups that enter and leave the market as relative prices change rather than on the assumption that persons already in the market buy more or less as the price falls or rises. Finally a smaller proportion of the output of these goods is exported than is true in the case of the major exports. In the case of manufactures many countries will export less than 10 percent of their output. With an assumed value of E_s equal to about .7 and n_d equal to unity and 90 per cent of output absorbed domestically the price effect will be a huge 16 r_p . Even if one halved this figure it is still large enough to be of major importance in understanding the behavior of r_x .

Thus another supply hurdle is introduced. A decrease in domestic absorption aimed at increasing the amount of output "released" for export can do just that. The reduced domestic absorption can then produce a fall in the domestic price that can virtually cancel the absorption effect. Or, a rise in the domestic price can increase the quantity available for export by virtue of increased output and reduced domestic absorption. Despite lack of estimates, there seems little doubt that this price effect on supply is of considerable relevance in understanding the behavior of r_{xm} , and is probably less important

for major export items.

4. The Role of the Exchange Rate. The preceding discussion suggested that if the developing countries could produce manufactures (or more generally something other than their traditional exports) at competitive costs they could export. The question of costs of exportables and their change over time has many implications for an import substitution approach to development [17] [13, Ch. III]. Attention here is limited to the role of the exchange rate. In Section 3 of Part II (Diagram III) a model was developed showing how depreciation could shift the foreign demand curve in such a manner that prices which, prior to the shift, were non-competitive became competitive with depreciation. A thoroughgoing empirical investigation of the magnitude of this effect is not possible in the present context. Fortunately Professor John Sheahan has studied one case (Colombia) in which the argument surrounding Diagram III seems more or less directly applicable [18]. The burden of Sheahan's argument is expressed in a series of regressions of Colombia's "minor" (other than coffee and crude oil) exports: (quarterly totals in U.S. dollars) X_1 on average of month end exchange rates divided by average cost of living for the same period (X_2) and world exports (X_3). The period covered is 1953

through half of 1966. There are several variations of this equation, but the simplest one is all that is needed here.

$$X_1 = -29.97 + 2.28\ X_2 + .23\ X_3$$
$$\qquad\qquad\quad (.71) \qquad (.02)$$
$$\bar{r}^2 = .78$$

This equation (as various other similar equations) yielded a strongly significant regression coefficient for the exchange rate variable. This equation uses quarterly data with no lags, suggesting that reactions are quick as well as strong. It is, in fact, the speed of the response that suggests that Diagram III is applicable.

One can interpret these results along the following lines. As prices and costs rise in Colombia the supply curves rise, and some "minor" exports become priced out of the world market. A depreciation pushes the foreign demand curve upward, and these commodities become exportable more or less immediately. The immediate response (and its magnitude) suggests that there was little in the way of foreign demand problems, i.e. the ff curves for these minor exports were quite elastic. A further question has to do with where the new exports come from --- increased output or decreased domestic absorption or both. Professor Sheahan notes that where the domestic price level was generally

stable this fact suggests that there was, prior to depreciation, underutilized capacity. In many instances increased utilization at prevailing prices did constitute the source of supply of the exports, but in other cases there are difficulties in the application of this argument. Price level constancy does not mean that all prices are constant. In particular evidence is needed on what happened to the price of the individual export items. Secondly, even with all prices stable, a shift leftward of the domestic demand curve would permit increased exports without increased output. As shown in the discussion surrounding Diagram III, depreciation acompanied by policies to reduce domestic absorption will produce a greater increment in exports than if there is no change in domestic absorption. Thirdly, the underutilization argument must explain why there was not full utilization before the depreciation. A conventional excess aggregate supply argument would work, but it is difficult to believe that such an argument is applicable in recent years in Colombia. Much of the underutilization is surely due to an input bottleneck, especially imported inputs. Where this latter is, in fact, a large part of the explanation of the underutilization, as rapid a response as that observed to depreciation seems almost impossible from the supply side. It seems likely then that in many cases the increased supply of exports did come from

reduced domestic absorption induced either by upward movements in specific prices or by a leftward shift in the domestic demand curve accompanying the depreciations.

Another aspect of the Sheahan study of relevance in the present context has to do with the specific items of exports. Although full evidence is not available, there is evidence that suggests that the effect on exports of the change in the exchange rate is in part -- perhaps large part -- due to new goods entering (or leaving) the export basket. Depreciation then seems to result in an inflow of new goods into exports to as great extent as simply increases in the quantity of exports of the same goods. This evidence supports the view that there is in fact a wide range of commodities that Colombia could export if she could produce them at competitive prices, and, having a reasonably accurate exchange rate, can make a noteworthy contribution to keeping domestic prices competitive for world markets. 23/

All these observations are consistent with interpreting the regression coefficient of the exchange rate variable in above equation (2.28) as essentially a supply parameter. It then measures the extent to which an increase of one (Colombian) peso in the price of foreign exchange results in an increase in the

supply of exportables. It does this by -- as stated in Part II -- correcting (in part) a distorted set of domestic prices relative to world prices. To put the same thing from the other side: the existence of an overvalued exchange rate seems to have acted to damp the supply of exportables by keeping the domestic supply price above the world market price.

The Colombian case is modest evidence, and one cannot gereralize these results to all -- or any -- other developing countries. A range of studies on this topic would doubtless turn evidence that suggested foreign demand proglems or lagged responses or other differences from those found by John Sheahan. In this one case, at any rate, it does seem appropriate to conclude that the exchange rate variation worked on the supply side in a manner not unlike that described by Diagram III.[24/]

5. The Role of Productivity Growth. The discussion surrounding Diagram IV suggested a variety of ways in which productivity growth entered the export picture. The empirical exploration of these ideas could be accomplished in a number of ways. The first and most obvious question to ask is simply what is the degree of association between the rate of growth of exports and of labor productivity.[25/] As noted in Part II a

regression equation of r_x on r_L (rate of growth of labor productivity) is not a very useful equation because of the ambiguity attached to the regression coefficient. It is not that r_L provides supplies of exports or changes foreign or domestic demand curves. It is rather that r_L can be used as both a measure (or indicator) of improved cost competitiveness and improved quality and, for reasons to be defended below, reduced domestic distortion. It was also argued earlier that the size of r_L can have an effect on the position of the foreign demand curve. All of these factors suggest that r_x and r_L should vary together, but do not lead to a simple regression model.

In light of all this, the simplest thing to do is to look at rank correlation coefficients. The following such coefficients were obtained from data for the 1950's.

Developing Countries

a. .48 Between r_x and r_L for $n = 22$.

b. .78 Between r_{xm} and r_{Lm} for $n = 17$.

Advanced Countries

a. .90 Between r_x and r_L for $n = 18$.

b. .41 Between r_{xm} and r_{Lm} for $n = 17$.

Although there are a number of difficulties in the interpretation of rank correlation coefficients, there seems little

doubt that these coefficients are significantly different from zero. By the usual tests for rank correlations all coefficients are significant at the .05 level and the two higher ones at the .01 level.

These results indicate that there is evidence to support the view of a positive degree of association between growth of exports and growth of labor productivity. In the case of the developing countries association seems considerably stronger for manufactures than for the total of exports. This latter again conforms with expectations as to the greater possibility of the developing countries increasing manufacturing exports through conventional competitive means than seems to be the case for traditional export items. It is, for example, evident that increasing labor productivity will result in the supply curve of Diagram III falling, and this will have a similar effect on exports as a depreciation that pushes up the foreign demand curve. As emphasized earlier, however, the growth of labor productivity measure is meant to indicate more than merely cost reductions, but is an indicator of a variety of other factors that seem to act on export growth.

This analysis and the correlation results lead into the argument outlined in Part I as to the role of productivity growth

in growth of output and clues as to the sources of the productivity growth. A more direct attack on this issue is now appropriate.

Consider the series of regressions in Table 4.

Regression 1 and 1' show the relationship between the rate of growth of GDP (r_y) and the investment rate. The presumption is that if capital formation plays a strategic role in growth of output, countries with higher investment rates should, in general, grow more rapidly than countries with lower rates.[26] Equations 1 and 1' show that there is some link between these two variables. The equations explain about 25 per cent of the variance for the A countries and 14 per cent for the D countries. The relative sizes of the regression coefficient suggest that an increase in the investment rate will have a greater effect on r_y in A than in D.[27] In neither case, however, have we a very satisfactory relationship, i.e. one which would permit the statement that physical capital formation is the single strategic growth supporting factor.[28]

Equations 2 and 2' are regressions of r_y on r_L, and for both groups of countries a very strong relationship emerges. These equations may be looked upon as an indicator used in place of ratios of total productivity growth to GDP growth. Such data are available for some few countries [37], but in general

TABLE 4

Productivity Growth

Developing	Advanced
1. $r_y = 3.07 + \underset{(.08)}{.15}\ I/GDP$	1.' $r_y = -2.46 + \underset{(.10)}{.31}\ I/GDP$
$\bar{r}^2 = .10$	$\bar{r}^2 = .28$
2. $r_y = 3.38 + \underset{(.10)}{.62}\ r_L$	2.' $r_y = 1.27 + \underset{(.13)}{.90}\ r_L$
$\bar{r}^2 = .62$	$\bar{r}^2 = .70$
3. $r_L = 1.78 + \underset{(.70)}{.08}\ I/GDP$	3.' $r_L = 1.03 + \underset{(.09)}{.11}\ I/GDP$
$\bar{r}^2$ = negligible	$\bar{r}^2$ = negligible
n = 23 in all equations	n = 20 in all equations

not for enough to make generalization very meaningful. A ratio of r_L over r_y provides some clue of the role of productivity growth in growth of GDP, but Equations 2 and 2' seem a bit more useful. There is considerable evidence that r_L and the productivity of other inputs -- including capital -- move together, and no evidence that labor productivity rises <u>because</u> capital productivity falls, i.e. no evidence that r_L rises because of a substitution of other inputs for labor.[29/] If this general notion is accepted, then r_L may be taken as an index of the rate of growth of "total" productivity. Equation 2 and 2' would measure the extent to which changes in this index affected changes in output. The high r^2 could be due to one of two things: either total productivity growth accounts for a large share of r_y or that factors that make for a high index of productivity growth also make for a high r_y. At any rate the data do indicate that r_L is a much more important explanatory variable of variations in r_y than are investment output ratios.

A final step may be taken which suggests something about the sources of productivity growth. A considerable body of material places heavy emphasis on gross investment as the "carrier" of productivity growth. Thus new technical improvements are assumed to be "embodied" in equipment, and thereby to raise the productivity of the labor that uses this new capital as well as

the productivity of the capital itself. If this hypothesis were generally valid, then a positive relationship between r_L and the rate of growth of capital would be expected. Equations 3 and 3' in Table 4 use the investment GDP ratio in place of the growth of capital stock. Neither equation indicates a convincing ralationship between these two variables, i.e. the equations are not consistent with the hypothesis that capital formation is an important carrier of productivity growth.[30/]

The picture then shapes up in this way: A simple regression between r_L and r_y explained over 60 per cent of the variance of the latter in both D and A countries. This is consistent with the view productivity growth is an "important" explanatory variable of r_y -- for whatever reason. There appears virtually no relationship between r_L and capital formation, and this fact supports the view that capital formation is not "important" because it is a carrier of productivity growth. The relationship between r_y and I/GDP was such that it supported the view that capital formation is not "important" in itself, i.e. simply because it results in more capital.[31/] Finally, a significant rank correlation was found between r_x and r_L.

In terms of the second argument stated in Part II, these results must be taken as -- at least -- not inconsistent with the view that countries that can grow, can export, and that the

variable explaining this direction of the link is productivity growth. Two dangers may be explicitly noted. One, the data can be easily questioned at all points. The fact that a similar picture emerges for both the A and the D countries is of course encouraging, but hardly conclusive. Secondly, the argument hardly means that capital formation is irrelevant. Surely it is quite pertinent, but its role is not as simple as is implied in many growth and import substitution models. Especially must one direct more attention to the question of the origin of productivity growth. The discussion and evidence presented here (and elsewhere) suggest a clue, namely, that distortions of all varieties in an economy do impede productivity growth. An import substitution strategy of development built upon policies that do subject the economy to distortions will thereby damp productivity growth, and in dampening productivity growth throw difficulties in the paths of increasing exports and this fact, in turn, leads to further distortions. These latter considerations obviously require further inquiry -- empirical and theoretical -- not possible here. They will be referred to again in the final section after a look at the demand side and the role of productivity growth on that side. Meanwhile, the role of productivity growth in exports described in this section will be accepted as a working hypothesis.

B. The Demand Side

The preceding arguments have concentrated attention -- to the extent possible -- on the supply side of the export question. Consider now issues that are more nearly on the demand side.

In Part II two demand equations were obtained. In one the rate of growth of a country's imports was made a function of income growth and a price variable and in the other the rate of growth of country i's exports were related to the growth of world imports and a price variable. Tables 5 and 6 present the results of efforts to give some empirical content to these equations for a series of countries and groups of countries.

1. The Income-Import Relationships. Table 5 contains a number of regressions relating rate of growth of imports to the income and price variables. The results do not exactly speak for themselves, but several points can be made which do cast some light on the central issues of this paper.

The first two equations are perhaps the clearest. The income coefficients applied to the advanced and developing countries are about the same, and both quite significant.[32/] The price elasticity of imports from advanced countries is higher than for

developing countries, but still that for the latter group of countries is well in excess of unity. On the basis of these calculations one would conclude that there was little or no difference in income and price effects on imports into advanced countries from advanced and developing countries. A major difference does appear in the values of the intercepts. The negative value for the developing countries indicates that, with no change in the price level of any country, income in the advanced countries must grow at over 2.6 per cent before their imports from the D countries grows at all. At this rate (2.6) of income growth imports from A countries would grow at a rate of 4.5 per cent.

This picture is evident for the equations of sub-groups of countries and the individual countries shown in the table, 33/ although not as clearcut in some instances. Africa for example yields very high income and price elasticities, but a very strongly negative intercept. Europe, on the other hand, yields an insignificant income coefficient, a lower price elasticity than does Africa, but has a positive intercept of about 4.7 per cent.

Now consider the equations for the Middle East and Japan. Both have income coefficients with the wrong sign, and the explanatory value of the equations (the $\bar{r}^2$) lower than for the other countries. The intercepts on the other hand are far and away the

TABLE 5

Income and Import Growth

Country or group	Intercept	Income Coefficient	Price Coefficient	r
Advanced	1.87	.90	-1.69	.75
		(.39)	(.69)	
Developing	-2.28	.87	-1.33	.82
		(.27)	(.48)	
Latin America	- .77	1.03	- .29	.40
		(.70)	(1.24)	
Africa	-9.28	2.52	-2.34	.78
		(.74)	(1.32)	
Asia	.21	.26	-1.29	.40
		(.56)	(1.00)	
Middle East	14.17	-1.84	-3.88	.36
		(1.52)	(2.70)	
Brazil	-3.32	.65	-1.15	.56
		(.46)	(.82)	
USA and Canada	.45	1.06	- .25	.45
		(.55)	(.98)	
Europe	4.69	.27	-2.02	.51
		(.61)	(1.08)	
Oceania	-4.47	1.41	- .85	.49
		(.83)	(1.47)	
Japan	21.02	-1.37	.43	.32
		(1.23)	(2.18)	

Note: The equation is $r_{mi} = a + b\, r_{yj} + c\, r_p$. The country listed in column 1 is the i^{th} country or group. The r_{mi} is the rate of growth of imports of country j from country i. The independent variables are the rate of growth of income in constant prices of country j (all j's are advanced) and the rate of growth of the price of imports over the wholesale price index. The expected sign of the latter is negative and of the former is positive. The interval is 1952/53 to 1962/63.

largest of the table. Imports from the Middle East are of course dominated by oil, and the organization of this market is such that one is not surprised that there appears perverse income effects. Much more interesting and pertinent is (again) the case of Japan. The equation suggests a competitive advantage not reflected in prices and not dependent on world income growth. The high intercept value suggests rather that imports of Japanese products by the other advanced countries was rising very rapidly due to a wide variety of factors. In particular one may say that Japanese commodities were increasingly demanded at the expense of domestic output and imports from other sources. Whatever the origin of this competitive strength, it was certainly lacking in the developing countries. An attempt is made below to say something more on the explanation.

2. The Import Demand Equation. Before doing that however consider Table 6, where the rate of growth of total imports is used as an explanatory variable in place of the rate of growth of income. This table tells a story similar to that told by Table 5, but the story is not quite as clearly told. The import coefficient for the D countries is decidedly lower than that for the A countries, and one may, from this, conclude that the former countries were handicapped in this way. In general

TABLE 6

Import Growth

Country or group	Intercept	Import Coefficient	Price Coefficient	r
Advanced	.32	1.11	.15	.95
		(.12)	(.39)	
Developing	-.99	.42	-1.06	.75
		(.21)	(.69)	
Latin America	2.58	.07	- .96	.23
		(.50)	(1.65)	
Africa	-7.47	1.68	- .49	.78
		(.50)	(1.66)	
Asia	1.79	-.25	-2.08	.41
		(.38)	(1.25)	
Middle East	10.01	-.57	-3.71	.26
		(1.06)	(3.49)	
Brazil	-3.06	.48	- .57	.57
		(.30)	(1.00)	
USA and Canada	1.02	.76	.63	.52
		(.38)	(1.21)	
Europe	.71	1.16	.43	.78
		(.30)	(.98)	
Oceania	2.04	-.35	-2.80	.36
		(.60)	(1.97)	
Japan	16.67	-.13	1.25	.19
		(.86)	(2.83)	

Note: The equation is $r_{mi} = a + b\, r_{mj} + c\, r_{p}$. The country or group of countries listed in column 1 is Country i. The r_{mi} is the rate of growth of imports of country j from country i. The independent variables and rate of growth of total imports of 19 j (advanced) importing countries and rates of growth of their price level relative to the price level of world exports. The expected sign of the latter is negative and of the former is positive. The period is 1952/53 to 1962/63.

however, another difference between the two tables seems more interesting.

With the exception of the advanced group, Europe, Japan and the Middle East the import coefficient in Table 6 is less than the income coefficient of Table 5. A priori this is unexpected for rather evident reasons. What the shift to imports did however was to raise the value of the intercepts. Except for the same four countries all intercepts of Table 6 are greater than those in Table 5. What including imports in the equations does then is to raise the threshold at which imports from developing countries are brought into the trade network. Accompanying this higher threshold is a lower (in general) import elasticity, generally a lower price elasticity, and little change in the $\bar{r}^2$. 34/

C. A Search for an Explanation

There is much to explain in all this, and the preceding discussion suggests as many questions as it does answers. One further question especially stands out: why do the several coefficients of the equations of Tables 5 and 6 differ among themselves? One approach to this question would be to calculate equations of the form of those in Tables 5 and 6 for a long list of developing countries, and make an attempt to explain the regression coefficients. This approach

has much to recommend it, but called for a data collection exercise that was not possible at this time. In its stead calculations were made for the following equation based on time series (1951 - 1966) data.

$$\ln X_i = a + b \ln M_w + c \ln \frac{P_i}{P_w}$$

In this expression X refers to exports (in U.S. dollars) from (developing) country i, M_w is world imports, and the P's are the index of export prices of country i and the world. The expected sign of b is positive and of c is negative. Equations for 18 countries were possible, and are presented in Table 7.

The use of time series is less satisfactory than a cross section analysis, and one of the difficulties of the time series is reflected in the price coefficient column. These coefficients are, with two exceptions, of the wrong sign. Since signs were generally good on the cross section equations, the best guess on the sign problem in Table 7 is the existence of a strong trend component in both export and price series. This is not an explanation without difficulties however, and the problem here remains. The very high $\bar{r}^2$ in almost all instances is surely also due to a trend factor. Finally note should be taken of the worrisome Durbin-Watson's here and there. Despite these difficulties the

TABLE 7

Time Series Import Equations

Country	Intercept	Import Coefficient	Price Coefficient	$\bar{r}^2$	DW
Argentina	- 1.04	.69	.29	.72	1.83
		(.16)	(.45)		
Brazil	3.91	.29	.65	.65	2.44
		(.07)	(.12)		
Ceylon	2.96	.25	.86	.76	1.92
		(.04)	(.15)		
Chile	- .97	.60	.89	.93	2.64
		(.05)	(.14)		
Taiwan	-16.59	1.87	.41	.89	.85
		(.21)	(.52)		
Colombia	3.20	.26	.81	.59	1.48
		(.12)	(.19)		
Costa Rica	- 2.04	.56	.07	.64	1.54
		(.15)	(.27)		
Ecuador	- 6.85	1.01	.82	.83	2.26
		(.19)	(.34)		
Guatemala	- 3.99	.75	.33	.74	1.41
		(.14)	(.17)		
Honduras	- 5.41	.83	.26	.72	1.39
		(.14)	(.44)		
India	1.76	.47	- .34	.89	1.70
		(.05)	(.18)		
Nicaragua	-11.20	1.33	.77	.76	1.97
		(.23)	(.39)		
Pakistan	3.04	.25	.70	.34	.80
		(.15)	(.32)		
Panama	- 4.48	.69	1.03	.72	2.07
		(.18)	(.29)		
Philippines	- 4.12	.89	.92	.95	2.34
		(.05)	(.21)		
Thailand	- 5.23	.96	1.09	.93	1.39
		(.07)	(.53)		
Turkey	- 2.82	.75	- .31	.47	1.71
		(.22)	(.14)		
Venezuela	- .34	.70	1.64	.93	1.27
		(.05)	(.34)		

Note: These values are computed from the equation $\ln X_i = a + b \ln M_w + c \ln \frac{P_i}{P_w}$ as described in the text. The column headings refer to country i and the parameters and characteristics of this equation.

equations seem useful for the present purpose, namely a consideration of the variation in the regression coefficients of world imports. While there is doubt that the coefficients meet the usual statistical requirements, there is less doubt that their relative magnitudes are misleading. So then why the variation in the values of the third column of Table 7.

Recall the earlier discussion as to the use of the rate of growth of labor productivity as an index of a variety of other factors -- quality of product, regularity of supply, standardization of product, profitability of the activity. Recall too the argument as to why it seemed meaningful to assume that the labor productivity index served reasonably well as a proxy for these other factors. All this suggests that the b's of the preceding equation may be related to the rate of growth of labor productivity. Again here it seems appropriate to use a rank correlation, and this coefficient turns out to be .64.[35/] It seems safe therefore to conclude that there is a significant positive relationship between the import regression coefficients of Table 7 and the rate of growth of labor productivity. The rationale of this relationship is that spelled out earlier as to the origin of labor productivity growth and its capacity to serve as a proxy

index for a number of other factors expected to act favorably on a country's capacity to export -- from both the demand and supply side.

The last part seeks to summarize, and to focus a bit on some policy implications suggested by the results and arguments presented here.

V Conclusions

The principal concern of this paper has been with the determinants of the rate of growth of exports and the rate of the latter in the rate of growth of output. This very large issue was narrowed to the two sets of specific arguments described in Part I. These were essentially the following: Are exports important because they permit a high rate of capital formation or because their existence indicates the presence of other attributes of an economy which are themselves growth producing. The second set of arguments had to do with the extent to which demand in the rich importing countries is the barrier to developing countries increasing r_x or whether it is supply difficulties in the D countries themselves that seem to be the higher hurdle. Part II developed models that suggested ways of attacking these two problems, and Part IV offered a variety of empirical exercises which were aimed at suggesting the validity of the various hypotheses derived from the models. After the model building exercises and the empirical results what can now be said?

Perhaps the safest thing that can be said is that the evidence does not support the twin assumptions that (1) exports are important because they permit capital formation which in turn produces growth, and (2) that demand obstacles in the advanced countries constitute a hurdle well above that of supply limitations. In this respect one might say that the evidence examined in this paper is not consistent with two widely held

assumptions which are also two important foundation blocks supporting the choice of an import substitution strategy of development.

Can one say something a bit more positive? The evidence that the rate of growth of labor productivity is important as an index of "something"(or an index of a group of somethings) that act on both r_x and r_L seems convincing. All of the relationships support this hypothesis. Similarly evidence presented here and elsewhere lend no support to the view that r_L is "carried" by (or embodied in) capital formation. Thus capital formation is not important as a carrier of productivity nor does a cross section regression of r_g on investment income ratios yield a significant relationship. Finally two significant relationships were found between the rate of growth of labor productivity and that of exports. From all this evidence plus the argument of the model (especially that described by Diagram IV), it would appear legitimate to accept as a working hypothesis (at least) the notion summarized in the phrase the country that can grow, can export.

These results suggest the further question of course as to the origins of productivity growth, if in fact productivity growth embodied in physical capital is not important. Evidence and argument presented in [2] and [3] suggests that r_L is negatively related to the "degree" of misallocation of resources. In this case an import substitution policy that results in severe and continuing distortion will also result in holding down productivity growth . Evidently this hypothesis is of great importance,

but also needs a great deal more study. Also, even if valid, it does not tell us much in a positive way about the sources of productivity growth, and this we surely need to know.

On the question of which hurdle - domestic supply or foreign demand - is the prior hurdle, the evidence is considerably less clear. The models and regression equations indicated that domestic absorption may well be a problem, as were costs of production - especially for manufactured products. Similarly the evidence suggests that measures to increase exports - e.g. price reduction - can set off domestic repercussions that can prevent an exploitation of the measure. Especially does it seem clear that price changes of whatever origin (depreciation, etc.) designed to increase exports unaccompanied by measures to reduce domestic absorption may well be ineffective (or of reduced effectiveness) because of internal supply problems. It does seem that there is evidence to support the important notion that the failure of price adjustments to affect the rate of growth of exports often is due to the failure of domestic absorption to be adjusted accordingly.

On the more commonly discussed problem of the foreign demand elasticity, there was less evidence. Again however no evidence that suggested clearly that the price elasticity of demand is the problem. This result seems due more to the fact that price changes alter the composition of exports - especially non-traditional exports -- rather than to the buying of more of

the same items in the basket of exportables. Finally it is important to remember that productivity growth enters on the demand side as well as on the supply.

One can admit that these results and these approaches to the problem are heuristic rather than definitive, and still suggest that they are of great relevance in understanding the behavior of exports, the role of the latter in growth of output, and of the effectiveness of the import substitution strategy.

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Footnotes

1. This argument is to be distinguished from that in which exports are a "leading sector" that rush ahead of the other sectors, and, via a pattern of linkages, pull other sectors along. On this role of exports see Kindleberger [10, Ch. 16].

2. A recent article by Griliches and Jorgenson [9] disputes these findings for the United States, but their evidence, though relevant and important, hardly counters that accumulated by the large number of other investigators.

3. The empirical validity of these two assumptions will be investigated in later sections. Evidently the second assumption is contrary to that usually made with respect to "embodied" technical change as a major source of increased productivity of capital and labor. The matter is of course empirical and will be discussed later.

4. The most careful form of this argument is to be found in Nurkse [15].

5. See Alexander Cairncross [6] and GATT report [8] for a full-scale defense of this argument.

6. In Equation 1, $b = \frac{Q - \frac{r_A}{r_q} A}{X}$ for an individual country. Since $Q - A = X$, b is unity when $r_A = r_q$. The same will hold on the average for a group of countries.

7. It is recalled that devaluation, when considered in the currency being devalued, results in the foreign demand curve shifting rightward (or rising), i.e. at a given internal price the quantity demanded after devaluation will exceed the predevaluation quantity (unless foreign demand is completely inelastic).

8. If F_1 and F_w are factor payments in this activity in the country represented by the diagram and in the "world" respectively, and P_1 and P_w are the corresponding indices of productivity, the statement in the text is that $F_1/F_w > P_1/P_w$.

9. See Lewis [11] and Bruton [1].

10. Whether devaluation is the "correct" policy is another matter of course. In general one might say that where all or most of the economic

activities in the country were described by a situation similar to that shown in Diagram III, then devaluation is indicated. Where, on the other hand, this picture seems to apply only to a few activities, then one might conclude that such activities represented a misallocation -- unless a more dynamic argument justified their existence. See however below for a slight modification of this point.

11. The basis of the classification of the countries into "developing" and "advanced" is primarily per capita income, the dividing point being about $500. There are, however, some notable exceptions. Argentina's per capita income is over $600, but her other economic characteristics seem more similar to those of the lower income countries than to those of the higher ones. Switching one or two countries will not affect the burden of the argument in most instances in any event. In most of the analysis communist countries are excluded as are countries that rely more or less heavily on oil exports from either group. The rationale for their exclusion is simply that general evidence suggests that factors affecting their export performance are enough different from those affecting other countries that it is appropriate to exclude them.

12. Without these four countries, the A countries part of Table 3 would be as follows (for the three periods in succession) : Mean of r_x: 5.83, 8.44, 8.81. Variance: 4.49, 7.66, 6.52. Relative variation: .36, .32, .29.

13. In each of the four countries (West Germany, Israel, Italy, and Japan) the ratio of the individual country's exports to world exports rose markedly from 1950 to 1965. In all countries except Italy, this ratio more than doubled, and in Italy it increased by more than 60 per cent. In this sense these countries were usurping the export markets of other countries.

14. "World exports" grew at rates of about 6.1, 5.5, and 7.4 over the three periods. These figures are quite close to the average r_x shown in footnote 12 above.

15. "Manufactured exports" are categories 5 through 8 in the SITC system.

16. Various periods were tried and results were all quite similar as long as the period was at least 10 years in length. An effort was made to obtain regressions for two periods -- the 1950's and the first half of the 1960's -- but calculations for the latter period were usually meaningless, and including one year or leaving it out altered the results markedly.

17. Almost all indicators of "world output" and world exports show the latter to be growing more rapidly than the former in the post 1950 period.

18. Note that this does not mean that the rate of growth of domestic absorption of manufactures is less (or more) than it is for total output. It means simply that the growth of domestic absorption of manufactures was not so high that the supply of exports of manufactures could not grow at higher rate relative to output than was the case for total exports. It means also of course that the ratio of manufacturing exports to manufactures output was rising rapidly, while the ratio of total exports to GDP was declining.

19. On the assumption that manufacture exports are primarily consumer durables, a possible measure of domestic absorption (as noted in Part II) would be saving rates. Regressions between saving rates and exports however did not yield meaningful results, but saving will enter the argument again later.

20. Denmark and Finland ranked just below West Germany, the lowest of the Big Four. The average annual rate of growth of "world manufactured exports" between 1953-63 was 9.1 per cent. The countries listed above had the following rates: Israel (25.0), Japan (18.0), Italy (17.1), West Germany (15.0), Denmark (14.8), Finland (14.1).

21. This is by no means universally the case. It applies chiefly to agricultural commodities, but the output of minerals can often easily be stepped up (or down) virtually overnight in response to price change.

22. If E_s were zero and n_d were .4 and 90 percent of output were exported, the price effect is $.04\, r_p$.

23. What exactly an "accurate" exchange rate is, is a major question of course. The point here is simply that the movement of the Colombian exchange rate in a direction generally agreed as the right direction did increase, in a significant fashion, the number of items which were exported.

24. Pakistan provides another case study that, in broad outlines, fits the argument of Diagram III. See /47/. In this case the post 1959 devaluation applied to minor exports (through the Export Bonus Scheme) was accompanied by a large number of increases in indirect taxes, and produced major increases in exports.

25. Labor productivity is used here because no data are available on the input of capital services with which one might measure "total" productivity.

26. If depreciation rates and capital output ratios were the same for all countries over the given time span (which they are not), the cross country regression of r_y on I/GDP would be equivalent to a regression of r_y on r_k.

27. The negative intercept in 1' is consistent with an underutilization explanation. As the investment rate in A falls quite low, output begins to fall because of unemployment and unused capacity.

28. Regressions for other time periods and larger groups of countries support this view. In all equations that for A groups had larger regression coefficients and larger $\bar{r}^2$ than the D groups. In no case did an equation explain more than one-third of the variance of r_y, and in most cases less.

29. This is important evidence and has numerous implications for a study of the sources of productivity growth. See [17], [27], [47].

30. For further empirical support of this position see [37], and for a discussion of the necessarily limited role that "embodied technical change" can play see [77].

31. Incomplete results for the manufacturing sectors alone of these three relationships show a similar picture.

32. These coefficients mean that an increase of one percentage point in real income in the advanced countries produces (on the average) .90 percentage point increase in imports from advanced countries and .87 percentage points increase in imports from the developing countries.

33. Not all equations calculated are shown. No equation was found to be inconsistent with the points made here, although some were meaningless, i.e. no regression coefficient was significantly different from zero.

34. The equation for the A countries is a bit misleading as imports from advanced countries constitute such a high proportion of total imports of advanced countries. This fact probably accounts for the positive price coefficient also.

35. A value of .56 is significant at the .01 per cent level for 18 observations.