Productivity Growth in Latin America*

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MOST OBSERVERS ARE now convinced that long-run increases in national product cannot be fully explained in terms of increasing inputs of capital and labor as these factors are conventionally measured. Although there are severe difficulties of measurement, the accumulated evidence, covering numerous countries and a variety of time spans, indicates clearly that more capital and more labor of unchanging quality can rarely explain more than one-half the estimated growth of Gross National (or Domestic) Product. The obvious consequence of this evidence is a search for other sources of growth, for the "residual" component of growth theory [5] [21]. The purpose of the present paper is to examine the growth of Gross Domestic Product in five Latin American countries (Argentina, Brazil, Chile, Colombia, and Mexico) in the period 1940–1964 in terms of hypotheses about possible explanations of the "residual" source of growth in these countries. The development and appraisal of the various hypotheses considered is based

on a comparison of the rate of growth of productivity (the residual) among the several Latin American countries and a comparison between these countries and a group of more economically advanced countries.

Part I outlines the approach employed and describes the data. Part II presents the principal results, Part III offers an interpretation of these results, and Part IV is a short summing-up.

I

THE APPROACH

The arguments are built around an aggregate production function, and the residual is isolated in the manner originated by Robert Solow [13]. That this approach is both useful and treacherous is now well established, and little is gained from continued debate as to its conceptual and theoretical basis. The contention here is that its us.. enables us to learn a great deal about Latin American growth, and, in the present context, this is defense enough. Richard Nelson [12] has recently provided an admirable review of all aspect of the model, and here we need only define symbols and note points of special relevance to later discussion.

The Cobb-Douglas production function may be written as

$$P_t = A_t K_t^a L_t^b \qquad (1)$$

where P is "potential" (i.e., full employment) GDP in year t; K and L are quantities of capital and labor available in the same period, A an index of productivity, and a and b are elasticities of output with respect to capital and labor respectively. Assume further that the sum of a and b is unity, and that their respective values are not affected by changes in A. Take logarithms and differentiate with respect to time and get

$$r_P = r_A + a r_K + b r_L \qquad (2)$$

and

$$r_A = r_P - (a r_K + b r_L) \qquad (3)$$

where r_P, r_A, etc., refer to annual proportionate rates of growth of GDP, productivity, etc. The task is to explain r_A, the rate of growth of productivity of capital and labor.[1] Given the production function the explanation is necessarily in terms of improved quality of the two inputs

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[1] The derivation given by (3) shows why the term "residual" is suggested for r_A. It refers to that part of r_P not accounted for by increased capital and labor, and is obtained by simple subtraction. Since a positive r_A results in capital and labor becoming more productive, it is convenient to refer to it as the rate of growth of (total) productivity.

and improvements in their utilization. Nelson, following Solow, Denison [14] [4], and others, seeks to break down r_A into components of improved quality of labor and technical change embodied in newly created capital. He then derives an expanded version of (2) in which these sources of growth are explicitly included, and leaves a residual explicable chiefly in terms of improved allocation.[2] For the present investigation only one modification of this approach is necessary.

The use of potential output washes out the effect on r_A of changes in the extent of underutilization of existing capacity. This procedure is justified on the grounds that underutilization is largely due to problems of aggregate demand, and as such has nothing to do with the productivity of the inputs. Estimates of the contributions to productivity growth of embodied technology, improved education, and better allocation must then be made directly. For the Latin American countries, however, the evidence (cited below) is convincing that the underutilization is not due to inadequate demand. It is therefore more fruitful to assume that the ability to exploit capacity is an important factor in potential output, and that changing utilization is a key variable explaining productivity growth in the Latin American countries (hereafter LAC). Indeed the principal empirical result of the investigation is that virtually all of the variance of r_A for LAC can be explained by variation in the degree of utilization. Given this result we can then deduce something about the rate of growth of "pure" (i.e., that not explained by changing utilization) productivity: namely, that it has been virtually zero over the time period covered. The task of Parts II and III is to derive and defend this conclusion, and to offer an explanation for the failure of r_A for LAC to grow independently of changes in the degree of utilization.

THE DATA

The data for both the advanced group (AG) of countries and for LAC are open to many questions. I have not constructed any new series, but have pieced together data from a variety of sources and have modified and adjusted a number of existing series to arrive at estimates of the variables called for in equation (2). Despite the questionableness of many

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[2] Let λ_K refer to the rate of growth of capital productivity embodied in machines, λ_L to the rate of growth of the quality of labor (both constant over time), and $\bar{a}$ as the average age of capital. Then the Nelson expansion of (2) is

$$r_P = r'_A + a\lambda_K + b\lambda_L + a\lambda_K \Delta\alpha + b r_L + a r_K$$

where r'_A is increased productivity not embodied in capital or due to improved quality of the labor force. Nelson [12] derives this equation rigorously, but once derived it is intuitively obvious.

of the individual observations, the series in general appear consistent with other available evidence, and, in general, their conceptual bases are acceptable. We work exclusively with rates of growth, rather than absolute numbers or ratios of absolute numbers, and in general rates of change are more meaningful than the absolutes from which they are drawn. In view of all this we have concluded that the data are worthy of analysis, and should not be relegated merely to filling yearbooks.

The findings which we will seek to analyze are presented in Tables

Table I—Growth Rates of Inputs, Outputs and Productivity in Latin American Countries

Country and period	r_P	r_K	r_L	r_A	r_A/r_P
Argentina					
1940–45	2.9	0	2.1	1.6	0.55
1946–51	3.4	3.9	2.4	0.4	0.12
1955–59	1.7	3.4	1.5	−0.6	−0.35
1960–64	1.2	4.6	0	−0.6	−0.50
Brazil					
1940–45	3.2	2.2	1.7	1.3	0.41
1947–53	5.6	5.9	2.4	1.6	0.29
1955–59	5.6	5.2	2.8	1.7	0.30
1960–63	5.0	5.1	2.8	1.2	0.24
Chile					
1940–45	2.7	0.9	1.8	1.4	0.52
1946–53	3.9	3.0	2.1	1.4	0.36
1955–59	3.0	3.4	2.5	0.1	0.03
1960–64	4.0	4.8	1.4	0.9	0.23
Colombia					
1940–45	2.8	1.5	1.8	1.1	0.39
1946–53	5.2	4.0	2.1	2.3	0.44
1955–59	4.0	4.9	2.6	0.4	0.10
1960–64	4.5	4.3	2.0	1.5	0.33
Mexico					
1940–45	9.0	1.7	2.8	6.7	0.74
1946–53	5.0	4.9	2.6	1.2	0.24
1955–59	5.7	4.2	3.1	2.0	0.35
1960–64	6.2	4.2	2.5	2.8	0.45

Source: Col. 1 (r_P)—computed from the published data of the national accounts of the various countries. Rates are for Gross Domestic Product in 1950 prices. Data after about 1950 are more satisfactory than those for the forties, and in some cases pre-1950 are quite rough. Also data for GDP 1963 and 1964 are preliminary and subject to revision. A description of the national accounts data for Latin American countries is given in [17].
Col. 2 (r_K)—in all cases the capital stock figures on which the r_K's are based were obtained from bench mark capital stock estimates and accumulations from gross investment and depreciation estimates provided by the national accounts. A general survey of capital stock estimates in Latin America with additional references to specific country studies is Alexander Ganz [7].
Col. 3 (r_L)—computed from estimates of employment made by ECLA and presented in [16, p. 3]. Data for certain years were obtained by logarithmic interpolation.

Table 2—Growth Rates of Inputs, Output and Productivity in Advanced Countries

Country and period	r_P	r_K	r_L	r_A	r_A/r_P
Belgium					
1949–54	3.6	2.4	0.6	2.5	0.69
1954–59	2.3	2.7	−0.1	1.6	0.70
Canada					
1949–59	4.3	7.1	2.1	0.7	0.16
Netherlands					
1949–54	4.9	4.0	1.4	2.7	0.55
1954–59	4.1	5.5	1.1	1.6	0.39
Norway					
1949–59	3.7	4.4	0.2	2.3	0.62
Sweden					
1949–59	3.4	2.0	0.5	2.5	0.73
United Kingdom					
1949–59	2.5	3.1	0.6	1.2	0.48
France					
1949–54	4.8	2.9	0.1	3.8	0.79
1954–59	4.1	3.9	0.2	2.8	0.68
Italy					
1949–54	6.4	3.0	1.5	4.4	0.69
1954–59	5.7	3.4	0.8	4.1	0.72
West Germany					
1950–54	8.3	4.8	1.8	5.6	0.67
1954–59	6.6	6.9	1.4	3.5	0.53
Israel					
1952–58	9.8	11.8	3.3	3.9	0.40
Japan					
1950–58	7.9	10.6	2.4	3.0	0.38
United States					
1947–54	4.4	4.0	0.7	2.9	0.66
1954–60	3.5	3.1	0.8	2.1	0.60

Source: Data for the United States from Nelson [12], for the European countries [15], and for Israel and Japan from Aukrust [1]. The Aukrust paper contains a summary report of productivity growth in all the countries included in this table except the United States.

1 and 2. The logic of the time periods chosen for the Latin American group is indicated as we proceed. For the advanced countries the dates selected were those for which diversity in the value of r_A was most marked.

The values for a and b used in estimating r_A are the relative shares of output accruing to the two inputs. In the case of the advanced countries capital share is given as 0.30 in all cases except for the United States

where 0.25 is used. For the five Latin American countries capital's share was taken to be the following:

Argentina	0.40
Brazil	0.45
Chile	0.50
Colombia	0.45
Mexico	0.50

While these percentages for LAC are based on incomplete data, they are consistent with a substantial body of evidence, and can be taken as a close approximation to what complete data would indicate. In the manufacturing sector alone capital's share will exceed 60 per cent in almost all the Latin American countries.

II

The simplest point to make about the data of Tables 1 and 2 has to do with the mean values of r_A and r_A/r_P of the two groups of countries. For the Latin American countries, r_A averages 1.4 and that of r_A/r_P is 0.26. For the advanced group of countries the averages are 2.8 and 0.58, respectively. If the extreme cases of Mexico for 1940–45 and Canada were excluded, the differences between the two groups would be even more marked.

This result is contrary to the frequently encountered notion that less developed countries with a somewhat primitive technological base may reap large windfalls by exploiting recently developed knowledge. If this were a valid hypothesis, one would expect that during years when modernization of the economies was actively promoted and the rate of capital formation comparatively high, LAC should have experienced an r_A considerably higher than that achieved by those countries already technologically advanced. That this did not occur requires some explanation.

THE ROLE OF CAPITAL

If productivity growth played a smaller role in the growth of output in LAC than in AG, then obviously inputs must have played a larger role. That growth of capital should be more important in LAC is suggested by the estimates of relative shares given above. But then why should capital's share be greater in LAC? The answer seems to be partly a matter of technology and partly of market structure. Available data suggest that the variance of capital output ratios (aggregate and sectoral)

is considerably less than the variation in labor output ratios. Further, the observed differences in the capital output ratios—unlike those of the labor output ratios—are not all in one direction, i.e., one cannot say that the capital output ratios in LAC are systematically higher or lower than in AG, while of course the labor output ratios are much lower across the board in AG than in LAC.[3] Given this evidence the assumption that the capital output ratio in LAC is about equal to that in AG is an acceptable approximation.[4]

If the capital output ratio is broadly similar for both groups of countries while capital's share is significantly greater in LAC, then the marginal product of capital must be greater in LAC than in AG. Why should this be? If the marginal product of capital in LAC exceeds that in AG because capital is combined with more labor in the former, then the capital output ratio in AG must exceed that in LAC. This latter inequality, as already noted, does not exist, and hence a conventional variable proportion argument will not explain the deduced differences in the marginal product of capital. Neither can one appeal to technological factors as the source of the difference, since technical progress is surely more rapid in AG than in LAC.

The similarity of capital output ratios can be explained in terms of the preponderance of imported physical capital in the more rapidly growing sectors of the developing economies. This equipment is usually designed for a high-wage economy, and rarely are modifications made in this imported equipment. Wage rates in LAC are much lower than in AG, and despite the fact that LAC has a much lower capital labor ratio her wage bill is a smaller proportion of total output than in AG. This could not be the case, however, if the marginal product of capital were very low in LAC. Two factors seem to account for the higher marginal product of capital in LAC. In the first place there are in LAC numerous and obvious "gaps" in the capital structure to be filled. To a considerable degree investment represents efforts to fill in these gaps, i.e., to add to the extensiveness of the capital structure. In the richer countries with an already extensive capital structure, investment was much more in the form of replacing and duplicating existing capital. In this latter case, new capital as such is expected to add less to the capacity of the economy since it is replacing or duplicating capital capacity already there. Secondly, the import substitution policy—the policy of curtailing

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[3] This point has been noted by several people. See especially Balassa [2] and Leontief [10].
[4] If the argument were limited to the fixed-capital full capacity output ratio in the manufacturing sector, the evidence is even more convincing.

or eliminating entirely the importation of certain products to encourage their domestic production—also creates gaps that in turn provide possibilities for profitable investments. The monopolistic position of most plants then permits the maintenance of prices at levels sufficient to assure relatively high returns on the capital. In the context of the present discussion, it is this latter explanation of the high marginal product of capital that is particularly relevant.

THE ROLE OF PRODUCTIVITY GROWTH

The preceding argument suggests why capital's role in LAC is more important than it is in AG. It does not, however, tell us why productivity growth is generally lower in the former country than in the latter. It is the question that we now consider.

It may be asserted that at least part of r_A is explained in terms of the flow of new technical knowledge from research and development activity. Such activity is carried on to a much larger extent in the advanced countries than in LAC. This new technical knowledge is rarely easily and costlessly transferred to countries with different factor endowments and different organizational arrangements. Thus whatever opportunities for the exploitation of new technology existed, there did not exist the capacity to adapt and modify this technology to use it effectively in Latin America. It is also probably correct to assume that the rate of growth and of improvement in the educational establishments was greater in the former group than in the latter. In terms then of the customarily identified sources of r_A, technical advance and education, the Latin American countries lagged. This argument is intuitively appealing, but its validity depends very much on the assumption as to the sources of productivity growth. We need then to investigate the extent to which the data in Tables 1 and 2 support this generalized notion of the sources of productivity growth.

The production function states that the growth of output is explained by the growth of inputs and an increase in their productivity. If then we calculate for a group of similar countries a simple regression of r_P on the rate of growth of inputs, r_n, $(r_n = ar_K + br_L = r_P - r_A)$, the resulting equation should indicate, by its intercept, the average value of r_A and the regression coefficient of r_n should of course be about unity. The estimates of r_P and r_n for the eighteen observations of the advanced group of countries yields the following equation:

$$AG\ r_P = 2 \cdot 47 + 1.17\ r_n \qquad \bar{r}^2 = 0.64. \qquad (4a)$$
$$(0.21)$$

Equation (4a) conforms to expectations reasonably well, The regression coefficient is not significantly different from unity, and the equation accounts for almost two-thirds of the variance in r_P.

For LAC, for the 1940–64 period, the corresponding equation is

$$LAC\ r_P = 1.26 + 1.06\ r_n \qquad \bar{r}^2 = 0.23. \qquad (4b)$$
$$(0.40)$$

Equation (4b) shows LAC's smaller r_A (the lower value of the intercept compared to that in (4a) and a regression coefficient not significantly different from one. The equation however explains such a small proportion of the variance of r_P that it is not appropriate to interpret it as describing the relationship between r_P and r_n for LAC in the same manner that equation (4a) does for AG.

Data in Table 1 suggest that the relative magnitude of the sources of growth in LAC was in fact substantially different during the war years from that of later years. If the observations for the war years are eliminated, equation (4b) becomes

$$LAC\ (1946\text{–}64)\ r_P = -1.73 + 1.89\ r_n \qquad \bar{r}^2 = 0.66 \qquad (4c)$$
$$(0.35)$$

and if the observations for the immediate postwar period are also eliminated, the regression becomes

$$LAC\ (1955\text{–}64)\ r_P = -2.87 + 2.21\ r_n \qquad \bar{r}^2 = 0.76. \qquad (4d)$$
$$(0.39)$$

The changes in the regression equations all move in a similar direction, the values of r_A (the vertical intercepts) fall sharply and those for the regression coefficient and $\bar{r}^2$ rise. The rising values of the regression coefficients and the $\bar{r}^2$'s indicate an increasing dependence of r_P on r_n. However, both the negative intercept and the regression coefficient in excess of unity imply that this increased dependence is due to the effects of changes in the degree of utilization. Thus a negative rate of growth of productivity can be most satisfactorily explained in terms of output falling more rapidly than it is possible to reduce the quantity of inputs. Similarly the regression coefficients of equations (4c) and (4d), both significantly greater than one, imply that the growth of output exceeds the growth of inputs, not because of a "pure" productivity effect, but because a positive r_n reduces the extent of utilization.

These regressions suggest the following conclusion: for AG equation (4a) provides an economically and statistically meaningful summary of

the data of Table 2 and of the relationship between the the rates of growth of output, inputs, and productivity. The same regression for LAC is revealing in a different way. Equation (4b) takes a form consistent with Equation (4a) but the low value of $\bar{r}^2$ suggests that the relationship changes over the time period considered. Equation (4c) and (4d) verify this result. These latter equations also indicate that r_n becomes increasingly important in the explanation of r_P as the period progresses. Given the observed change in r_A we may conclude that this rising importance is due both to the role of inputs on the supply side and their role in preventing or reducing underutilization.

Another way of looking at the data is in terms of a direct explanation of r_A. The notion that increases in productivity result from improvements embodied in capital equipment and from better educated, better trained workers suggests that r_A and r_n should move together, i.e., that r_n is a carrier of r_A. Thus for countries with similar technology and similarities in rate of technical progress and comparable improvements in education a positive and significant relationship between r_A and r_n is expected. Equation (5a) is this regression for the eighteen observations for AG.[5]

$$A\,G\,r_A = 2.47 + 0.17\,r_n \qquad \bar{r}^2 = 0.02. \qquad (5a)$$
$$(0.21)$$

This equation shows, contrary to expectations, that inputs are not carriers of the sources of productivity growth. From (4a) and (5a) we may conclude that for AG the rate of growth of productivity was in fact simply added to whatever growth is produced by increased inputs. In particular the evidence is consistent with the hypothesis that r_A is autonomous with respect to the growth of inputs.

For the Latin American countries the regression of r_A or r_n with all twenty observations yields

$$LAC\,r_A = 1.26 + 0.06\,r_n \qquad \bar{r}^2 = 0. \qquad (5b)$$
$$(0.40)$$

The form and interpretation of this regression are similar to (5a). Again, however, eliminate the war years and then the first postwar period to get equations (5c) and (5d).

$$LAC\,(1946\text{--}64)\,r_A = -1.73 + 0.89\,r_n \qquad \bar{r}^2 = 0.29 \qquad (5c)$$
$$(0.35)$$

[5] It should be recognized that equations (5a)–(5d) are derivable from equations (4a)–(4d).

$$LAC\,(1955\text{--}64)\,r_A = -2.87 + 1.21\,r_n \qquad \bar{r}^2 = 0.50. \qquad (5d)$$
$$(0.39)$$

The regression coefficients and adjusted coefficients of determination rise through time, but this change cannot mean that in the later periods r_n began to carry r_A for if this were the case, the vertical intercept would not turn negative. The negative intercept implies that the increasing strength of the relationship is due not to r_n's role as a possible carrier of increasing productivity, but as a source of demand, i.e., r_A becomes increasingly dependent on the growth of demand. More specifically, the rate of growth of productivity seems increasingly dependent on changes in the degree of utilization, and the evidence shows little or no independent growth of "pure" productivity.

The preceding discussion suggests a final way to consider the data, namely a regression of r_A on r_P. For AG this regression is

$$A\,G\,r_A = 0.64 + 0.44\,r_P \qquad \bar{r}^2 = 0.51. \qquad (6a)$$
$$(0.10)$$

This equation indicates that if r_P were zero r_A is still about 0.64, and hence implies that if r_P were zero (or slightly above) r_n must be negative (e.g., capital not replaced, increased unemployment, etc.). This result is also consistent with the notion that productivity growth occurred in AG more or less independently of the growth of inputs. That the equation explains one-half the variation in r_A is due simply to the fact that, for AG, r_A is a very large proportion of r_P.

The picture for LAC emerging from the regression of r_A on r_P is again different from that for AG and again changes over the time period considered.

$$LAC = -1.71 + 0.74\,r_P \qquad \bar{r}^2 = 0.75 \qquad (6b)$$
$$(0.10)$$

$$LAC\,(1946\text{--}64)\,r_A = -1.62 + 0.63\,r_P \qquad \bar{r}^2 = 0.85 \qquad (6c)$$
$$(0.07)$$

$$LAC\,(1955\text{--}64)\,r_A = -1.67 + 0.64\,r_P \qquad \bar{r}^2 = 0.91 \qquad (6d)$$
$$(0.06)$$

The value of the intercepts again shows that productivity growth is negative unless r_P is substantially positive, a result directly opposite to that shown by equation (6a) for AG. Similarly, the rising $\bar{r}^2$ indicates a heightened dependence of r_A on r_P, i.e., changes in the degree of utilization account for an increasing proportion of the variation in r_A.

In the decade 1955–64 over 90 per cent of the variation of r_A is accounted for by variation in r_P. And this occurs even though r_A/r_P in this latter period is much smaller than it was in the earlier period.[6]

SUMMARY

The results of the regression analysis may now be summarized. We have examined three relationships for AG and LAC: r_P on r_n, r_A on r_n, and r_A on r_P. For AG both r_A and r_n are important in explaining r_P, and their effect on r_P is more or less additive. Thus the evidence is consistent with the notion that r_A represents a flow of improvements that can be employed independently of the growth of inputs.

For LAC the 1941–45 period reveals a picture very similar to that summarized for AG. After 1945, this picture changes. The rate of growth of output and the rate of growth of productivity become increasingly dependent on r_n. The negative vertical intercepts in both sets of regressions suggest that this dependence is due to the effect of r_n on the rate of growth of capacity utilization. This last possibility is further supported by the rise in $\bar{r}^2$ between r_A and r_P over the twenty-five year period. From these results we concluded that the variation in the values of r_A is due primarily (after 1945 and especially after 1955) to the ability of LAC to exploit fully its capital and labor resources. If this is correct, then the important conclusion that "pure" productivity growth has, in the past decade or so, been about zero emerges.

The findings for LAC would be consistent with the assumption that underutilization is due to a conventional oversaving problem. The evidence that this is not the case is convincing. In the first place, there are the inflations. A simple excess demand theory of inflation is probably not adequate to explain inflation in Latin America, but equally probably such inflations could not continue if demand were not pressing against capacity in key sectors of the economies. Also the rate of capital formation (see Table 1) has generally been quite high, and this fact is difficult to reconcile with a general oversaving problem. There is evidence of a positive nature [18] [19] which indicates that the underutilization is due to bottlenecks on the input side. Finally, an oversaving argument would not explain why "pure" productivity growth was negligible in recent years. It seems appropriate to rule out oversaving as the explanation of the behavior of r_A in LAC.

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[6] The regression of r_A on r_P for LAC for the ten observations 1940–53 is $r_A = -1.53 + 0.78 r_P$ $\bar{r}^2 = 0.73$.

III

This final section seeks to explain the behavior of r_A in terms of the development strategies and policies followed in LAC and in terms of the productivity of capital discussed in Part I above.

The central hypothesis defended here is that the development policies which created the profitable opportunities for investment (especially in the years after 1955) also created conditions that had two other effects: made it extremely difficult, for technological reasons, to achieve a high r_A and secondly, created an economic environment in which the entrepreneur had little incentive to search for productivity-increasing improvements. During the war years, on the other hand, both the technological and the incentive factors worked in favor of a relatively high r_A. The war period provided protection without distortion, while the import substitution approach to development has provided protection but has also imposed severe distortions, and it is these distortions that create the two effects just enumerated. The general evidence supporting the hypothesis is easily stated, but a detailed investigation would require a country-by-country survey. Such a survey is not possible here, but the following points are generally pertinent.

THE WAR PERIOD

An examination of the 1940–45 period is especially helpful. In this period the rate of growth of capital was much lower than in later periods due to the curtailment of imported capital goods. During the war there existed a strong and obvious demand in both the internal markets and for exports. Consequently, there was great incentive to increase output among all firms in the five Latin American countries, but virtually no ability to obtain new plant and equipment, spare parts, and replacements. Similarly, the flow of many raw material imports was irregular and unpredictable. With foreign supplies of capital equipment difficult to obtain, firms (to capitalize on the favorable market) were forced to find ways to use their existing capital stock with increasing effectiveness. Improvisation and adaptation of existing equipment were common, and one can find many examples of ingeniously and indigenously devised machines producing various items for household and business use [14a] [20]. The war then not only provided "protection" from foreign competition, but also helped to create an environment within which entrepreneurs had incentives to use available resources with increasing effectiveness. The innovative activity observed in this period involved not only changes in technique to fit the domestic supply of inputs complementary

to capital (labor of various skills and quality, raw material imports, and managerial ability), but also included adaptation of techniques to fit market size and of product to fit market demand.

Although the growth of the labor supply was not thwarted the way capital imports were, the wartime isolation had some effect on labor's use. One of the consequences of the efforts to use physical capital more effectively was the adaptation of the tools and equipment to fit the quality of the available labor. Thus the form of the capital became increasingly appropriate for the workers and thereby *their* productivity tended to rise. We conclude then that strong and obvious demand in a situation where availability of new, imported capital was *recognized* to be almost nil is part of the conditions necessary for entrepreneurs to achieve a relatively high rate of increase in productivity. The important thing to note is that the relatively high r_A in this period was accomplished without capital goods imports. We cannot say that it was generally high export earnings permitting a high level of imports that were responsible for a strong showing of r_A.[7]

THE POST-1955 PERIOD

The wartime experience is most clearly contrasted with the post-1955 period. In this latter period a large sector of the domestic economy of LAC again was isolated from foreign competition, but this time by high tariffs and other forms of import impediments rather than by a world war. As the war had created profitable opportunities for increased output of a wide range of manufactured goods, so also did the import substitution strategies of development followed in LAC create opportunities in the post-1955 years. The response to these opportunities that produced the high r_A in 1940–45 seemed to be absent in the later period. The question now is why?

In comparing the later periods with the war period, three characteristics seem especially relevant.

1. The most obvious difference has to do with the supply conditions of imported capital goods. During the war, as already noted, they were virtually unavailable. After 1955 the almost universal and continuous overvaluation of the local currencies made capital imports cheap, relative to domestic inputs. Entrepreneurs not only knew that foreign-made capital was available, but had a major incentive to use it intensively in

their production, But the regression analysis of Part II gave us no reason to think that capital formation carried the sources of productivity growth. On the labor side, a variety of social welfare policies (minimum wage rates, paid vacations, factory infirmaries) instituted (or enforced) in the fifties added to the cost of employing labor.[8] It is also probably correct to say that wage earners were better able to protect themselves from inflation in the fifties and sixties than they were in the forties. There is no doubt then that prevailing market prices for capital and labor reflected the real factor supply situation much more accurately in the war period than they did in the later periods. In a very general sense, it seems correct to say that the capital equipment imported from and designed for capital rich, labor scarce countries was more nearly appropriate (for the individual producer) in its unmodified state than was the case in the war years. In this sense, the entrepreneurs had less incentive to modify and adapt (and thereby raise the productivity of) their imported capital than they had in the earlier period. Indeed, their incentives worked in the opposite direction: they were encouraged to meet any demands for increased output by acquiring more capital from abroad. It is important to emphasize that the misleading factor prices arose largely from specific policy measures, not from some endemic characteristic of the economy. Similarly, note should be taken of the fact that "entrepreneurial response" did not change, i.e., entrepreneurs reacted to market signals in both periods with considerable rationality.

2. Another difference between the two periods has to do with the composition of output. Although industrialization was underway in LAC before the war, it was not until the fifties than an explicit import substitution policy of industrialization became effective. In the present context the most relevant characteristic of this policy is the haphazard and *ad hoc* manner in which trade barriers have been applied. There is no evidence of a careful review leading to the protection of this or that activity on the basis of expected productivity growth or infant industry considerations. Rather import limitations have been in response to immediate balance-of-payments difficulties or to pressure from specific interests wishing to expand into new activities.[9] The result of such a

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[7] Strong external demand did not mean in all cases higher exports or more favorable terms of trade than prevailed later. Exports as well as imports were handicapped by transportation. The rate of growth of exports was much higher than later and all producers knew a demand existed for all that they could produce.

[8] Wage rates in most Latin American countries have risen considerably less than total labor costs since 1950. The owner of a very modern textile mill in Mexico told me that his skilled labor cost the equivalent of one dollar per hour. Of this 53 cents was "fringe benefits." The fringe benefit contribution in the early 'forties —according to the same source—was negligible. See also [18].

[9] The most thorough documentation of this point is Santiago Maracio [11]. See also the papers prepared for the Latin American Symposium on Industrial Development [18] and the analysis of Raul Prebisch [22, especially the first 25 pages].

policy has been not only a reduction in current income in accordance with the conventional free trade model. More importantly, an industrial structure has tended to emerge that is so alien to factor endowments that full utilization of existing capacity came to depend more, not less, on a constant flow of imports.[10]

The following sequence is typical and illustrates the way the development pattern affects productivity growth. In response to balance-of-payments difficulties, a certain category of imports (almost always a consumer durable, e.g., fully assembled automobiles for general use) are prohibited. Demand for the product is strong, and a number of plants come into being to exploit this newly created investment opportunity. Initially, almost all produced inputs used are imported. The underpricing of foreign exchange means that it must be rationed by an exchange authority and that demand always exceed supply. With a strong demand for the product, with output dependent on access to foreign exchange, and with the latter allocated among the firms independently of their competitive strength there is no market test for survival, and no need to increase productivity to survive or even to make acceptable profits.

The next step in the sequence occurs when the governments require the new firms to buy a given proportion of their produced inputs from domestic manufacturers. Usually this proportion rises over time; also, the policy usually has its origin in efforts to reduce imports.[11] This new requirement has two consequences. It creates a new gap (in the sense of Part I above) in the capital structure, i.e., a new obvious opportunity for profitable investment. Secondly, it forces the originally protected activity to use some inputs which are more costly, of lower quality, and less reliably supplied than was the case when imported inputs were used. The costs of the first activity are thus pushed up.[12] Foreign exchange allocations to the first activity are reduced, in line with the requirement

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[10] Several investigations have shown that the income elasticity of demand for imports has risen in recent years in LAC due to a reduction in the average propensity to import while the marginal remained about constant. See especially David Felix's study of Argentina [6].

[11] Whether it does in fact have this effect obviously depends on the quantity of imported materials used by the local manufacturers of the produced inputs. See [3] for a model defining the conditions necessary for such a sequence to reduce the import content of the output of the initially protected product.

[12] Unreliable supply conditions have their most obvious consequence on inventory policy. The Chilean automobile assembly activity, for example, follows practically a seasonal pattern of production as the plants must have inputs on hand in sufficient quantity to permit an assembly run. Leland Johnson [8] has a good description of the problems of the Chilean automobile industry. Irregular supply and its consequence for inventory policy is not limited to purchases from domestic

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to buy domestically fabricated inputs, and excess demand for foreign exchange by this activity continues. The consequence is also a continuation of the protection of the high-cost producers by allocating to them a share of the foreign exchange essential for production. Strong internal demand pushes product prices up, the overvalued exchange rate (and other investment incentive concessions) keeps capital costs low, and even the relatively inefficient producer makes a comfortable profit. The relatively efficient producer cannot increase his share of the market because he cannot acquire the necessary inputs, especially those that are imported. Meanwhile the most recently protected sectors (supplying the domestically produced inputs to the *initially* protected activity) attract investment.

The final stage arrives when it appears unacceptably costly to try to find ways to reduce the import content of output in the initially protected activity.[13] Then the process is begun again by levying a prohibition against the importation of another consumer durable. Investment then seems to take place over a wide range of activities as advantage is taken of the gaps in the economy created by import policies, and there is little evidence of investment in response to profit opportunities created by increased efficiency and rising productivity.[14]

New investments require capital goods imports, and when foreign exchange sufficient for an acceptably high rate of capital formation and full utilization of existing capacity is not available, one or the other had to give way. As profit rates on invested capital even with considerable underutilization, were acceptable, as new gaps offered opportunities for further investment, and as foreign loans and aid were more easily obtainable for increasing capacity than for using capacity, r_K remained reasonably high in these post-1955 years. Consequently, an economic structure emerged which, when subjected to strong pressure on the demand side, produced rising prices rather than rising productivity. This final result is of course exactly opposite to that described in the war period.

3. A final element in the picture has to do with the extent and nature of external competition prevailing during the war with that prevailing in the later periods. During the war direct competition between LAC

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manufacturers. Almost all producers import (if permitted) well in excess of current needs on the grounds that they do not know what import policies will be next month. ECLA [18] places heavy emphasis on the lack of continuity and predictability of import policy. Finally, the usually misleadingly low interest rates reduce any incentive the producer might have to find ways to avoid carrying large inventories.

[13] Or when domestic demand at the going price is satisfied.

[14] ECLA recognizes this point in [18, p. 53] where "development in depth" is contrasted with "development in breadth." Similarly David Felix [6] speaks of a "premature widening" of the market in Argentina.

and AG was virtually nil. With demand strong in AG, Latin American countries were in effect competing among themselves for the AG market as well as for their domestic markets. With the end of the war and reconstruction and the beginning of the emphasis on industrialization in LAC, competition with AG was direct. That producers in LAC tend not to respond to direct competition with AG, while they do seem to respond to competitive threats with producers in other less developed countries is reasonably clear. The most appealing explanation of this is simply the initial difference in costs. A Chilean manufacturer of refrigerators may seek ways to undersell a Colombian manufacturer because their costs are at least comparable. The Chilean manufacturer would, however, fold up immediately if he were confronted with producers who could offer refrigerators at less than one-third his costs. Protection was thus believed necessary, and competition in large segments of the individual economies became almost nonexistent.

I V

A short summary statement of the main conclusions may be useful. Evidence has been presented that is consistent with the hypothesis that in neither LAC nor AG are inputs (capital and labor) the carrier of productivity growth. Also evidence has been presented which leads to the conclusion that the observed changes in the rate of growth of productivity in LAC could, in the periods after 1945, be accounted for largely by the ability of LAC to utilize all its available resources. From this conclusion and on the basis of comparison with data for AG, the further important conclusion was reached that "pure" productivity growth has been virtually zero in LAC in the past decade or so. The explanation of this last result rested on three points: (1) a growing inappropriateness of the input mix of production due in large part to the continued undervaluation of foreign exchange to interest and wage rate policies, etc.; (2) a growing inappropriateness of the composition of output in the sense that productive activity was not based on cost or potential cost considerations, but rather has evolved in response to the incentives generated by protectionist policies made up largely to meet balance-of-payments crises; (3) a decline in competition.

A more general conclusion is also suggested by the argument of this paper. Recently a number of studies have shown that the increased output to be expected if all deviations from a conventionally defined optimal allocation of resources were eliminated is exceedingly small. Therefore concern with the traditional allocation questions is of little interest in

understanding development.[15] If, however, productivity growth is an important element in development, and if it is handicapped by severe misallocations, then the solving of the allocation problem in a satisfactory way is a crucial element in development policy.

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[15] See Harvey Leibenstein [9] for a recent survey and critique of the various studies on this issue.