A COMPARISON OF INDUSTRIAL EFFICIENCY FOR MEXICO, PUERTO RICO, AND THE UNITED STATES

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ABSTRACT

A COMPARISON OF INDUSTRIAL EFFICIENCY FOR MEXICO, PUERTO RICO, AND THE UNITED STATES

By

Paul Edward Snoonian

This study shows that Mexican and Puerto Rican industries operating with capital intensity levels of equivalent United States industries would not achieve labor productivity levels of those United States industries. The resulting difference in labor productivity is called a "labor efficiency difference." A multiple regression analysis reveals a significant relationship between high capital intensity levels and high levels of labor productivity. A Cobb-Douglas production function is then used to calculate labor efficiency differences between Mexican, Puerto Rican, and United States industries. It is generally found that labor efficiencies in Puerto Rico are higher than those of Mexico because many Puerto Rican industries produce for United States markets. Labor efficiency differences between United States and Mexican industries are attributed to worker and managerial ability and economies of scale.

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are mainly due to worker and managerial ability with economies of scale being a smaller influence since, as mentioned earlier, a number of Puerto Rican industries produce for United States markets.

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CHAPTER I

ASSESSMENT OF LABOR PRODUCTIVITY STUDIES WITH REFERENCE TO RELATIVE AND ABSOLUTE LEVELS OF CAPITAL INTENSITY

I. HYPOTHESIS AND INTRODUCTION

This analysis is concerned with the calculation and comparison of international labor productivity differentials at various levels of capital intensity. The countries involved are the United States, Mexico, and Puerto Rico with the United States serving as the standard of comparison. The hypothesis is that even if industries in the less developed areas were equipped with the capital-labor ratio of equivalent manufacturing industries in the United States, labor productivity levels for the former countries would not approach labor productivity levels of the latter country for the greater majority of industries. It will be shown that the hypothesis holds true regardless of the productivity of capital in the less developed countries and the highest plausible values assigned to the output elasticity coefficient of capital. A related supposition is that scale of plant and integrated industrial development with commensurate linkage effects increase the productivit

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productivity of capital and hence labor productivity and efficiency under given levels of capital intensity.

General Statement Concerning Methodology

To test the previously mentioned hypothesis, cross sectional empirical data for output, labor, and capital from the manufacturing sectors of the respective countries are employed. Productivity comparisons are made for certain years as well as averages of some selected years. The calculations seek to answer these questions.

(1) To what extent do capital intensity differences lead to labor productivity differences?

(2) Are labor productivity differences less for industries of intensive capital than for industries of intensive labor?

After establishing that relative productivity differences in lesser developed areas are greater than their relative capital intensity differences, an explanation must be made as to the probable cause or causes of the further differences. Different industries in the same country are compared as well as the same industry for different years. Differences among industries in the less developed areas are also compared within the context of their historical economic development patterns.

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The second question (above) relates to a hypothesis advanced by Hirschman who does not divorce managerial and worker efficiency from the level of capital intensity itself. Hirschman states that productivity differences are less for capital intensive industries than for labor intensive industries. Accordingly, capital intensive investment projects promote operations on a large scale, set up an atmosphere where labor becomes more efficient, coordinate difficult human tasks, and force management to be more efficient thereby shortening and improving the decision making process of the managerial hierarchy.[1]

If the hypotheses and questions are to be answered successfully, productivity adjustments must be made for capital intensity variations per worker. These adjustments require knowledge about production functions in the countries under investigation. Otherwise certain assumptions must be made about the characteristics of these functions. The latter approach is used here since there is virtually no knowledge of production functions for each individual industry under investigation. However, previous empirical studies have provided production

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[1]Albert Hirschman, The Strategy of Economic Development (New Haven and London: Yale University Press, 1959), pp. 146-50.

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functions which could be applied to all the industries. One such function is the Cobb-Douglas production function. The usual procedure when productivity comparisons are made, regionally or internationally, is to assume a single production function for all industries again with the further assumption that the exponents are the same for each industry in all the countries. The constants need or will usually not be the same if the function is fitted to empirical data and the equation solved for the constant. Nor do the constants have to be the same when they are determined from the empirical data.

Two techniques are employed in this analysis. The first uses arithmetic and logarithmic multiple linear regression functions while the second uses a ratio of Cobb-Douglas production functions. The regression equations calculate relative labor productivities for Mexico and Puerto Rico under appropriate levels of capital intensity. Briefly, the regression planes are used to compute the following: (1) quantitative and directional influence of changes in the capital-labor ratio upon the ratio of output to labor; (2) to test the Hirschman hypothesis; and (3) to compute the overall relative productivity of Mexican and Puerto Rican industries operating with the aggregate United States capital-labor ratio for the chosen industries. The second meth

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second method assumes that Cobb-Douglas production functions are applicable for all industries in all countries. Relative capital and labor productivities are computed for Mexican and Puerto Rican industries along with relative capital-labor ratios for each industry. Following this, per worker labor productivities for Mexican and Puerto Rican industries operating with the observed United States capital-labor ratio in each similar industry are worked out under varying values of capital elasticity of substitution coefficients. This analysis is carried on under constant returns to scale assumptions for all industries and increasing returns for some selected Mexican and Puerto Rican industries.

A detailed explanation of the above calculations is presented in Chapter II. The data and calculations are given in the Appendix. The remaining chapters are devoted to interpretation, analysis, and conclusions of the calculations, and sub-hypotheses flowing from support or non-support which the calculations give to the original suppositions.

Limitations of the Present Study

Apart from problems stemming from the lack and nature of raw data, every empirical study must contend with certa

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with certain limitations regarding the scope of the performed calculations. This investigation does not construct input-output tables nor attempt a measurement of the rate of technological change. Also, an optimum capital-labor ratio is not quantified for Mexican and Puerto Rican industries. This would require the specification of optimum techniques and determination of a most favorable economic growth rate. In turn, demand elasticities for final products would have to be ascertained. These calculations are not regarded as unimportant. However, for purposes of manageability, computations are made strictly with reference to labor productivity differences at varying levels of capital intensity.

The remainder of the present chapter reviews and evaluates prior studies of international labor productivity comparisons which give credence to the current analysis. The characteristics and application of the Cobb-Douglas production function in empirical testing is then discussed as well as methodological problems involved for any study using empirical production functions.

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II. SELECTED SURVEY OF INTERNATIONAL LABOR PRODUCTIVITY STUDIES

Earlier international labor productivity studies have raised and explored some very important questions. This writer feels however, that some methodological mistakes were made, that some studies were analytically incomplete, and that some investigations could have probed more deeply into the topics raised by the existence of international labor productivity differentials. Rather than attempt a complete review of the vast literature, stress is given to studies which are especially pertinent to the present investigation.

Empirical Tests of the Hirschman Hypothesis

Carlos Diaz Alejandro has compared labor productivity differences between the United States and Argentina to test the existence and magnitude of the Hirschman hypothesis.[2] A cross section of sixty-three manufacturing industries was chosen in both countries on the basis of output comparability. The compared years were an average of data for 1953 and 1957 in Argentina and the single year

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[2]Carlos Diaz Alejandro, "Industrialization and Labor Productivity Differentials," Review of Economics and Statistics, Vol. 47 (May, 1965), pp. 207-14.

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1958 for the United States. Relative labor productivity differences between the United States and Argentina with the former country as the comparative yardstick were attributed to (1) labor intensity in Argentina; (2) the absolute size of firms in Argentina; and (3) the relative size of firms in Argentina. These productivity differences were represented by the following regression equation which was used to test the Hirschman hypothesis:

$$P = a - bL + cS - gE.$$

The terms P, L, S, and E represent in turn, the average relative productivity per worker in Argentina; the absolute labor intensity in Argentina denoted by the portion of wages and salaries for production and non-production workers to total dollar value added for each establishment; the absolute size of Argentine establishments where "size" is the average number of production workers per establishment; and E is the relative size of Argentine establishments to comparable establishments in the United States. The results of the regression equation are given below:

$$P = 67.77 - 0.935(L) + 0.035(S) - 0.018(E).$$

The regression coefficient for labor intensity was very high but the regression coefficients for the absolute and relative size factors indicated a weak relationship between th

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between these factors and relative labor productivity. The coefficient of determination (R^2) was 0.523 and not significantly high. Except for the petroleum refining industry, relative labor productivities in all Argentinian industries were lower than the equivalent industry in the United States.

On the basis of overall results, the author accepted the Hirschman hypothesis with some reservations. He qualified his acceptance by showing that some industries in Argentina with a comparative advantage in international trade also possess a high degree of labor intensity. Other forces which could affect the Hirschman hypothesis but lying outside its analytical scope were cited such as (1) import substitution industries in lesser developed areas having highly capital intensive techniques and therefore smaller labor productivity differences when compared to similar industries in developed countries; (2) tariff protection for certain industries in underdeveloped areas favoring capital intensive techniques placing those industries in a more favorable price position than competitors in developed countries; and (3) the narrowing of technical factor substitution possibilities as industries become more capital intensive. Alejandro claimed, and correctly so, that any further conclusions had to be

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to be based on the characteristics of industrial production functions in Argentina and the United States. If production functions were known or assumed, factors which lay outside the range of Alejandro's analysis could have been given a meaningful interpretation. Alejandro's regression equation could scarcely be called a production function. Approximately 48 per cent of the output variations were unexplained by capital intensity variations and these could be given no meaningful analysis. The regression equation also suffers from poor and inconsistent definitions for the independent variables. In the first place, relative labor productivities for Argentinian manufacturing industries are not explained by labor intensity in Argentina alone. Alejandro did use relative size as a variable and the results would have been better if relative labor intensity was also used. Secondly, Alejandro's definition of the size variable is not able to produce a high positive relationship with capital intensity even if such a relationship did exist. A high average number of workers per establishment or industry might very well indicate a high degree of labor intensity. Consistency would require that the size factor be used as an inverse index of capital intensity along with the labor intensity variable given the author's definitions. As used by Alejandro, an

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incompatibility is present between the labor intensity and size variables which is revealed in the following manner: the greater the number of production workers, the greater their share of payroll in total dollar value added. Therefore, the greater would be the level of labor intensity and the lower the capital-labor ratio. But the greater the number of production workers, the greater is the size variable (S) and consequently, the greater is the level of capital intensity. The relative size variable (E) is also correspondingly affected. This could account for the low regression coefficients obtained by Alejandro for the absolute and relative size variables. Alejandro did state that capital-labor ratios would have been better indicators of capital intensity but that data on capital was unavailable for Argentina.

A subsequent article by Edmar Bacha included capital data in a comparison of relative labor productivities between Mexico for 1961 and the United States for 1958.[3] In addition, Bacha calculated a correlation coefficient between the size of firms and capital intensity, "size" being defined as the number of establishments divided by the

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[3]Edmar Bacha, "A Comparison of Industrial Productivity Between Mexico and the United States," El Trimestre Economico, Vol. 33 (October-December, 1966), pp. 657-73.

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number of workers. The Hirschman hypothesis was also put to an empirical test. Forty-five manufacturing industries were selected from both countries on the basis of comparability of outputs and availability of statistics. For the computations, the symbols K, L, and VA represented the amount of fixed capital, labor, and value of output. Thus, K/L stood for the level of capital per unit of labor. The United States, as in Alejandro's article, was the standard of comparison (i.e., United States = 100). The subscripts "u" and "m" specified the United States and Mexico, each in the order given. Bacha then computed the absolute size of the capital-labor ratio for each industry in each country. From this, the relative capital-labor ratio for Mexican industries to comparable United States industries was obtained. Next, Bacha derived the aggregate relative capital-labor ratio for Mexican industries, the numerical result of which is given below:

$$(1) \quad \frac{Km/Lm}{Ku/Lu} = 0.36.$$

The absolute value of output per unit of labor for each industry in both countries and the relative value of output per unit of labor for Mexico in each of the forty-five industries was calculated. Overall relative labor productivity was ensuingly determined:

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$$(2)\quad \frac{VAm/Lm}{VAu/Lu} = 0.27.$$

Bacha concluded from the above that overall productivity for United States industries was approximately four times greater than Mexican industries (1.0/0.27). Capital intensity for United States industries was computed as being nearly three times greater than Mexican industries (1.0/0.36). Bacha attributed 75 per cent of the overall productivity difference to the difference in capital intensity via the succeeding manner:

$$(3)\quad \frac{0.27/1.0}{0.36/1.0} = 0.75.$$

Bacha proceeded to remove the effects of capital intensity differences upon output for each industry. The resulting figure was termed an "efficiency difference" (DPP) between United States and Mexican industries. This DPP was to point to the presence of other factors influencing output besides capital intensity. Bacha's method for removing capital intensity differentials is shown below:

$$(4)\quad \frac{VAm/Lm}{VAu/Lu} \div \frac{Km/Lm}{Ku/Lu} = DPP.$$

Bacha interpreted a DPP of greater than 100.0 as the United States using a "disproportionate" amount of capital to achieve a greater per worker product than average la

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average labor output in the equivalent Mexican industry. Alternatively, a DPP of less than 100.0 showed that other factors in the United States than the capital intensity advantage were responsible for the productivity advantage of United States industries over similar Mexican industries. Out of forty-five industries, thirty had a DPP of less than 100.0. The conclusion was that the majority of the United States industries under examination possessed productivity advantages over the same Mexican industries which were not attributed to capital intensity.

The Hirschman hypothesis was empirically tested by Bacha to further determine the effects of capital intensity on relative labor output of manufacturing industries in Mexico. The regression equation, given below, depicts the capital intensity and productivity relationship:

$$(5) \quad \log \frac{VAm/Lm}{VAu/Lu} = \log a + b \log \frac{Km}{Lm}.$$

The regression coefficient (b) had a positive value of 0.219 and the coefficient of correlation was 0.319, neither one of which was significantly high. Bacha found that the Hirschman hypothesis generally held but in a very weak fashion. A positive value of the regression coefficient but a low absolute value of 0.219 would indicate this to be correct. A 1 per cent change in the capital-labor ratio by

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Bacha's calculations would lead only to a 0.219 per cent of a 1 per cent change in the ratio of relative productivity for Mexican industries. Apart from this, Bacha believed that the Hirschman hypothesis would have to be accepted with caution because (1) his data covered only a one year period; (2) the business cycle may have influenced his data; and (3) differences in labor productivity may have been due more to technology than to capital intensity since the possibilities of factor substitution narrow as capital intensity levels rise.

Bacha's study is an improvement over the analysis conducted by Alejandro. Bacha made an attempt to measure the contribution of capital to productivity and isolate an efficiency difference. Alejandro's prime concern was to test the Hirschman hypothesis. Bacha's linear logarithmic equation also provided a better fit to the data than Alejandro's (the correlation coefficients were 0.319 and 0.229 respectively) although goodness of fit could scarcely qualify a regression equation as a true production function for the data under consideration.

Previously stated, the measurement of the contribution of capital intensity and the correction of output for differences in capital intensity by Bacha thereby isolating an efficiency difference, represented an important

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contribution to international labor productivity studies. Once such procedures are accomplished, the feasibility of economic development through maximum or minimum levels of capital intensity becomes more apparent. Nevertheless, Bacha's adjustment method for the efficiency difference and his definition of that term is unsatisfactory. Bacha used the same adjustment to obtain a productivity of capital ratio and to remove the effects of capital intensity on relative output. To explain Bacha's error, it is necessary to consider his method for arriving at the conclusion that 75 per cent of the overall productivity difference between Mexican and United States manufacturing industries was attributed to the difference in aggregate capital intensity. His calculation technique is as follows:

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(8) $$\frac{\frac{VAm/Lm}{VAu/Lu}}{\frac{Km/Lm}{Ku/Lu}} =$$

(8a) $$\frac{VAm/Lm}{VAu/Lu} \cdot \frac{Ku/Lu}{Km/Lm} =$$

(8b) $$\frac{VAm}{VAu} \cdot \frac{Ku}{Km} =$$

(8c) $$\frac{VAm}{Km} \cdot \frac{Ku}{VAu} =$$

(8d) $$\frac{VAm/Km}{VAu/Ku}.$$

The absolute value of equation (8d) was 0.75 which Bacha called the difference in productivity due to the difference in capital intensity. However, (8d) is only an aggregate relative productivity of capital ratio for Mexican industries compared with identical United States industries. Moreover, Bacha also used the above procedure to adjust for capital intensity differences calling the result a "pure efficiency difference". In brief, the same computational procedure was used to obtain capital productivity and to remove the influences of differences in capital-labor ratios on relative output. In both cases the result was a relative productivity of capital ratio. Another

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shortcoming of Bacha's investigation lies in the regression equation used to test the Hirschman hypothesis. Relative labor productivities between Mexican and United States industries were determined on the basis of capital intensity in Mexico alone. The choice of 1958 as a year to gather United States data could not be considered a sound choice since a recession was occurring in that country during 1958 which could have distorted capital-labor ratios as well as other data under consideration. If years other than 1958 were selected along with the latter year, then the empirical data could have better reflected true capital usages and labor productivities.[4]

The previously reviewed articles provide a start but lack analytical depth. The Cobb-Douglas function enables this writer to examine questions and reach conclusions which could not have been explored or drawn by Alejandro or Bacha. The most obvious advantage possessed by the Cobb-Douglas production function over the other regression equations is that the exponents can be expressed as

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[4]Einar Hardin and W. Paul Strassmann, "Industrial Productivity and Capital Intensity in Mexico and the United States," El Trimestre Economico, Vol. 35 (January-March, 1968), pp. 51-62; and W. Paul Strassmann, Technological Change and Economic Development (Ithaca, New York: Cornell University Press, 1968), p. 78.

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elasticities of substitution between capital and labor inputs or can be considered as the output elasticities of the factor inputs. The output elasticities for the Cobb-Douglas function have three notable characteristics: (1) both are positive but less than unity; (2) both sum to unity; and (3) both are constant. Consider the regression equation:

$$(9) \quad Yc = aX_1^{b_1} X_2^{b_2}.$$

If the X_1 coefficient is a capital input, the X_2 coefficient a labor input, "a" an arbitrary constant, and the exponent values b_1 and b_2 for the capital and labor inputs sum to unity, equation (9) becomes a Cobb-Douglas production function. The logarithmic form of equation (9) can then be written as:

$$(10) \quad \log Yc = \log a + b_1 \log X_1 + b_2 \log X_2$$

where the regression coefficients (b_1 and b_2) are the substitution elasticities or output elasticities for the capital and labor inputs respectively.

In addition, the relative economic efficiency of Mexican industries is not described by a relative productivity of capital ratio. The concept of economic efficiency is elusive and deserves careful consideration before any conclusions can be reached about investment priorities for lesser developed areas. For example, various a

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various analyses define economic efficiency according to their own or given aims and purposes but in any event Bacha's definition must be considered as not being descriptive of anything save a relative productivity of capital ratio. Chapter II fully elaborates the notion of economic efficiency used in this analysis.

As stated earlier, the application of a Cobb-Douglas production function to empirical data provides advantages over the previously mentioned studies. However, the mathematical properties and the assumptions underlying the Cobb-Douglas function are subject to criticism on their own score. The remainder of this chapter briefly reviews the mathematical properties and assumptions of the Cobb-Douglas function and some relevant studies which have employed production functions of the Cobb-Douglas type for international labor productivity comparisons. The studies to be cited have somewhat different methodologies and purposes from the current study but they will serve to uphold the methodological validity used in this investigation.

The Cobb-Douglas production function has the mathematical property of being linear homogeneous of degree one. This property along with constant substitution elasticities which add to unity cause objections toward the Cobb-Douglas function for empirical testing. To begin with, the

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function is based upon the assumption of perfect competition in resource markets. Moreover, the assumption of linear homogeneity of degree one requires that all firms are operating on the minimum point of their long run average cost curves which requires in turn, that the conditions for long run competitive equilibrium have been met. Markets are far from perfect nationally or internationally and since the Cobb-Douglas function was developed by observation of United States data, its usage on an international scale is complicated by different accounting systems which may record capital and labor inputs differently. Definitions of the market place may also be different for the lesser developed areas. In the United States, a transaction is recorded in the GNP accounts if the transaction is productive and if there is a money flow associated with the transaction. Such may not be the case with many lesser developed areas. What is considered productive in the United States may not be considered productive elsewhere. Further, many lesser developed areas typically have many productive transactions with no commensurate money flows, that is, at least a higher proportion of such transactions than the United States. More importantly, market imperfections and structural disequilibria of various sorts could hamper output elasticities or substitution el

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elasticities for the lesser developed areas to a greater extent than the United States. Narrow domestic and export markets for the former countries leading to low sales volume could also distort capital-labor substitution.

Empirical Production Functions and International Labor Productivity Comparisons

An article by E. J. Heath compared labor productivity for Great Britain and Canada for 1948.[5] A Cobb-Douglas production function was fitted to empirical data for output, capital, and labor. The same exponents were assumed for similar industries between the different countries. Relative horsepower per unit of output with Great Britain as 100.0 was used as the level of mechanization or capital intensity. The horsepower data suggested that its use per unit of labor was higher in Great Britain although output per unit of horsepower was higher in Canada. The Cobb-Douglas function was employed for a three factor case and written as:

(11) $X = pL^{\alpha} H^{\beta} M^{\delta}$

where X is output; L is relative labor; H is relative horsepower; M is relative fuel usage; and "p" is the

[5] E. J. Heath, "British-Canadian Industrial Productivity," Economic Journal, Vol. 67 (December, 1957), pp. 665-91.

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productivity ratio. Using a logarithmic form of (11) above, a three variable regression was calculated and the numerical values of "p" and α, β, and δ, the output elasticities, were calculated. It was found that labor productivity in Canada was 7 per cent higher in Canada than Great Britain. Using a Cobb-Douglas function proper, that is by excluding M^{δ} and reducing the regression equation to a two factor case, labor productivity in Canada was 55 per cent higher in Canada than Great Britain. Relative fuel usage then revealed that fuel inputs were superior in Great Britain than Canada. The remaining 7 per cent difference in labor productivity not accounted for by differences in capital intensity was attributed to such factors as quality differences in horsepower, business organization, labor and managerial effort, and statistical errors in Heath's measurement technique. No attempt was made by Heath to adjust productivity differences to determine relative labor efficiencies.

Some years later, several economists, in a jointly written article, advanced the CES (Constant Elasticity of Substitution) production function as an alternative to the

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Cobb-Douglas production function.[6] Using nineteen countries including the United States and Mexico, and twenty-four industries within each country, the authors tested the relationship of value added upon wage rates with the regression equation:

$$(12) \quad \log \frac{V}{L} = \log a + b \log W + e$$

where V is value added in units of $1,000 per man year; L is labor input in man years for units of $1,000 per value added; W is the average wage rate in $1,000 units per man year or total labor cost divided by the number of workers; and "e" a random error term.

The coefficient of determination for the above regression equation was very high showing that 85 per cent of the variations in average labor productivity $\left(\frac{V}{L}\right)$ could be associated with variations in the average wage rate (W).

A "t" test revealed that for all twenty-four industries in the nineteen countries, the regression coefficient (b) was significantly different from zero at the 90 per cent level of confidence. In fourteen of twenty-four cases, the

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[6]Kenneth Arrow, Hollis Chenery, Bagicha Minhas, and Robert Solow, "Capital-Labor Substitution and Economic Efficiency," Review of Economics and Statistics, Vol. 43 (May, 1961), pp. 225-47.

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"b" value was significantly different from unity at the 90 per cent confidence interval which led the authors to reject the hypothesis that the regression coefficient (b) could be called the elasticity of substitution between capital and labor. If the "b" value was not significantly different from unity at the specified confidence level, this could have generalized the case for application of a Cobb-Douglas production function for empirical tests concerning output, labor, and capital.

Rejection of the hypothesis led Arrow, et al. to develop an alternative to the Cobb-Douglas function. It was called the CES (Constant Elasticity of Substitution) production function which was written as:

$$(13) \quad V = \gamma\left[\delta K^{-\rho} + (1-\delta)L^{-\rho}\right]^{\frac{1}{-\rho}}$$

where V was value added per man year; K was capital; and L was man years of labor time. The terms γ, δ, and ρ were constants standing for an efficiency parameter, a distribution parameter, and a substitution parameter each to each. The term $\frac{1}{1+\delta}$ was the elasticity of substitution which was also a constant.

The CES function possesses similar properties to the Cobb-Douglas production function such as (1) linear homogeneity of degree one; (2) positive marginal products subject t

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to diminishing returns; (3) pure competition in factor markets; and (4) constant elasticities of substitution. With constant substitution elasticities both the CES and Cobb-Douglas production functions have no uneconomic regions. Graphically, uneconomic regions may be portrayed as isoquants bending backward upon themselves or as stages one and two in a three stage output curve. The CES and Cobb-Douglas functions have no such regions.[7] However, the Cobb-Douglas and CES production functions differ in one respect. While the Cobb-Douglas is constrained to a constant elasticity of substitution of unity, the CES function could have constant substitution elasticities greater than zero and up to unity. In the limit, where the elasticity of substitution is unity, the CES production function reduces to the Cobb-Douglas form.[8]

Part of the article was devoted to testing the CES production function parameters for efficiency variations due exclusively to capital intensity variations, efficiency variations attributable solely to changes in labor, and variations in efficiency which affect both labor and

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[7] C. E. Ferguson, Microeconomic Theory (Homewood, Illinois: Irwin, 1966), pp. 146-48.

[8] Ibid., p. 150n.

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capital in equal proportions. The countries used were the United States, Canada, the United Kingdom, Japan and India. Industries employed for the tests were spinning and weaving, basic chemicals, iron and steel, and metal products. Capital estimates, obtained from balance sheets, were defined as net fixed assets plus land plus cash plus working capital. An estimate of the rate of return on capital was also required and this was defined as gross profit from operations less depreciation. The coefficient of variation was calculated for each parameter. Conclusions pointed to a constant distribution parameter (δ) meaning that any changes in productive efficiency (γ) would affect capital and labor in amounts proportionate to the value of the respective exponents for the capital and labor inputs.[9] The distributive shares would thus remain constant and increases in output would be shared in the ratio of the respective exponents. The Cobb-Douglas production function thus has the property of neutral efficiency variations between capital and labor inputs. In brief, technical change is neutral in the CES (as well as the Cobb-Douglas) function meaning that the output elasticities and the distributive shares of capital and

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[9] Arrow, et al., op. cit., pp. 235-36.

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labor in the national income are unaltered as technological change occurs.

The CES production function was then used to calculate relative productive efficiencies for sample manufacturing industries of Japan to United States industries. The first step was to estimate distribution parameters and the elasticity of substitution for each industry with the latter defined as:

$$(14) \quad \frac{(K/L)_j}{(K/L)_u} = \left(\frac{w_j/r_j}{w_u/r_u}\right)^{\sigma}$$

where K/L is the capital-labor ratio or capital intensity; "w" is the real wage rate; "r" is the real rate of return to capital; σ is an exponent power of the elasticity of substitution; and the subscripts "j" and "u" represent Japan and the United States respectively. The weighted median elasticity of substitution was found to be 0.93 whereas a previous analysis in the same article showed it to be 0.87. The higher former value for the elasticity of substitution (0.93) was attributed to the omission of working capital from the capital intensity index. The authors stated that the elasticity of substitution between working capital and labor is much less than unity and since manufacturing industries were believed to possess large amounts of working capital relative to fixed capital, the elast

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elasticity of substitution would be significantly less than unity for those industries. The inclusion of working capital in the current calculations thus accounted for the lower value of 0.87 compared to 0.93.[10]

Variations in the efficiency parameter (γ) and the real wage rate were studied to establish relative productive efficiencies of selected manufacturing industries in Japan compared with similar industries in the United States. The authors also looked for a positive correlation between the efficiency parameter (γ) and the capital-labor ratio.

Having estimated the distribution parameters (δ) and the elasticities of substitution $\frac{1}{1+\delta}$ for the various industries, the authors determined iso-product curves $\left(\frac{V}{\gamma}\right)$ from commodity prices to generalize their concept of relative productive efficiency by using Figure 1.[11]

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[10] *Ibid.*, pp. 236-39.

[11] *Ibid.*

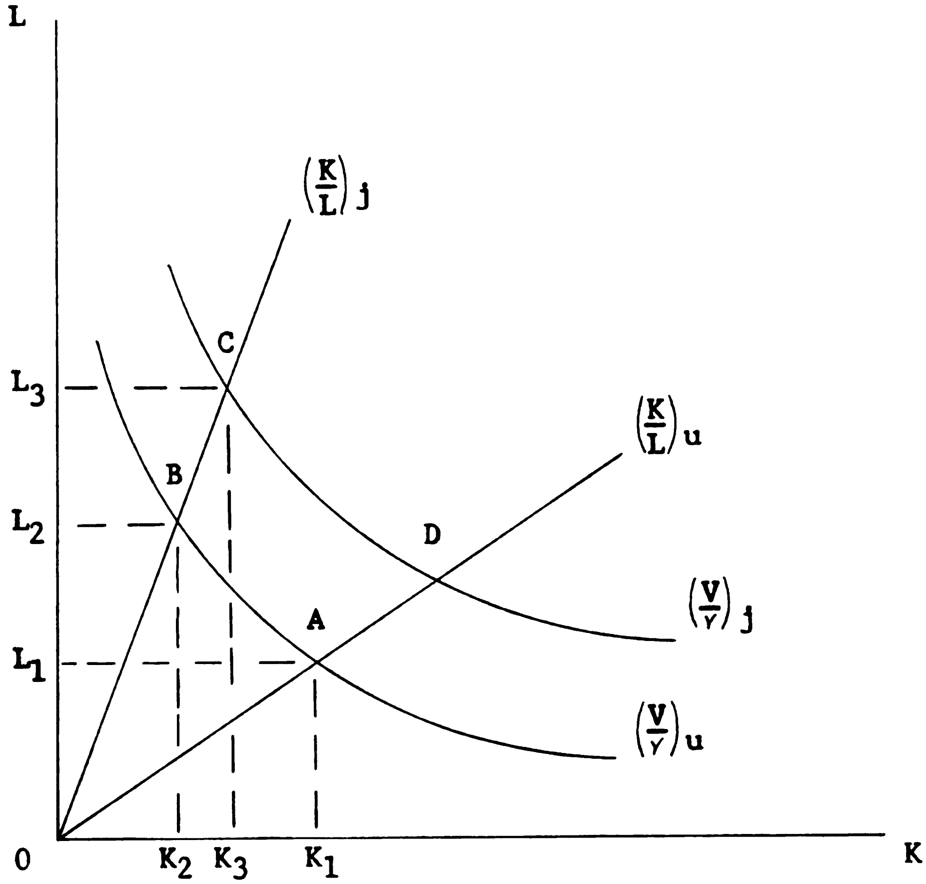

FIGURE 1

RELATIVE PRODUCTIVE EFFICIENCY
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If point A with labor input OL_1 were selected as a starting point, the labor input at point B or OL_2 could be determined by:

$$(15) \qquad \frac{V}{V} = L_1\left[\delta x_u^{-\rho} + (1-\delta)\right]^{-\frac{1}{\rho}} = L_2\left[\delta x_j^{-\rho} + (1-\delta)\right]^{-\frac{1}{\rho}}$$

where "x" is capital intensity. Point B on the isoquant shows factor combinations necessary to generate a unit of output with factor proportions in Japanese industries at industrial levels of efficiency in the United States. Point C shows the actual combination of resource inputs used in Japanese industries for the output at point B. Briefly, the efficiency ratio used by the authors was shown by the ray OC in Figure 1. Therefore, conclusions were that in primary production the efficiency ratio was lower in all cases with a range of 0.13-0.56. In Japanese manufacturing industries except petroleum products, the efficiency ratio was relatively lower when compared with the same United States industries. The authors attributed the efficiency differences to a number of factors which were (1) relative shortages of natural resources which would hamper primary production; (2) tariffs and transport costs protecting inefficient Japanese industries producing for the domestic market; and (3) differences in capital intensity and size of

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General conclusions were that the elasticity of substitution for manufacturing industries may be less than unity but such evidence in the case of primary production was not nearly as strong. Especially pertinent to this paper was the conclusion that relative efficiency differences of Japanese industries to United States industries were less in industries of intensive capital than labor intensive industries indicating that the Hirschman hypothesis may be operative.[13]

The CES production function analysis of international relative productive efficiency improves considerably upon the investigations undertaken by Alejandro and Bacha. Alejandro had no method for isolating efficiency differences. Bacha attempted such an isolation but failed in that he used the same adjustment to obtain productivity differences due to capital intensity and to correct for differences in capital intensity. Thus, Bacha's definition of productive efficiency could not be accepted. The authors of the CES function proceed further because they set forth a sound definition of relative productive

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[12] *Ibid.*, pp. 241-46.

[13] *Ibid.*, pp. 246-47.

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efficiency given their estimation of the production function parameters. It is questionable however, whether the CES production function has any great advantage over the Cobb-Douglas function when both are applied to the same empirical data. In fact, the limiting case of the CES production function is the Cobb-Douglas form since the elasticity of substitution in both cases is unity.

Both functions have identical properties of (1) homogeneity of degree one or constant returns to scale; (2) diminishing marginal product but with no uneconomic regions of production; (3) constant substitution elasticities; and (4) a neutral impact of changes in productive efficiency upon capital and labor inputs which would leave the capital and labor exponents and hence the distributive shares unchanged.

Empirical evidence advanced by Arrow, et al. showing that the elasticity of substitution was substantially less than unity is not corroborated by the present writer. The regression coefficient (b) exhibited a value of significantly less than unity at the 90 per cent level of confidence in only fourteen of twenty-four manufacturing industries or 58.3 per cent of the cases. Given the sample size, it is felt that this evidence is not conclusive enough to say that the elasticity of substitution is less

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than one for manufacturing industries in general.

Moreover, the inclusion of working capital by the authors in the index of capital would distort the true elasticity of substitution between capital and labor. The authors stated that the elasticity of substitution between working capital and labor was much less than unity and concluded from this that since manufacturing industries had large amounts of working capital, the elasticity of substitution would typically be less than one for those industries. Of course, the conclusion could easily be reached that the elasticity of substitution between working capital and labor would be less than unity or perhaps even zero. Working capital is defined as the excess of current assets over current liabilities. Current assets include cash, receivables, prepaid expenses, and inventories which may be categorized as raw materials, work in process, and finished goods. It is hardly legitimate to believe any substitutability exists between the excess of the previously mentioned assets above current liabilities. To obtain a more accurate value for the elasticity of substitution only fixed assets such as machinery, equipment, and assemblies should be employed. An increase in inventories in no way reflects a decrease in labor. A rise in raw materials, goods in process or finished goods might very well r

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necessitate a rise in labor inputs. Inventories, in addition, cannot be considered an input but the result of inputs of labor and/or fixed capital. In short, this writer agrees with Arrow, et al. that the elasticity of substitution between working capital and labor is much lower than unity or even close to zero but the current writer does not agree that working capital is an input which is substitutable for labor. When the originators of the CES production function omitted working capital in their definition of the capital input during a section of their investigation, the elasticity of substitution between capital and labor took on a higher value (0.93) than when working capital was included as part of the capital index (0.87).

The CES function was used in a subsequent study to compare relative labor productivities for eleven manufacturing industries between the United States and Peru.[14] Labor productivities were given and then the CES function was applied to the empirical data to determine what labor productivity in Peru would be with the United States capital-labor ratio for the selected manufacturing

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[14]C. Clague, "An International Comparison of Industrial Efficiency: Peru and the United States," Review of Economics and Statistics, Vol. 49 (November, 1967), pp. 487-93.

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industries. Labor efficiency was defined along the lines of the CES study and capital inputs were defined as the interest rate plus depreciation charges. The annual input cost per \$100 worth of capital was calculated as:

$$(16) \quad p = i\$100 + d$$

where "i" is the rate of interest and "d" is the amount set aside from the earning stream of the asset to get back \$100 at the end of the asset's life. The "d" value was calculated as:

$$(17) \quad \sum_{t=1}^{n} d = \frac{\$100}{(1+i)^{n-t}}$$

where "n" is the life of the asset. Calculation of relative efficiency was then calculated on the basis of the average interest rate between the two countries. The average rate of interest was assumed to be 12.4 per cent and it was further assumed that the opportunity cost of internal financing was correctly represented by the interest rate. The assumption of opportunity cost enabled the interest rate to properly reflect the marginal productivity of capital. Capital figures for Peru were converted to United States prices by dividing the Peruvian figures by an index of one hundred fifty. Since the value of buildings was not available for Peru, it was assumed that the United States share of buildings in total fixed capital also applied to

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Peru. The relative price of all fixed assets in Peru was then computed by the formula, x(1.0) + (1-x)(1.5). After estimating capital requirements and calculating relative efficiencies, the author found a high positive Spearman rank correlation coefficient (+0.71) between relative efficiency and the United States level of capital intensity, and that relative efficiencies for the eleven Peruvian industries were lower than United States levels. However, given the nature of the empirical data and the author's method of estimating capital, this writer feels that Clague's results were inconclusive.

Another article, by Edward J. Mitchell, examined the relationship of average man hour output and the wage rate for eleven developed countries and a total of seventeen developed and underdeveloped countries.[15] The developed countries were Australia, Canada, New Zealand, Norway, South Africa, Sweden, the United Kingdom, the United States, Denmark, Puerto Rico, and Finland selected for the year 1958. The underdeveloped countries, chosen for 1958, were designated as Greece, Japan, Peru, the Philippines, Turkey, and the United Arab Republic. The following regression

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[15] Edward J. Mitchell, An Econometric Study of International and Interindustrial Differences in Labor Productivity (Santa Monica, California: Rand Corporation, December, 1966), 97 pp.

line was employed in the analysis:

$$(18) \quad \log \frac{V}{L} = \log a + b \log w + e$$

where $\frac{V}{L}$ is average output per head of labor; "w" is the wage rate; and "e" a residual error term.

Like the authors of the CES production function, Mitchell used his regression equation to determine whether the "b" coefficient was significantly different from unity and the constancy of the wage share. The developed countries supported the hypothesis that the "b" coefficient was not different from unity at the 5 per cent level of significance. Therefore, the elasticity of substitution for the developed countries assumed a value of unity. For the developed and underdeveloped countries combined, the hypothesis was rejected at the 5 per cent significance level. Overall conclusions however, were that the wage share of national income was approximately constant over a span of time which indicated a constant unitary substitution elasticity between capital and labor.

Mitchell also proposed a method for isolating differences in value added because of labor efficiency differences. Variations in labor efficiency among countries were attributed mainly to differences in the quality of labor with average wage differentials accounting for variations in labor quality. Mitchell then put forth a basic form of the Cobb-Douglas production function:

$$(19) \quad r = \alpha A \frac{K}{L}^{1-\alpha}$$

where "r" is the rate of return to capital or the marginal product of capital which is assumed to be equal among countries; α is the elasticity of substitution; and $\frac{K}{L}$ is the capital-labor ratio or level of capital intensity.

Mitchell stated that a 1 per cent change in the efficiency parameter (A) would cause a $1-\alpha$ change in value added. Changes in technology and efficiency (the greater the quality of labor, the greater would be the marginal product of capital for any given capital-labor ratio) were presumed to be reflected in $1-\alpha$. Changes in α were attributed to changes in capital intensity levels. His method for isolating productive efficiency differences did not require the collection of capital data due to his assumption of equalization of capital rates of return made possible by the mobility and homogeneity of international capital movements. Productive efficiency differences then were exclusively reflected in the quality of labor which was assumed to have very low international mobility.

Mitchell did not calculate relative productive efficiencies for the industries in the different countries.

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He merely set forth a method for doing so. However, Mitchell's analysis gives support to the notion that substitution elasticities between capital and labor are approximately unity among several countries and industries. On that score one point should be mentioned. Puerto Rico was used in his analysis and since Puerto Rico is used in this present analysis as an underdeveloped country, the case for usage of a Cobb-Douglas production function is strengthened.

A study by Fuchs in 1963 showed that the data used by the authors of the CES function do not support or necessarily imply that the elasticity of substitution is less than unity. Fuchs proposed that when two different groups of countries are compared, each group could have an elasticity of unity, but different intercepts for the regression lines. When the lines are combined, the regression coefficient (the elasticity of substitution) may be subject to a downward bias. This proposition is demonstrated in Figure 2.[16]

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[16] Victor R. Fuchs, "Capital-Labor Substitution: A Note," Review of Economics and Statistics, Vol. 45 (November, 1963), pp. 436-38.

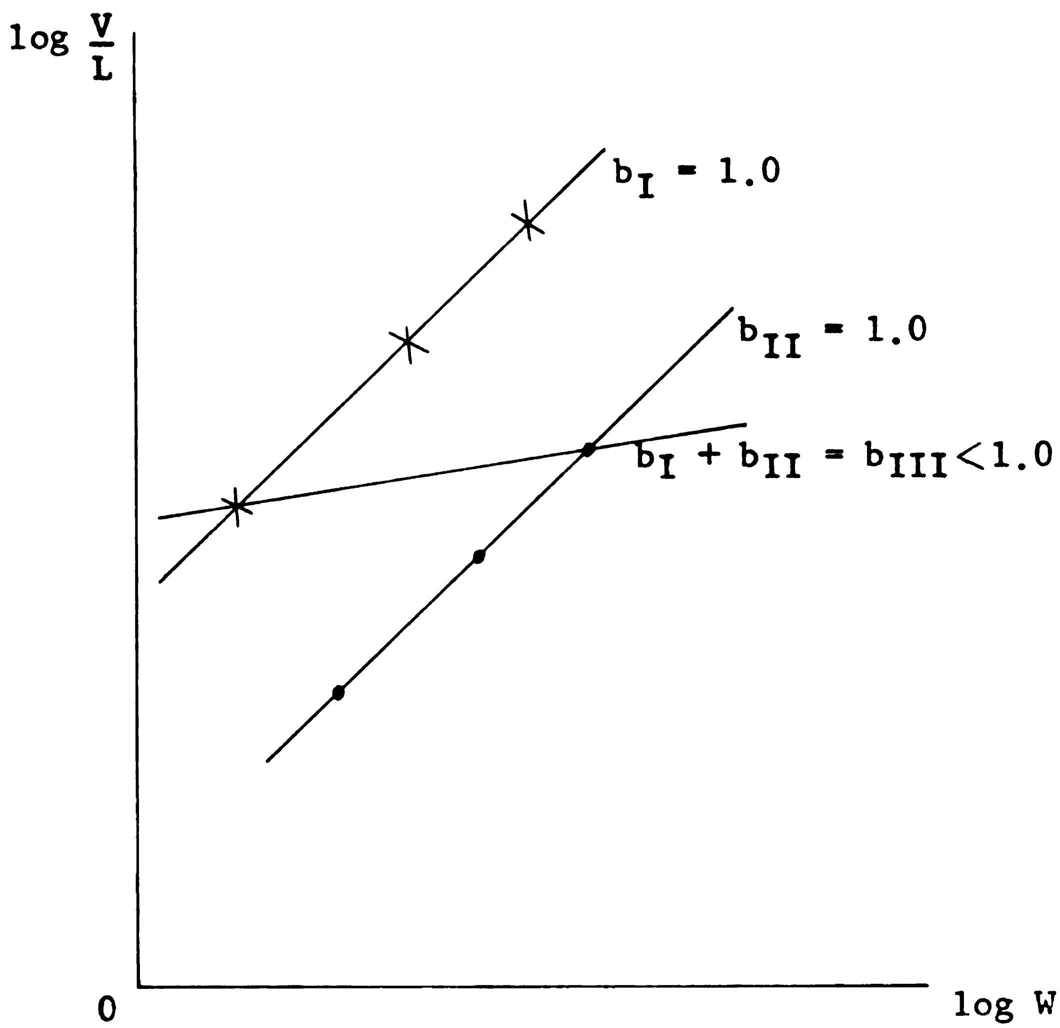

FIGURE 2

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The "b" terms are the regression coefficients and the subscripts denote the respective country groupings. The line with numeral III indicates a summation of the regression coefficients. The relationship shown on Figure 2 is between value added per unit of labor $\left(\frac{V}{L}\right)$ and the wage rate (W) and is represented by the regression equation, $\log \frac{V}{L} = \log a + b \log W + E$.

Fuchs tested the CES production function for this downward bias using the same industries, years, countries, and regression equation as Arrow, et al. The countries were divided into developed and underdeveloped categories. The authors of the CES function made no such categorization. Fuchs concluded that the regression coefficient (b) for both groups of countries was not significantly different from unity indicating the elasticity of substitution to be constant and unity. Fuchs also used a shift coefficient to measure differences in the elasticity of substitution between capital and labor resulting from different payroll data and different wage accounting systems in various countries. Again, the conclusions were that the elasticity of substitution was constant and unity.

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C. E. Ferguson tested the elasticity of substitution for 129 samples obtained from 61 industry groupings.[17] The industries were selected from the four digit classification of the United States Census of Manufactures. The census years were 1947, 1954, and 1958 and the ensuing regression line was employed:

$$(20)\quad \log v = \log a + b \log w + u$$

where "v", "w", and "u" respectively represented value added per worker, the wage rate and a random error term.

The regression coefficient (b) was found not to be significantly different from unity in more than one half of the 129 samples. For 13 per cent of the samples, the "b" value was between zero and one and in 16 per cent of the cases the "b" value was greater than one. The latter value would indicate some presence of increasing returns to scale. Ferguson further concluded that the elasticity of substitution has changed randomly over time shifting from values between zero to unity and greater than unity for many industries.

The previous critique of the CES production function was not intended to substantiate the correctness of the

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[17]C. E. Ferguson, "Cross Section Production Functions and the Elasticity of Substitution in American Manufacturing Industry," Review of Economics and Statistics, Vol. 45 (August, 1963), pp. 305-13.

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Cobb-Douglas procedure for empirical testing. Rather, the critical evaluation was designed to show that the CES production function is not a strong or reliable repudiation of the Cobb-Douglas technique if empirical observations of elasticity of substitution coefficients are the basis for negation. The basic form of the Cobb-Douglas production function is used in the current study. Since much of the criticism of the function hinges on its constant elasticity of substitution of unity, empirical justification for the capital and labor exponent values used was a necessary undertaking.

All the studies reviewed make essentially the same assumption as this analysis; namely, the application of a single regression equation for all industries within a country and for the countries whose industries are compared. In brief, a single regression equation is used by all the studies cited here. Many of the studies reviewed here established the crucial relationship as between value added or value of output per unit of labor and the wage rate and then tested for the value of the elasticity of substitution coefficient. The authors of the CES article also put forth an alternative production function to the Cobb-Douglas form for empirical testing and tested relative efficiency differences between the United States and Japan. In addition

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addition, Mitchell offered a procedure to isolate relative efficiency differences by varying an efficiency parameter (A) and judging the change in $1-\alpha$. The causal relationship in Mitchell's paper is different from this analysis. Heath compared relative labor productivities between Canada and Great Britain but did not offer a method to judge an efficiency difference. Clague used the CES function to test for efficiency differences but was not clear on his procedure or methodology. Bacha also offered a method to correct for efficiency differences but was shown to be incorrect. In any event, the studies which were mentioned in this chapter were to establish the validity of the Cobb-Douglas procedure and to show that useful conclusions can be drawn with the application of a single production function among industries and countries.

Thus far, comments regarding the shortcomings of applying production functions to empirical data were confined mainly to the mathematical properties and the underlying assumptions regarding the resource and product markets of these functions. There may however, be more fundamental criticisms than those discussed earlier. The most vital part of any production function is the possibility of technical factor substitution set forth by the function. A high or low regression coefficient or a high

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coefficient of determination is not an adequate description of a production theory. Nor does a good fit of a Cobb-Douglas function to empirical data reflect the true possibilities of capital-labor substitution. Empirical data are not able to reflect technical factor substitution and hence a production function. For aggregation purposes dollar values must be used for physical inputs and outputs. Even if physical quantities are available their heterogeneous nature would prevent any meaningful aggregation. Labor inputs could be represented by man hours of labor but this measure does not reflect intensity of effort. High capital-labor ratios may contain a high degree of unused capital and excess capital capacity is not shown on balance sheets. Balance sheets in turn, show fixed assets at historical costs and not market values. Market values for capital assets would indicate a more accurate output indicator for capital and therefore a truer rate of return to fixed assets.[18] All the above problems are compounded when different accounting systems come into play with international productivity comparisons.

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[18]*Ibid.*, pp. 311-12.

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Solow had made further comments regarding empirical production functions:

> Production functions are best suited to the realm of general equilibrium analysis and micro theory. However, some amount of aggregation is necessary to make them useful (for empirical testing and predictive purposes). At this point two tacks are possible. One is to try to preserve the rigor of the theory by making special assumptions and defining special aggregates so that the underlying microeconomic relationships entail the existence of corresponding macroeconomic relationships. The other is to give up (some) rigor in favor of empirical practicality, to use conventionally defined aggregates and index numbers, and to construct macroeconomic relationships more or less by analogy with microeconomics. But it seems to me to be a mistake to ask deep philosophical questions of such loose concepts. Index numbers will not behave like the physical commodities they are supposed to mimic. They are not trying to do so; they are empirical compromises. They need scrutiny, of course, but of an appropriate kind.[19]

This analysis is constructed along the lines of the second approach outlined by Solow. Given the hypothesis and purposes of this paper empirical compromises can still yield useful predictions. Market values are indeed better indicators of capital or fixed asset values than historical costs. But the only way true and accurate market values could be determined is through liquidation of plant assets. Then the industry is no longer a going concern and

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[19]Robert M. Solow, "Comment: Concepts and Measures of Changes in Productivity," Review of Economics and Statistics, Vol. 41 (August, 1959), pp. 282-85.

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productivity comparisons are meaningless. Dollar values moreover, provide a useful mechanism for the aggregation of heterogeneous types of capital equipment. As far as the specific form of the production function applied to the empirical data in the body of this work, namely, the Cobb-Douglas, no mandatory alternative has been offered to refute its practicability for empirical testing. Evidence for the United States as well as on an international scale upholds the constancy of the wage share and a constant elasticity of substitution between capital and labor of unity.

III. SUMMARY

The purposes of Chapter I were to (1) set forth the working hypothesis; (2) frame the analytical apparatus; and (3) establish the methodological viability of the analytical framework. The hypothesis was stated and the methodological approach for testing this hypothesis was put forth as fitting regression equations and Cobb-Douglas production functions to empirical data on capital, output, and labor for a cross section of selected manufacturing industries among selected countries. The chosen countries were Mexico, Puerto Rico, and the United States with the United States designated as the comparative standard. The

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relative labor outputs of Mexico and Puerto Rico at relative levels of capital intensity would be compared and measured by the regression and Cobb-Douglas functions and changes in value of output per labor unit to changes in capital intensity levels would be calculated. Relative labor efficiencies also would be determined. In connection with methodology, some previous studies of international labor productivity comparisons were cited and their procedural mistakes examined. Since the present analysis assumes that all industries in all countries operate with Cobb-Douglas production functions, justification for its application toward empirical data was made. This was done by examining studies which made use of empirical production functions of the Cobb-Douglas type. At best, some studies concluded that the elasticity of factor substitution was constant and unity. At worst, it was concluded that nothing could be said about elasticity of factor substitution values between capital and labor. The findings of the authors of the CES production function were also considered inconclusive. In the absence of any mandatory or compelling alternatives to the Cobb-Douglas approach and the use of money values as indexes of capital-labor substitution, the current methodological tack can be justified within the light of previous studies of this type. The belief o

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belief of this writer is that useful conclusions are not precluded by such procedures.

Chapter II discusses the regression equation, Cobb-Douglas function, and other analytical procedures in great detail. Sources and handling of the empirical data, combination of years, and the choice of industries are also explained. The notion of economic efficiency is then discussed. An Appendix of the calculations is presented at the end of the thesis.

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CHAPTER II

METHODOLOGY

I. THE EQUATIONS

Preliminary tests of the hypothesis employ a multiple linear regression function in arithmetic and logarithmic form. The second method assumes that all industries in all countries operate with Cobb-Douglas production functions and uses these functions to obtain a labor efficiency ratio for each industry in Mexico and Puerto Rico.

The Regression Function

The initial calculations show relationships between relative labor productivities under appropriate levels of capital intensity (United States = 100). The regression function is also used for testing the Hirschman hypothesis. The dependent variable in the regression equation is the relative output between Mexico or Puerto Rico to the United States. The predictor or independent variables are the relative levels of capital intensity and average levels of capital intensity between the compared countries. The symbols used in the regression function are defined as follows: V is aggregate output; L is the amount of labor; K is the quantity of capital; and "m", "p" and "u" are subscrip

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subscripts representing Mexico, Puerto Rico, and the United States respectively.

If Mexico and the United States are compared, the regression equation in arithmetic terms is:

$$(21)\quad \frac{Vm/Lm}{Vu/Lu} = a + b_2 \frac{Km/Lm}{Ku/Lu} + b_3 \frac{\left(\frac{Km}{Lm} + \frac{Ku}{Lu}\right)}{2}$$

where $\frac{Vm/Lm}{Vu/Lu}$ is the relative labor productivity; $\left(\frac{Km/Lm}{Ku/Lu}\right)$ is the relative capital-labor ratio; and $\frac{\left(\frac{Km}{Lm} + \frac{Ku}{Lu}\right)}{2}$ is the average level of capital intensity between Mexican and United States industries.[1] To make comparisons for the United States and Puerto Rico, "p" would replace "m" along with the Puerto Rican output, labor, and capital figures. If Y stands for the relative labor productivity, X_2 for the relative level of capital intensity, and X_3 for the average level of capital intensity, the regression equation can be written as:

$$(22)\quad Y = a + b_2 X_2 + b_3 X_3$$

and the logarithmic form of equation (22) above is:

$$(23)\quad \log Y = a + b_2 \log X_2 + b_3 \log X_3.$$

The equations (22) and (23) are the maximum likelihood estimators for the data essentially meaning that the sum of the squared deviations around the regression plane

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[1]Hardin and Strassmann, op. cit., pp. 51-62.

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will be minimum no matter which equation is used. However, both the arithmetic and logarithmic forms of the function are used to determine which equation best describes the data in terms of higher correlation and determination coefficients. The regression coefficients (b_2 and b_3) show how changes in relative and absolute levels of capital intensity affect relative labor productivity. A positive sign for the b_2 coefficient means that Mexican and Puerto Rican industries approximate United States labor productivity levels in those industries where the relative value of the capital-labor ratio is high. An industry which has a relative capital-labor ratio one unit or 1 per cent higher than another industry also has a relative value of product b_2 units or b_2 per cent higher than the latter industry. Similarly, a one unit or 1 per cent change in the relative capital-labor ratio leads to a b_2 unit or b_2 per cent change in the relative output per unit of labor provided that the b_3 coefficient is held constant. Coefficient b_3 reveals how changes in the average level of capital intensity affect relative labor productivity if b_2 is held constant.

Cobb-Douglas Procedure

Labor productivity differences do not reveal labor efficiency differences if there has been no adjustment for differences in capital intensity between the industries under investigation. The method used in this analysis makes such an adjustment assuming that Cobb-Douglas production functions are applicable for all the selected industries in Mexico, Puerto Rico, and the United States. The Cobb-Douglas production functions are written down for the United States, Mexico, and Puerto Rico respectively as:

(24) $Vu = CuKu^{g}Lu^{h}$

(25) $Vm = CmKm^{j}Lm^{k}$

(26) $Vp = CpK_{p}^{r}L_{p}^{s}$

where V is output volume; C is a proportional constant; K is the amount of capital; L is the amount of labor; "g" and "h" are the capital and labor input exponents in the United States; "j" and "k" are the capital and labor input exponents in Mexico; and "r" and "s" are the capital and labor input exponents in Puerto Rico.

If equation (24) is divided on both sides the average productivity of labor is obtained as:

(27) $\frac{Vu}{Lu} = Cu\left(\frac{Ku}{Lu}\right)^{g}.$

If Mexico is the country being compared to the United

States, equation (25) is divided on both sides by Lm and there results:

$$(28) \quad \frac{Vm}{Lm} = Cm \left(\frac{Km}{Lm}\right)^{j}.$$

Then a ratio of the average labor productivities of Mexico to the United States is taken as:

$$(29) \quad \frac{Vm/Lm}{Vu/Lu} = \frac{Cm}{Cu} \frac{(Km/Lm)^{j}}{(Ku/Lu)^{g}}$$

where $\frac{Vm/Lm}{Vu/Lu} = P$; and $\frac{Cm}{Cu} = z$.

A labor efficiency ratio (E) can now be stated as:

$$(30) \quad E = z\ (Ku/Lu)^{j-g}$$

provided that equation (29) is solved for "z".[2] Equation (30) shows what Mexican labor productivity would be in a given Mexican industry if that industry had the same capital-labor ratio as the equivalent United States industry assuming values for the "g" and "j" exponents. A labor efficiency ratio (E) can also be calculated by solving equation (29) for "z" and by substituting that value into equation (30) resulting in:

$$(31) \quad E = P \left(\frac{Ku/Lu}{Km/Lm}\right)^{j}.$$

As long as the exponent summations for both countries are constrained to unity and constant returns to

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[2] *Ibid.*, pp. 55-58, and Strassmann, *op. cit.*, pp. 78-81.

scale are assumed, equation (31) can be used to show labor productivity in a Mexican industry which operates with the United States capital intensity level for that same industry. Equation (31) is superior to equation (30) in that equation (31) requires an assumption about the capital input exponent of the Mexican industry alone.[3] In brief, the inverse of the observed relative capital-labor ratio between Mexico and the United States is raised by an exponent power of the capital intensity level for a given Mexican industry. The resulting figure is then multiplied over the relative labor productivity for the selected industry. A labor efficiency ratio (E) is thus obtained. The procedure dictated by equation (31) is used in this analysis under the assumption of constant returns to scale. Of course, if Puerto Rico is taken into account rather than Mexico, the same analysis is followed with equation (26) substituting for equation (25).

The results of the calculations from equation (31) are shown in the Appendix under varying values for the capital elasticity of substitution coefficient. The elasticity values assumed here are the two extreme values 0.9 and 0.1 with intermediate values of 0.7, 0.4, and 0.3.

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[3] Ibid.

After calculating the labor efficiency ratios, the weighted mean values of the labor productivity and efficiency ratios are calculated with the mean statistic:

(32)
$$\bar{X} = \frac{\sum_{j=1}^{n} w_i X_i}{\sum_{j=1}^{n} w_i}$$

where "w" is a weight representing capital (K) or labor (L); and $\bar{X}$ is mean labor productivity (P) or mean labor efficiency (E).

<u>The Assumption of Increasing Returns to Scale</u>

If increasing returns are assumed, equation (31) is unsatisfactory for computing a labor efficiency ratio because only the capital input exponent is known. Both capital and labor exponents must be included to incorporate the effect of increasing returns into the analysis. However, by writing an unrestricted Cobb-Douglas production function, that is, by allowing the exponent powers to sum to greater than unity and by rewriting equations (27) and (28), the analysis can incorporate the influence of increasing returns to scale. Equation (27) now becomes:

(33) $$\frac{Vu}{L_u^h} = Cu(Ku^g).$$

Equation (28) is also rewritten as:

$$(34)\quad \frac{Vm}{L_m^k} = Cm(K_m^j).$$

Taking a ratio of equations (33) and (34) there obtains:

$$(35)\quad \frac{Vm/Lm^k}{Vu/L_u^h} = z\left(\frac{K_m^j}{K_u^g}\right).$$

Equation (35) is solved for "z" and its value substituted into equation (36) to obtain a labor efficiency ratio which is:

$$(36)\quad E = z\ (Ku/Lu)^{j-g}.$$

Equation (36) is the same as equation (30) and is appropriate for calculating a labor efficiency ratio under increasing returns. Since an assumption must be made about the value of all the exponents for both the United States and Mexico, the problem is now to pick plausible values for those exponents. A study made by Walters has revealed some insights into the problem of choice of exponents under increasing returns.[4] Walters criticized Solow's assumption of constant returns to scale in the aggregate production

[4]A. A. Walters, "A Note on Economies of Scale," Review of Economics and Statistics, Vol. 45 (November, 1963), pp. 425-27.

function[5] and then proceeded to fit a Cobb-Douglas function with an exponential trend to Solow's data to calculate elasticity of substitution values. In three separate tests, Walters found that the sum of the elasticity of substitution coefficients was 1.353, 1.265, and 1.375. The capital input exponents in each case were 0.125, 0.187, and 0.151 and in all of the tests Walters found that the elasticity of substitution coefficients were greater than unity. He concluded that 27 to 35 per cent of the increase in aggregate output over the years studied by Solow was due to economies of scale.

A previous article by Walters made a comprehensive survey of the literature concerning production functions.[6] Among the topics discussed were estimation and identity problems and the value of the exponents in the Cobb-Douglas production function. The author found some evidence that the elasticity of substitution was not unity but the more general case was that the elasticity of substitution was approximately unity for industries in various countries as well as the United States. Walters concluded however, that

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[5]Robert M. Solow, "Technical Change and the Aggregate Production Function," Review of Economics and Statistics, Vol. 39 (August, 1957), pp. 317-20.

[6]A. A. Walters, "Production and Cost Functions," Econometrica, Vol. 31 (January-April, 1963), pp. 1-66.

nothing conclusive could be said about economies of scale. He said those industries which concluded that the elasticity of substitution was approximately unity used inputs as a measure of the variation in plant size. Hence, the result was a proportionate change in value added, which, in turn, led to a constant elasticity of substitution between capital and labor.

This current study incorporates Walter's findings concerning Solow's data and uses a value of 1.3 as the summation of the exponent powers indicating increasing returns. This is approximately the average for all three of the tests conducted by Walters. Ten industries are selected for the United States and Mexico and five industries are chosen for the United States and Puerto Rico. Three cases are subsequently examined.

(1) The compared countries both operate under increasing returns with the same exponents.

(2) Mexico and Puerto Rico operate under increasing returns with the United States under constant returns and the capital input exponent for Mexico or Puerto Rico is greater than the capital input exponent for the United States.

(3) The United States works under increasing returns with Mexico and Puerto Rico exhibiting

constant returns. The capital input exponent for the United States is greater than the corresponding capital input exponent for Mexico or Puerto Rico.

II. THE DATA

The following section defines the sources and treatment of the data to which the equations are applied. Definitions of output, capital, and labor are also discussed.

Sources of Data

For the United States, output and employment figures were obtained from the Census of Manufactures for 1958 and 1963. Capital figures were provided by the Annual Survey of Manufactures for 1964. The Puerto Rican Census of Manufactures for 1958 and 1963 yielded data on output, labor, and capital. Mexican figures on output, labor, and capital were derived from the Industrial Census of Mexico for 1956, 1961, and 1966.

Selection of Years

The combinations of years selected for comparison are apparent from the tables showing the calculations. The choice of years was dictated by availability of good census information concerning the data. Comparisons were made on the basis of proximity of years for both countries. Whenever averages of years were compared it was not the averages of the capital-labor or value of product per unit of labor ratios but the averages of the raw data subsequently converted to the proper ratios.

Selection of Industries

Industries were chosen on the basis of product homogeneity and availability of statistics. The criterion of product homogeneity is considered especially important since, without that criterion, comparisons would be meaningless. Of course, availability of statistics is always the final factor in the selection of any industry. For instance, many industries in Puerto Rico could not be chosen because of a lack of capital data or information with which a reasonable capital estimate could be made. The Puerto Rican census only reveals capital data for industries with ten or more employees. Also, much capital reporting is not given in order that individual company totals are not disclosed.

In most cases the four digit industrial classification was used because Mexico had only four digit classifications except for power companies and petroleum and to avoid double counting in the output value for the United States and Puerto Rico. Some three digit classifications were used and some four digit classifications were added for any country when it was necessary to obtain output comparability.

The Data

Most of the data was directly obtainable from the various censuses but some capital estimates were necessary. All output and capital figures are shown in dollar values by converting Mexican pesos at the appropriate rate of exchange.

Output. This figure was directly obtained from all censuses and is defined here as the dollar value of net sales. This definition is consistent for all countries. Value added of output may have been a better measure to use but the Mexican census provided no figures for value added. In the case of the United States and Puerto Rico, "value of shipments" is synonomous with the definition of output used here and there is some possibility of double counting when value of shipments is used rather than value added. The Census of Manufactures does reveal however, that double counting is negligible when the four digit classification is used. No mention of double counting was made in the

Mexican census but it can be assumed that double counting is negligible for Mexico in the value of output figures since four digit classifications were used there also. The important consideration however, is not so much that value added or value of product be used but that the definitions be consistent among countries.

Capital. The gross book value of fixed assets defines capital. Fixed assets are plant and equipment, machinery, tools, and buildings. Working capital, for reasons discussed in Chapter I, was excluded from the definition of capital. The Mexican censuses for 1956 and 1961 did provide total fixed capital figures but the 1966 census only provided total capital (fixed plus working capital). Total fixed capital was estimated during 1966 by taking the proportion of fixed to total capital during 1961 for each Mexican industry and assuming this rate was applicable to the same industry during 1966. By multiplying the appropriate rate over total capital for each industry, total fixed capital was derived industry by industry.

The Annual Survey of Manufactures of the United States for 1964 provided total fixed asset figures as well as the rental value of fixed capital equipment and machinery for 1964, 1963, 1962, and 1957. Thus 1963 capital figures were directly obtained for the United States industries. The fixed capital figures for 1954 and 1958 were estimated by obtaining an index of capital growth of each year to each succeeding year.[7] An average index of fixed capital growth was obtained over the seven year period, 1957-64, for each industry. The average index was divided into the 1963 fixed capital figure plus rentals and into each consequently lower figure until the required capital figures were reached in each industry for 1958 and 1954. If the 1958 figure was lower than the 1957 fixed capital book value, the 1957 book value was adjusted upward by the index of growth for that industry. A check was then made to determine the accuracy of the estimates. Since all industries for 1958 showed higher fixed capital figures than 1957, net investment should have occurred for 1958. In fact, total net investment for 1958 was $18 billion[8] and thus the accuracy of the estimates is corroborated in the total sense.

For Puerto Rico, only net investment and expenditures

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[7]If the years represent the figures, the indexes were computed as $\frac{1964}{1963} \times 100$, $\frac{1963}{1962} \times 100$, and $\frac{1962}{1957} \times 100$.

[8]Board of Governors, "Financial and Business Statistics, U.S.," Federal Reserve Bulletin, Vol. 50 (January, 1964), pp. 104-5.

on consumed plant and equipment were provided. To estimate total fixed capital for Puerto Rican industries, the ratio of expenditures of used plant and equipment to total fixed capital was calculated for comparable industries in the United States. This rate was then divided into the expenditures on used plant and equipment for the same Puerto Rican industry. Net investment was added to that figure to obtain total fixed capital for each industry in Puerto Rico during 1958 and 1963. This procedure assumed that each Puerto Rican industry was replacing fixed assets at the same rate as the comparable United States industry.

To the extent that rental values do not reflect the true book value of assets which are rented, the capital data for the United States may be underestimated. Since rental values are not known for Puerto Rico and Mexico, capital figures for those industries may also be underestimated.

Labor. Employment figures were defined as production and non-production workers and, for the Mexican case, any worker who was not permanently attached to the industry but who may have contributed to production during the year. These figures were directly obtained from all of the censuses. The justification for including all workers rather than just production workers is that any workers may contribute to production whether directly or indirectly involved in the manufacturing process. The Hirschman hypothesis also lends justification to including workers directly or indirectly involved in production.

III. SUMMARY

This chapter described the regression equation used in the analysis and the Cobb-Douglas procedure used to test the hypothesis. The Cobb-Douglas production function was also applied to selected industries assuming the sum of the exponents showed increasing returns to scale. The empirical data was also analyzed in terms of its sources and years, definitions, and estimation methods.

Chapter III presents a summary and detailed discussion concerning the initially introduced hypothesis and the calculations which support that hypothesis. The first part of the chapter presents overall results and conclusions for purposes of brevity and clarity. There follows a detailed explanation for completeness and conciseness.

CHAPTER III

INTERPRETATION OF THE CALCULATIONS

I. GENERAL RESULTS AND CONCLUSIONS

Labor Efficiency Summary Statistics

The arithmetic mean values of the labor efficiency ratios are presented for Mexico and Puerto Rico on the following pages. Table 1 summarizes the results for Mexico and Table 2 gives the summary results for Puerto Rico. Column (3) shows the employment weighted arithmetic means of the labor efficiency ratios while column (4) contains the unweighted labor efficiency means of the Cobb-Douglas results. Column (5), or antilog "a", shows the labor efficiency ratios when the exponent values for capital and labor inputs are the same for the compared countries. Column (5) was computed using the simple logarithmic linear regression:

(37) $\log Y = a + b_2 \log X_2$

where $Y = \frac{Vm/Lm}{Vu/Lu}$, or relative output value for Mexico; and $X_2 = \frac{Km/Lm}{Ku/Lu}$, or the relative capital labor ratio for Mexico. The subscript "p" replaces "m" when Puerto Rico is compared to the United States. The antilog of the constant term "a" is the ratio of the two constant terms in the two

TABLE 1

EMPLOYMENT WEIGHTED AND UNWEIGHTED MEAN LABOR EFFICIENCY RATIOS FOR MEXICO

1	2	3					4					5
Years Mexico to the United States	No. of Indus-tries	Employment Weighted Means (Cobb-Douglas Mexican Capital-Input Elasticities)					Unweighted Means					Anti-log a
		0.9	0.7	0.4	0.3	0.1	0.9	0.7	0.4	0.3	0.1	
1956 to 1954	39	0.93	0.59	0.30	0.24	0.15	1.02	0.60	0.29	0.23	0.14	0.17
1956 to 1958*	39	0.94	0.62	0.34	0.27	0.18	0.91	0.52	0.24	0.19	0.12	0.19
1961 to 1958	60	0.77	0.55	0.36	0.32	0.25	0.81	0.57	0.37	0.32	0.25	0.32
1961 to 1963	60	0.87	0.57	0.33	0.28	0.20	0.92	0.59	0.34	0.29	0.21	0.42
1966 to 1963	59	0.74	0.56	0.38	0.33	0.26	0.82	0.62	0.42	0.37	0.30	0.41
Averages for 1961+66 to 1958+63	60	0.74	0.57	0.40	0.35	0.28	0.76	0.58	0.41	0.36	0.30	0.28

*Only the summary results for 1956 to 1958 comparisons are presented. The writer feels that there has been enough detail with respect to the other compared years.

TABLE 2

EMPLOYMENT WEIGHTED AND UNWEIGHTED MEAN LABOR EFFICIENCY RATIOS FOR PUERTO RICO

1	2	3					4					5
Years Puerto Rico to the United States	No. of Indus-tries	Employment Weighted Means (Cobb-Douglas Puerto Rican Capital-Input Elasticities)					Unweighted Means					Anti-log a
		0.9	0.7	0.4	0.3	0.1	0.9	0.7	0.4	0.3	0.1	
1958	22	0.87	0.74	0.63	0.60	0.56	1.07	0.87	0.67	0.63	0.57	0.55
1963	33	1.35	1.02	0.73	0.66	0.56	1.83	1.34	0.90	0.81	0.67	0.55
Averages for 1958+63	22	1.14	0.91	0.69	0.64	0.56	1.46	1.12	0.79	0.72	0.61	0.59

Cobb-Douglas production functions one representing Mexico or Puerto Rico and one representing the United States in equation (37). Then antilog "a" shows overall labor efficiency for either Mexico or Puerto Rico when the capital and labor input exponents are the same as the United States.[1]

Summary Results for Mexico

Table 1 reveals that Mexican labor efficiencies for all years and columns are lower than United States levels except for the 1956-54 comparison in column (4) under the 0.9 exponent. Column (5) follows the same general trend as both the weighted and unweighted Cobb-Douglas results and corresponds most generally to the exponent values of 0.3 and 0.4. It should be mentioned that a 0.9 capital input exponent is an extreme assumption for a Cobb-Douglas function. This means that a 100 per cent change in labor inputs leads to a 10 per cent output change (holding capital constant). Further, the term "labor efficiency" not only applies to worker characteristics but to all factors affecting output per unit of labor after capital stock adjustments are made. This becomes apparent as the analysis

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[1]Hardin and Strassmann, op. cit., pp. 55-62, and Strassmann, op. cit., pp. 78-81.

continues.

There is little difference in the values of the weighted and unweighted means in Table 1 and, as expected, both vary directly with the assumed capital exponent power. The 1956-58 comparisons yield increasing labor efficiencies over 1956-54 for the weighted means but decreasing efficiencies in the unweighted columns. This is a result of higher labor weights being associated with higher labor efficiencies thereby raising weighted averages over the years, 1956-54. Reliance must be placed on the unweighted means for 1956-58 since United States capital-labor ratios increased along with relative output values from 1956 to 1958. The overall productivity of capital fell for Mexico in 1956-58 (1.35-1.21).

Generally, except for 1956-54, and the average year comparisons, both the weighted and unweighted means increase or decrease in the same manner under all exponents for all the compared years. For 1961-58, labor efficiencies have fallen from the previous relative year (1956-58) in the upper regions of the capital input exponent (0.9 and 0.7 in column 3 and 0.9 in column 4) while rising for the lower exponent regions. Exactly the reverse is true when 1961-63 is compared to 1961-58. Labor efficiencies have risen for the weighted and unweighted calculations (0.9-0.7) but have fallen in all other regions. A recession occurred during 1958 in the United States and what capital was utilized was employed efficiently. The relative productivity of capital was higher for the United States in 1961-58 (0.99) but fell in 1961-63 (1.17), while the relative capital-labor ratio fell for Mexico during those years (0.52-0.43).

It is not surprising to find the relative capital productivity and the relative capital-labor ratio moving in opposite directions. Further, the relative productivity of capital is a more important factor in changing labor efficiency at higher capital exponent powers (0.9-0.7) while the relative capital intensity is a more important determinant in lower elasticity regions (0.4-0.1). Where capital productivity and its output elasticity are high, further increases in capital significantly affect labor efficiency regardless of the original capital intensity. Relative capital productivity loses influence as its output elasticity falls and the level of capital intensity is a controlling factor in changing labor efficiency as massive doses of capital are needed to increase labor efficiency.

The above discussion is supported by comparing labor efficiency changes between the relative years 1961-63 and 1966-63. Labor efficiencies for 1966-63 fell for both the unweighted and weighted means for the 0.9 and 0.7 exponents but rose for the 0.4-0.1 exponents. The relative productivity of capital also fell during 1966-63 (1.17-0.93) while the relative capital-labor ratio rose (0.43-0.51).

Summary Results for Puerto Rico

Puerto Rican labor efficiencies (Table 2) are higher than those of Mexico in all columns. The Puerto Rican unweighted means are higher than the weighted means and overall labor efficiencies in column (5) correspond closely to the means obtained for an exponent value of 0.1.

Unweighted and weighted labor efficiencies for Puerto Rico increased between 1958-63 but overall efficiency remained the same for both years (0.55). The weighted results do not increase by as much as the unweighted means. Puerto Rican employment figures for 1958 are very low in many cases between about 20-50 for many industries in the three digit classification. They do increase for 1963 but the low initial employment followed by sharp increases could affect the weighted results. Moreover, the overall relative capital-labor ratio fell for Puerto Rico from 1958-63 (1.38-0.86) while the relative productivity of capital changed upward (1.31-2.08). These offsetting changes may have kept the overall result in column (5) the same between years but the tremendous jump in capital productivity may have offset the fall in relative capital intensity so that the weighted and unweighted means were pulled upward for all the exponents between the compared years.

General Conclusions

Given the assumptions, including those concerning the Cobb-Douglas production function, Mexican and Puerto Rican industries would have to use much greater levels of capital intensity than equivalent United States industries to achieve the same labor productivity as the latter. This result is suggested by the summary results in Table 1 and Table 2 and by examination of individual industries in the relevant tables in the Appendix. There were also significant regressions obtained under the multiple regression analysis suggesting that higher levels of labor productivity are associated with higher capital-labor ratios. Then labor productivity differences are less for industries of intensive capital than industries of intensive labor.

The remaining productivity gap in Mexican and Puerto Rican industries after adjustment for United States capital stock levels (the labor efficiency difference) could theoretically be attributed to five factors: (1) social, cultural, and political hindrances in Mexico and Puerto Rico regarding work and capital formation; (2) the superiority of fuel and resource-related inputs in the United States; (3) newer capital stock in the United States; (4) differences in worker and managerial ability; and (5) economies of scale in favor of the United States. The first three reasons were rejected or not explored.

Mexican-United States labor efficiency differences were attributed to differences in worker and managerial ability and greater economies of scale for United States industries as demonstrated by their market size for final output. This is also demonstrated by Mexican-Puerto Rican comparisons. Wage rates are generally higher for Puerto Rico than Mexico thereby dictating more capital intensity for Puerto Rico. Puerto Rican labor efficiencies are also higher than the Mexican indicating more scale economies for Puerto Rico since many Puerto Rican industries produce for the United States market. For this reason, labor efficiency differences between United States and Puerto Rican industries are probably not mainly due to scale differences. The labor efficiency difference is probably due to superior workers, managers, and decision makers in the United States.

II. THE MULTIPLE REGRESSION ANALYSIS

Significance Tests and the Regression Coefficients

Since the capital-labor ratio of United States industries is substituted for capital intensity levels of the same Mexican or Puerto Rican industries, it was necessary to determine whether a significant relationship existed in the population for the given years. If there was no linear relationship among the variables, the raising of labor productivity for Mexican and Puerto Rican industries by substituting the pertinent United States capital-labor ratios would have little meaning apart from being an exercise in mathematical mechanics. The null hypothesis stated that there was no relationship in the population between value of output per unit of labor and relative and absolute levels of capital intensity. A "t" test was conducted at the .0005 significance level for both the arithmetic and logarithmic regression coefficients for Mexican and Puerto Rican comparisons to the United States. The appropriate degrees of freedom were used in each case and the null hypothesis was rejected for all years for both the arithmetic and logarithmic coefficients. Thus, it can be concluded, and especially for the very low significance level of .0005, that there is a significant relationship in the population for the compared variables. An examination of Table 14 and Table 16 (Mexico and Puerto Rico respectively) reveals very low standard errors of the regression coefficients relative to the size of the coefficients. The null hypothesis could be rejected for most commonly used significance levels by visual inspection. The standard errors of the regression coefficients are shown in parentheses directly below the coefficients.

Referring to Table 14 and Table 16, the regression coefficients all show positive signs and high numerical values. For Mexico (Table 14), the arithmetic b_2 coefficients range from 1.14-1.62 and the arithmetic b_3 coefficients are 1.0 for all comparisons. The logarithmic b_2 coefficients have values of 1.31-1.57 and the logarithmic b_3 coefficients have a range of 1.05-1.10. Thus, in the case of Mexico, the arithmetic and logarithmic regression coefficients show that a one unit or 1 per cent change in the relative and average values of capital intensity induce an equivalent or greater change, in units or per cents, in the relative value of output per unit of labor.

For Puerto Rico (Table 16) the b_2 coefficients in the arithmetic case range from 1.02-1.60 and the arithmetic b_3 coefficients are unity for all years as well as the 1958 and 1963 average. The logarithmic regression coefficients for Puerto Rico range from values slightly less to slightly greater than unity. The signs of the coefficients are again positive. Therefore, for both the Puerto Rican and Mexican cases and given all the previous information, higher capital-labor ratios are definitely associated with higher labor productivities.

Coefficients of Multiple Correlation and Determination

Mexican and United States correlation coefficients (R) are neither exceptionally high or low and are shown in Table 14 along with the coefficients of multiple determination (R^2) and the unbiased coefficients of multiple determination ($\bar{R}^2$). The comparison of the years 1956-54 shows the lowest values for R, R^2, and $\bar{R}^2$. The correlation and determination coefficients for Puerto Rico compared to the United States (Table 16) are noticeably lower than Mexican-United States comparisons.

The coefficients R^2 and $\bar{R}^2$ are of special importance to this analysis. Interpretation is made here with reference to $\bar{R}^2$ since the unbiased coefficient of determination is adjusted for degrees of freedom thereby yielding more accurate results. With the exception of the arithmetic result for the comparison of 1956-54, the arithmetic unbiased determination coefficients provide a better fit to the data than the logarithmic determination coefficients for Mexican-United States comparisons. For Puerto Rico, the unbiased determination coefficients in arithmetic terms are negative for 1958 and for 1963. For averages of those years, $\bar{R}^2$ is very low showing a value of 0.10. The logarithmic unbiased determination coefficients are also very low.

Table 14 and Table 16 reveal that for both the arithmetic and logarithmic cases a large amount of variations are left unexplained by the regression planes. The unexplained variations are much larger for Puerto Rico than for Mexico. Hence, the analysis shows very high regression coefficients with a large scatter of unexplained points around the regression planes for all the comparisons. Geometrically, this situation is represented by a steeply sloped regression plane with a wide scatter of points around the plane.[2] The predictor variables (X_2 and X_3) are very strong but the large amount of unexplained variations around the regression plane reveals that factors other than capital intensity affect relative output to a large degree.

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[2]On the other hand, there may also be low regression coefficients along with high determination coefficients. This is shown geometrically by a relatively flat regression plane with a small scatter of points around the plane.

Zero Order and Partial Correlation Coefficients

To determine the individual correlations of each of the predictor variables with the dependent variable and to determine the correlation between the predictor variables, the zero order and partial correlation coefficients were calculated.[3] The results are summarized in Table 15 for Mexico and Table 17 for Puerto Rico. For Mexican-United States comparisons, the correlations between the predictor variables are very low under both the logarithmic and arithmetic calculations. This holds true for both the zero order (R_{23}) and partial correlation coefficients ($R_{23.1}$).

When the Puerto Rican analysis is undertaken, the arithmetic and logarithmic correlations between X_2 and X_3 are larger for both the zero order and partial correlation coefficients than those for the Mexican analysis but not exceptionally large. If extremely large correlations or

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[3]For example, the term R_{12} is the zero order or simple correlation coefficient of relative value added and the relative capital-labor ratio. However, in the case of the simple correlation coefficient, the effect of the variable X_3 could enter into the correlation between Y and X_2 (R_{12}). The partial correlation coefficient ($R_{12.3}$) removes the influence of X_3 upon the correlation between Y and X_2. The first two subscripts for the simple and partial correlation coefficients denote the correlated variables. The last subscripts attached to R for the partial correlation coefficients show the variables whose effects have been removed from the correlations of the first two variables.

almost perfect correlations prevailed between the predictor variables, the partial regression coefficients would be severely affected although the overall prediction yielded by the regression lines would not be hampered. That is, the interpretation of b_2 with b_3 constant would be severely limited since large variations in b_3 would enter into the b_2 variations and conversely.

The strongest zero order and partial correlations for Mexico are between relative value added per unit of labor and relative capital intensity for both the arithmetic and logarithmic equations (R_{12} and $R_{12.3}$). The highest zero order and partial correlations for Puerto Rico are between relative and average levels of capital intensity for the arithmetic and logarithmic calculations (R_{23} and $R_{23.1}$) although not high enough to affect the partial regression coefficients.

The next part of the current chapter compares relative labor productivities for Mexico and Puerto Rico to relative labor efficiencies. The comparisons are shown in Tables 18-22 for Mexican-United States comparisons and Tables 23-25 for Puerto Rican-United States comparisons.

III. LABOR PRODUCTIVITY AND LABOR EFFICIENCY COMPARISONS

Mexican-United States Industry Comparisons

Tables 18-22 reveal that relative labor productivities and relative capital-labor ratios are lower in Mexico for almost all industries. Labor efficiencies are also lower in the greater majority of cases. The greater the capital input exponent or the power of the capital intensity ratio, the greater is the relative labor efficiency. Labor efficiencies are greatest under a 0.9 capital input exponent and lowest when a value of 0.1 is assumed for the capital intensity ratio since the exponent power is the output elasticity of capital (the percentage change in output with respect to the percentage change in capital). Raising a given capital-labor ratio by a relatively greater elasticity exponent increases output by a greater amount than if the capital-labor ratio was raised by a lower elasticity coefficient.

For Table 18, which compares Mexico, 1956, to the United States, 1954, only twelve of thirty-nine Mexican industries show greater labor efficiencies than United States industries under a capital input exponent of 0.9. These industries are Dairy Products, Wines and Grape Liquors, Cigars and Cigarettes, Cotton Spinning and Weaving, Pharmaceuticals and Medicines, Gypsum, Lime, Pottery and Related Products, Metal Doors, Sash, and Trim, Metal Drums and Containers, Cutlery, and Dental Equipment. When the exponent value is 0.7 the number of Mexican industries showing greater labor efficiencies than the similar United States industries decreases sharply to Dairy Products, Gypsum, Pottery and Related Products, and Metal Drums and Containers (four of thirty-nine industries). At an exponent value of 0.4, only the Gypsum industry in Mexico has a higher labor efficiency than the Gypsum industry in the United States.

Table 19 compares Mexico, 1961, to the United States, 1958. Under the 0.9 capital input exponent, nine of sixty industries in Mexico (Leather Tanning and Finishing, Organic Chemicals, Fertilizers, Lubricating Oils and Greases, Hydraulic Cement, Gypsum, Lime, Tires and Inner Tubes, and Motor Vehicles and Parts) are more efficient under a capital intensity power of 0.4 than the similar United States industries. Apparently a recession during 1958 in the United States did not affect labor productivities or capital-labor ratios as shown by their comparisons to Mexican industries.

When Mexico, 1961, is compared to the United States, 1963, in Table 20, thirteen of sixty industries in Mexico show greater labor efficiencies than the same industries for the United States (0.9). The industries are Chewing Gum, Soft Drinks, Venetian Blinds and Shades, Leather Tanning and Finishing, Organic Chemicals, Fertilizers, Pharmaceuticals and Medicines, Lubricating Oils and Greases, Hydraulic Cement, Gypsum, Lime, Tires and Inner Tubes, and Motor Vehicles and Parts. Of these industries only Leather Tanning and Finishing, Fertilizers, and Tires and Inner Tubes show a greater labor efficiency than United States counterparts when the 0.7 exponent is used. For a capital input exponent of 0.4 a single industry alone, Leather Tanning and Finishing, possesses a higher labor efficiency for Mexico.

For 1966-63 comparisons (Table 21), the number of Mexican industries showing higher labor efficiencies is greater than any other year rising to seventeen out of fifty-nine industries given a 0.9 exponent (Bakery Products, Chewing Gum, Shortening and Cooking Oils, Manufactured Ice, Venetian Blinds and Shades, Leather Tanning and Finishing, Plastics, Pharmaceuticals and Medicines, Lubricating Oils and Greases, Hydraulic Cement, Gypsum, Lime, Pottery and Related Products, Cutlery, Motors and Generators, etc., Storage and Wet and Dry Batteries, and Tires and Inner Tubes). For a capital input exponent of 0.7 the industries in Mexico with greater relative efficiencies than

United States industries are five out of fifty-nine (Leather Tanning and Finishing, Hydraulic Cement, Gypsum, Pottery and Related Products, and Tires and Inner Tubes). Relative Mexican labor efficiencies are lower in all industries under an exponent value of 0.4.

When the averages of years for Mexico and the United States are compared (Table 22), thirteen of fifty-nine Mexican industries reveal higher labor efficiencies than comparable United States industries (Bakery Products, Chewing Gum, Shortening and Cooking Oils, Soft Drinks, Leather Tanning and Finishing, Pharmaceuticals and Medicines, Lubricating Oils and Greases, Hydraulic Cement, Gypsum, Lime, Pottery and Related Products, Storage and Wet and Dry Batteries, and Tires and Inner Tubes). Merely two of fifty-nine industries (Leather Tanning and Finishing and Lubricating Oils and Greases) have higher labor efficiencies for Mexico than the United States. Again, Mexican labor efficiencies are lower in every single industry for a capital intensity power of 0.4.

The preceding discussion proves that the productivity gap between the less developed countries and the United States goes well beyond differences in capital intensity. This holds true for all ranges of output elasticity coefficients for capital under a Cobb-Douglas function. The question arises as to which capital input exponent best fits Mexican-United States comparisons. Hardin and Strassmann use a capital input exponent of 0.4 and 0.3 when comparing labor efficiencies between Mexican and United States industries.[4] Douglas, in his study of manufacturing industries for a twenty-two year period ending in 1924, found the capital input exponent to be 0.25.[5] Walters calculated the capital input exponent using two tests (one of which employed an autocorrelation function) and found six capital input exponent values ranging from approximately 0.12-0.23.[6] Given the above information the pertinent capital input exponent for this study could be 0.3 or certainly a value no higher than 0.4. Under these exponents the hypothesis is very strongly supported.

To expand the original hypothesis, industries were arranged by ascending order of labor productivity for each of the relative years and by ascending order of relative years for the same industry. Labor productivity groupings show that the same level of relative labor productivity can

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[4]Hardin and Strassmann, op. cit., p. 58, and Strassmann, op. cit., pp. 80-81.

[5]Paul Douglas, Theory of Wages (New York: Macmillan, 1934), p. 133.

[6]Walters, "A Note on Economies of Scale," op. cit., p. 427.

be achieved by a high relative capital productivity ratio accompanied by a low relative capital-labor ratio and conversely. In brief, for a constant level of relative labor productivity the higher the relative capital productivity ratio the lower is the relative capital-labor ratio. This is as could be expected. A high capital productivity implies little capital usage per unit of labor to achieve a given level of labor productivity. What is significant is that the higher the relative capital productivity ratio, the higher is the labor efficiency ratio which results from the same level of relative labor productivity.

The labor efficiency differences for different capital productivities or capital-labor ratios are only large at the upper regions of the capital output elasticity coefficient (0.9-0.7). As the output elasticity coefficient of capital falls, the labor efficiency differences become less such that for a coefficient of 0.3 the differences are slight and for a coefficient of 0.1 the differences are practically non-existent. Thus for a given level of labor productivity, regardless of the absolute value of that productivity, the capital productivity ratio is a strong influence on labor efficiency differences only at the upper regions of the capital output elasticity coefficient. At lower coefficient regions neither the relative capital productivity ratio or the relative capital-labor ratio has an influence on relative labor efficiency.

Differences in relative labor productivities and labor efficiencies among industries are caused by differences in relative productivities of capital and relative capital-labor ratios. The higher the relative capital productivities and relative capital-labor ratios the higher the relative labor productivities and efficiencies. The regression coefficients (b_1 and b_2) also bear out this relationship. Previous comparisons have shown that changes in labor efficiency are very responsive to the relative productivity of capital ratio at the upper regions of the capital output elasticity coefficient. The relative capital-labor ratio is a more important determinant of changes in labor efficiency at the lower regions of the output elasticity coefficient for capital. For example, the figures reveal that industries with different relative capital productivities and different relative capital-labor ratios have the same labor efficiencies for a capital output elasticity coefficient of 0.9. Beyond that coefficient at the lower capital exponent ranges of 0.4-0.1, the industries with the relatively lower capital productivities and relatively higher capital-labor ratios have greater labor efficiencies.

The grouping by relative years for the same industry shows that almost all industries in Mexico are becoming capital intensive with the exception of Dehydrated, Frozen Fruits and Vegetables, Seafood, Confectionary Products, and Soft Drinks. A few other industries became less capital intensive but the falls in capital intensity were negligible. The size of fixed capital assets is increasing almost without exception for all years. This would indicate that industries which became less capital intensive mechanized rather than instrumentized their operations, the former requiring more labor and the latter less labor. It is not difficult to suppose that the foodstuff industries mechanized the preparation of canned or frozen foods. Variations in relative capital productivities and relative capital-labor ratios as well as variations in the absolute value of those ratios for Mexico show capital-labor substitution and the absence of fixed technical coefficients. Value of product per unit of labor and value of product figures are increasing almost without exception. The increases in product values for the greater majority of industries are almost doubling and tripling between years indicating a widening of markets. If market extension is indicative of returns to scale, then a scale factor could be present for Mexican industries.

As expected, variations in relative labor productivities and labor efficiencies between years for the same industry are caused by variations in relative capital productivities and relative capital-labor ratios. Whenever relative capital productivities and relative capital-labor ratios increase together between years, relative labor productivities and labor efficiencies rise without exception for those years. If both relative capital productivities and capital-labor ratios fall between given years, then relative labor productivities and labor efficiencies also fall. If either the relative capital productivity or the relative capital-labor ratio falls while the other increases, then labor productivities and efficiencies can move in opposite directions. A rise in relative productivities of capital increase labor productivities even though relative capital-labor ratios have fallen. Thus, increases in capital productivities can increase labor productivities by offsetting falls in capital-labor ratios. In this situation labor efficiencies increase for every single output elasticity of capital coefficient. If relative productivities of capital fall but relative capital-labor ratios rise labor productivities again increase. Labor efficiencies will decrease for the capital input exponent 0.9 and for some values of 0.7 while all other labor efficiencies rise. Further, given increases in relative capital-labor ratios, falls in relative capital productivities, and falls in relative labor productivities, labor efficiencies fall for the lower ranges of the capital input exponent (0.4-0.1) but rise in most cases for the higher exponent values (0.9-0.7). Therefore, labor efficiencies and relative labor productivities move in opposite directions whenever relative capital productivities and capital-labor ratios move in opposite directions. The labor efficiencies and productivities move in the same direction when capital-labor and productivity ratios move in the same direction. Again, the productivity of capital is a more important determinant of labor efficiency increases in the upper ranges of the capital input exponent while the capital-labor ratio is more influential concerning increases in labor efficiency at the lower input exponent values.

Puerto Rican-United States Comparisons

The data presented in Tables 23-25 reveal that relative labor productivities are generally higher for Puerto Rican industries than Mexican-United States comparisons. In many industries Puerto Rican capital-labor ratios are higher than comparable United States industries.

In the 1958 comparisons (Table 23), five of twenty-two industries have higher labor efficiency ratios for Puerto Rico than the United States given the capital exponent of 0.9. For 1963 comparisons (Table 24) and given the capital input exponent 0.9, fifteen of thirty-three industries in Puerto Rico show higher labor efficiencies than similar United States industries. Again under the 0.9 exponent, twelve of twenty-two Puerto Rican industries in Table 25 have greater labor efficiencies than the same industries in the United States. The industries which have greater labor efficiencies are not listed here as they were in the Mexican analysis because the tables and industries for Puerto Rico are not as numerous as they are for Mexico and hence these industries are more easily discernible by an inspection of Tables 23-25.

Predictably, when the capital-labor ratio in a Puerto Rican industry is greater than the capital-labor ratio for the same United States industry, labor productivity in the Puerto Rican industry falls as the lower United States capital-labor ratio is substituted for the higher Puerto Rican capital-labor ratio. However, labor efficiencies rise as the capital output elasticity coefficient falls. This is to be expected. A lower capital-labor ratio results in a lower labor productivity. Then, as the output elasticity of capital falls, labor productivity (efficiency) rises since the lower capital-labor ratio has a lesser influence on the level of output as the capital output elasticity coefficient falls. This situation is also true for Mexico. When industries for Puerto Rico are grouped by labor productivity and by year for the same industry, the same conclusions are reached as in the Mexican industrial groupings.

Labor Productivity and Labor Efficiency Compared Under Increasing Returns

When Mexican and United States industries are compared under increasing returns assuming identical capital and labor input exponents (Table 30), Mexican labor efficiencies rise beyond United States levels in four of ten industries (Plastics, Inorganic Chemicals, Hydraulic Cement, and Tires and Inner Tubes). For Puerto Rican industries (Table 31) labor efficiencies are greater than United States industries in three of five observations under identical capital and labor input exponents. These industries are Millwork and Related Products, Concrete Block and Brick, and Concrete Products. In some industries, labor efficiencies fall below original labor productivity levels when the same input exponents are used. This occurs for Meat and Dairy Products, Veneer and Plywood Plants, and Petroleum Refining in Mexico and for Canned Fruits and

Vegetables in Puerto Rico.

Under increasing returns to the United States and constant returns to Mexico (Table 30), labor efficiencies are greater for all Mexican industries except Petroleum Refining. Given the identical assumptions for Puerto Rican-United States comparisons, all industries in Puerto Rico have greater labor efficiencies than their United States counterparts (Table 31). Where Mexican and Puerto Rican industries operate under increasing returns and United States industries exhibit constant returns, all industries in Mexico and Puerto Rico show lower labor efficiencies than their original labor productivity levels.

Relative Mexican and Relative Puerto Rican Comparisons and Their Historical Economic Developments

The previous sections have shown that most Mexican and Puerto Rican industries have productive deficiencies exceeding their capital deficiencies when compared to similar United States industries. Labor productivity and efficiency differences and fluctuations in these values were attributed to have the same causes for both countries. There are however, some notable differences in the data between Mexican and Puerto Rican industries. Relative capital-labor ratios are generally much higher for Puerto Rican industries as well as labor efficiencies. A higher percentage of industries in Puerto Rico have greater labor efficiencies than similar United States industries than is the case for Mexico. These greater labor efficiencies in Puerto Rico extend in many cases into the exponent values of 0.3-0.1. In Mexican comparisons, no industry in any of the compared years has a labor efficiency which is greater than the United States level when the capital intensity powers are 0.3-0.1. Also the number of industries which have greater labor efficiencies in Puerto Rico compared to the United States under a 0.7 exponent does not fall as sharply as Mexican cases, remaining the same as the 0.9 exponent in Table 23, and falling to thirteen out of thirty-three in Table 25. Under a 0.4 exponent further declines for Puerto Rican efficiencies are witnessed but not as severe as Mexican-United States comparisons. Then why do these differences in Mexican and Puerto Rican industries exist? What were the patterns in economic development which have led to similarities or dissimilarities in labor productivities and efficiencies for Mexico and Puerto Rico?

Mexico and Puerto Rico have experienced similar economic development patterns. Both countries could scarcely be underdeveloped in the sense of traditional economies stagnating in low level equilibrium traps and vicious circles of poverty. Both countries experienced breakdowns of social and cultural barriers to capital accumulation and technological change before 1940 and from 1940-65 the rate of industrialization was heavy for the two economies. Further, Mexico and Puerto Rico possess relative ease of access to United States technology and the two countries have good export markets and tourist trades which alleviate inflationary pressures during the course of development.[7]

As early as 1900, in Mexico, foreign enterprises had set up mining, railroads, and electric power industries. Also at that time beer, glass, cigarettes, match, soap, cloth, cement, and steel establishments had been set up by foreign and domestic manufacturers. During the years 1935-40 a stable political process was established, and schools, roads, and irrigation systems were built. Urban industries also arose.[8] Investment in social overhead capital was made and combined with the backward and forward linkage effects of the cement and steel industry, economic development became an on-going process during the early 1940's. From 1945-60 the heavy rate of industrial growth was achieved largely through tariff protection, credit

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[7] Strassmann, op. cit., pp. 279-80.

[8] Ibid., p. 282.

manipulation in the capital market by the government which encouraged banks to lend on easy terms to industry, tax exemptions, and fast depreciation writeoffs were granted to new and necessary industries (e.g., steel) by the government. There were elements of government planning in the industries of steel, cement, food, transport, and petroleum but hardly anything proceeding along socialistic lines. Unequal income distribution in favor of corporate profits was also tolerated.[9]

In Puerto Rico social overhead capital was formed through the United States New Deal administration during the 1930's. Schools, roads, hydroelectric plants, and cement plants were built. Unlike Mexico, Puerto Rico is a United States territory and provides special tax exemptions to industries. More importantly, unlike Mexico, Puerto Rico had some planning for an integrated industrial structure. Huge direct financial assistance was given to core industries. Core industries were defined as those using Puerto Rican minerals and plant inputs or industries which import and process crude raw materials to be used by other industries. Essentially core industries were those which supply or buy from many other industries. Thus core

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[9] *Ibid.*, pp. 286-98.

industries imply industries with significant backward and forward linkages. There is one other important difference between Mexican and Puerto Rican industrial development. There are more economies of scale evident in Puerto Rico since Puerto Rico produces for a larger market.[10] The data appear to show that Puerto Rican labor productivities, capital productivities, capital-labor ratios, and labor efficiencies are higher than those of Mexico. Value of product figures are larger for Puerto Rican establishments in general than for Mexican establishments. Value of product figures would indicate or serve as a proxy for market size. Capital figures per establishment could serve as a proxy for scale of plant. Given the data on capital and value of product figures along with the historical development pattern of the two countries it must be concluded that differences in labor productivity and efficiency between Mexico and Puerto Rico are attributable to (1) economies of scale; and (2) planning or integrating economic development along the lines of backward and forward linkage.

[10] Ibid., pp. 298-315.

IV. CONCLUSIONS

The hypothesis of this analysis states that industrial labor productivity in less developed areas would be less than industrial labor productivity in the United States even if industries in the less developed areas had the same capital-labor ratios as similar United States industries. The hypothesis is stated for all plausible values of the capital output elasticity coefficient which can be assumed for a Cobb-Douglas production function. Given the results of the regression analysis and the labor efficiency calculations assuming a Cobb-Douglas production function for industries in all three countries, the hypothesis is accepted. Industry comparisons between Mexico and the United States strongly support the hypothesis, and Puerto Rican-United States industrial comparisons also support the hypothesis but not as strongly as in the Mexican case. Even under the greatest capital exponent power, labor efficiencies for the compared industries in Mexico and Puerto Rico are lower than United States productivity levels for the majority of industries. As the exponent power of capital falls, the number of Mexican and Puerto Rican industries with greater labor efficiencies than similar United States industries decreases sharply thereby strengthening the hypothesis.

Thus, the capital input exponent is of prime importance in determining labor efficiency levels of Mexican and Puerto Rican industries. Walters has cited studies in his article which have determined the empirical value of the capital input exponent to range from 0.1 to approximately 0.3 for countries such as Australia, Great Britain, New Zealand, the United States, and India.[11] The Western developed nations cited in Walters' article have perhaps a higher capital output elasticity than Mexico or Puerto Rico. Reviewing the historical development pattern of Mexico and Puerto Rico, they could scarcely be called underdeveloped in the same sense as India. It could be inferred that the output elasticity of capital for Mexican and Puerto Rican industries is generally higher than that of Indian industries but certainly not higher for most industries in the Western world. Also, given the relative capital productivity figures and labor productivity figures for Mexico and Puerto Rico, the latter country's capital output elasticities for the majority of industries could be considered higher than Mexico. But certainly for both Mexico and Puerto Rico capital output elasticities in most cases could

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[11] Walters, "A Note on Economies of Scale," op. cit., pp. 425-27.

not be considered higher than the United States. A best compromise for a common output elasticity for capital in this study given all previous information would be 0.3. With a value of 0.3 Mexican and Puerto Rican industries would require much greater capital-labor ratios than United States industries to achieve the same level of labor productivity. However, it would appear that policies which provide Mexican and Puerto Rican industries with greater capital-labor ratios than United States industries are both capital and labor wasting. Some industries could realize capital and labor shortages while others absorb disproportionate amounts of capital and labor.

It should be mentioned at this point that the results under increasing returns are not reliable enough to support or reject the hypothesis. In both Tables 30 and 31, estimated capital productivities and labor efficiencies are equal when the same capital and labor input exponents are assumed for the compared countries. Under identical exponents for capital and labor for the compared countries the labor efficiency ratio thus reduces to the productivity of capital ratio. This however, is precisely the criticism of Bacha's technique stated in Chapter I. It is seen that the combinations and values of exponents severely affect the outcomes. Tables 30 and 31 show that labor efficiency levels achieved by Mexican and Puerto Rican industries are lower under certain assumed exponent values than their original labor productivity levels when capital-labor ratios of similar United States industries are used. This result is plausible if the United States capital-labor ratio is lower than the Mexican or Puerto Rican capital-labor ratio. However, in the cases of Tables 30 and 31 the lower labor efficiency results are due to the assumed values and combinations of exponent values chosen for the capital input.

The regression analysis pointed to a strong relationship between the predictor variables and relative value of output. Nevertheless, the wide scatter of points around the regression plane indicated that factors other than capital intensity strongly affect the relative value of output. Some of these factors are managerial skill and decision making, health and educational levels of workers, and perhaps even elements like the quality of mail service provided for the country in question. It has already been shown that relative labor productivity differences in Mexico and Puerto Rico are not eliminated when their capital intensity differences are eliminated. Then the additional productivity gaps must be examined and explained.

As outlined earlier, the residual productivity differences for Mexican and Puerto Rican industries could in theory be attributed to five categories of factors: (1) social, cultural, and political barriers affecting attitudes toward work and capital accumulation; (2) differences in fuel and other material resource-related inputs; (3) differences in the ages of capital stock; (4) differences in worker and managerial ability; and (5) differences in economies of scale as evidenced by output volume and market size.

In the cases of Mexico and Puerto Rico social and cultural barriers as a hindrance to economic development can probably be dismissed. An unstable political process is also not a hindrance. This view was supported by an examination of the history of economic development for both countries. Moreover, an examination of the data shows that almost all industries are becoming capital intensive or at least that net capital formation is occurring for almost all the years examined. This situation is not likely to occur in an underdeveloped economy where tradition remained strong or where the political structure were highly unstable.

The second possible reason for differences in labor productivity in Mexico and Puerto Rico after removal of the capital gap, namely the superiority of fuel and other resource-related inputs used in the United States, is outside of the scope of this study. The Cobb-Douglas function is a two factor case and no allowance has been made for differences in material inputs.

The third reason for productivity differences for Mexico and Puerto Rico could be differences in the quality of capital as measured by the age of their capital stocks. If Mexican or Puerto Rican industries employ machinery and equipment which are much older than United States industries, this could explain part of the labor efficiency differences. However, there is reason to believe that the capital stock is newer in Mexican and Puerto Rican industries than in United States industries. As previously stated, Mexican and Puerto Rican industries with very few exceptions are also becoming more capital intensive. Net investment in almost all industries has been rising since 1956 for Mexico and since 1958 for Puerto Rico. There is one qualification to this statement. Relatively lower volumes in Mexico and Puerto Rico can lead to different ages and qualities in capital machinery and equipment employed by Mexican and Puerto Rican industries.

There remain two other explanations of the causes of labor productivity and efficiency differences for Mexico and Puerto Rico: (4) differences in worker and managerial ability; and (5) differences in market size or economies of scale. When relative Mexican data are compared to relative Puerto Rican data, capital-labor ratios and labor efficiencies are generally higher for the latter country. The development pattern of both countries suggests that the differences in the raw and calculated data point to greater economies of scale for Puerto Rican industries because of greater market size and production volume. Many Puerto Rican industries also produce for the United States market and therefore realize significant scale economies and more organized marketing outlets for large production volume.

With the elimination of causes of labor efficiency differences between Mexico and the United States and differences in value of product and capital figures, it must be concluded that economies of scale, managerial ability, and worker capacity account for the labor efficiency gap in Mexico. For instance, in Mexico, for many industries "lack of volume and unpredictable demand levels prevent gains from external economies by checking internal economies. Production runs are too short and demand levels unpredictable. Metal fabricators complain about large volumes they have to buy from steel mills and steel mills say that demand for special steel is too low to make production worthwhile. It is also possible that short production runs keep a worker low on the learning curve."[12] This prevents workers from solving breakdown and maintenance problems. The supply of competent managers is therefore hindered because promotion through the ranks is not possible. Vocational training by private or governmental means becomes especially important. Lack of good managers can further lead to procurement problems, internal supply bottlenecks, and poorly set up marketing channels for distribution of final output. This last factor further aggravates the situation of small markets for final output.

In Puerto Rican-United States comparisons, labor efficiency differences are much narrower for the Puerto Rican industries. From the data and previous discussions it could be inferred that economies of scale are strong in Puerto Rico and therefore account for higher labor efficiencies. The labor efficiency differences which do exist in Puerto Rico must then be due to managerial and worker ability. There may perhaps be some scale economy advantages for United States industries where Puerto Rican industries produce only for the island market.

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[12] Strassmann, _op. cit._, pp. 162-65.

V. SUMMARY

Important results of the calculations were discussed in this chapter. It was stated that the regression coefficients showed strong relationships between relative and average levels of capital intensity and relative value added for the compared countries. Significant relationships between the compared variables were also found in the population according to "t" tests conducted for the sample regression coefficients. Nevertheless, the unbiased coefficient of determination revealed that factors other than capital intensity play a strong role in determining labor productivity. The maintained hypothesis was therefore accepted. Labor and capital productivity differences were discussed along with labor efficiency and capital intensity differences among industries in the same country and between years for the same country for Mexico and Puerto Rico. The causes of labor efficiency differences between Mexico and Puerto Rico and the United States were examined and it was found that the efficiency differences were due to differences in (1) capital intensity; (2) worker and managerial ability; and (3) economies of scale as indicated by the size of the market for manufacturing output. However, economies of scale as a reason for efficiency differences between Puerto Rican and United States industries were not considered an important factor since many Puerto Rican industries produce for United States markets.

CHAPTER IV

SUMMARY AND CONCLUSIONS

This investigation began with a statement of the hypothesis and general procedures for testing this hypothesis. The hypothesis was that labor productivity levels for less developed areas would not be as great as labor productivity levels in United States industries even if the former countries worked with United States levels of capital intensity. Underdeveloped areas would necessarily have to increase capital intensity levels by greater amounts than United States levels to achieve the same amount of product per unit of labor. The countries chosen for the analysis were Mexico, Puerto Rico, and the United States. The United States served as the comparative standard. The analysis used a multiple linear regression equation and a Cobb-Douglas production function to test the hypothesis. The remainder of Chapter I cited previous international labor productivity comparisons discussing their methodology and mathematical techniques. The validity of the Cobb-Douglas procedure was also established.

Chapter II was specifically concerned with the methodology of this investigation. The first part of this chapter discussed the statistical procedures for testing

the hypothesis. The multiple regression equation was set forth in arithmetic and logarithmic form and the terms in the equation were discussed in great detail. The behavior of the regression coefficients was then interpreted. Then the procedures for calculating labor efficiencies were explained under the Cobb-Douglas production function assuming constant returns to scale. An explanation of the calculation of labor efficiencies under increasing returns by way of modification of the Cobb-Douglas technique was also put forth. The second part of Chapter II was concerned with the nature of the empirical data itself. The sources of data, selection of years, and selection of industries were enumerated. The terms output, capital, and labor were defined and methods for estimating capital figures for some years in Mexico and Puerto Rico were given. The Appendix presents tables concerning the raw data and calculations which result from applications of the equations to the data.

The presentation in Chapter III was involved with interpretation of the regression results and calculations of the labor efficiencies under constant and increasing returns. The regression function in the logarithmic and arithmetic case showed that the b_2 and b_3 regression coefficients were very high in all years for both Mexican-

United States and Puerto Rican-United States comparisons. These coefficients also verified the Hirschman hypothesis. Significant relationships were also found in the population at the .0005 significance level for the variables used in the regression function. The multiple correlation, determination, and unbiased determination coefficients showed a wide scatter of points around the regression plane indicating that factors other than relative and average levels of capital intensity strongly affect relative labor productivity. The calculation of labor efficiencies showed that in the majority of cases for all exponents, labor efficiencies in Mexican and Puerto Rican industries were not as high as similar United States industries. Given the results of the regression analysis and the calculation of labor efficiencies, the hypothesis presented in Chapter I was accepted for all plausible values of the output elasticity of capital which could be assumed under a Cobb-Douglas production function.

Several other results were proven other than the original hypothesis. It was found that for a given level of labor productivity, fluctuations in labor efficiency come about because of changes in capital productivity and/or changes in the capital-labor ratio. Under a constant level of labor productivity among Mexican and Puerto Rican

industries, the higher the capital productivity ratio the lower is the capital-labor ratio. The greater the capital productivity ratio the greater is the level of labor efficiency at the upper values of the capital output elasticity value (0.9-0.7). At the lower values of the capital exponent (0.4-0.1) there is virtually no difference among labor efficiencies for industries with the same labor productivities regardless of differences in capital productivities or capital-labor ratios. However, higher labor productivities and efficiencies are caused by higher capital productivity ratios and higher capital-labor ratios in general. An examination of differences among years for the same industry shows further that differences in labor productivities and efficiencies are caused by capital productivity and capital-labor ratio differences. If capital productivities and capital-labor ratios both increase between successive years, labor productivities and efficiencies also increase. Decreases in capital-labor ratios which are offset by increases in capital productivities do not affect labor productivity and efficiency increases. Both labor productivities and labor efficiencies increase when a rise in capital productivity offsets a fall in capital intensity. If the rise in capital productivity does not offset a fall in the capital-labor ratio, labor productivities fall in all cases. However, in the majority of cases, labor efficiencies do not fall at the capital exponent of 0.9-0.7 but fall nevertheless for the lower exponent values of 0.4-0.1. If a fall in the productivity of capital is offset by a rise in the capital-labor ratio, labor productivities rise and so do labor efficiencies except for the capital exponent values of 0.9-0.7. For those values, labor efficiencies decrease. It was thus concluded that changes in relative capital productivities were more important determinants of labor efficiencies at the upper ranges of the capital exponent (0.9-0.7) and that changes in relative capital-labor ratios were a more important determinant of labor efficiencies at the lower ranges of the capital exponent (0.4-0.1). The figures further reveal that almost all Mexican and Puerto Rican industries are becoming more capital intensive and that net investment is occurring in nearly every single industry. Employment figures are also rising in every single case for Mexican and Puerto Rican industries along with value of shipment figures, the latter indicating an expansion of market size.

Relative Mexican and relative Puerto Rican data were compared to each other and it was found that in most cases for Puerto Rico (1) labor productivity is higher;

(2) capital productivity is higher; (3) the capital-labor ratio is higher; and (4) labor efficiency is higher for all exponent values of capital. Both countries have followed similar economic development lines except that Puerto Rico has had greater economies of scale as evidenced by the larger markets for which Puerto Rican industries produce and has had a somewhat more integrated economic development in terms of planning for backward and forward linkages. The data on market size here is taken to be value of product or value of product per unit of labor and supports the historical evidence of more economies of scale for Puerto Rico.

It was previously stated that after Mexican and Puerto Rican industries are equipped with the same capital-labor ratio of similar United States industries, the Mexican or Puerto Rican industries fall short of United States productivity levels. An explanation of the productivity gap exceeding the capital intensity gap was then undertaken. The differences in labor productivity other than capital intensity differences were stated as differences in (1) superiority of fuel inputs; (2) ages of capital stock; (3) worker and managerial ability; and (4) economies of scale. Differences attributed to superiority of fuel inputs and capital stock ages were eliminated because of the nature of the data and the historical economic development pattern of Mexico and Puerto Rico. It was thus concluded that labor efficiency differences between Mexican and Puerto Rican industries and United States industries were due to worker and managerial ability and economies of scale as United States industries produce for larger markets. The scale factor as a cause of a labor efficiency difference between the United States and Puerto Rico was considered to be strong only when Puerto Rican industries produced for the island markets.

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APPENDIX

APPENDIX

TABLE 3

SELECTED INDUSTRIES FOR MEXICO AND THE UNITED STATES

1. Meat Products
2. Dairy Products
3. Dehydrated Frozen Fruits, and Vegetables
4. Rice Milling
5. Canned, Dehydrated, Frozen, and Fresh Seafood
6. Bakery Products
7. Cane and Beet Sugar
8. Confectionary Products
9. Chocolate and Related Products
10. Chewing Gum
11. Shortening and Cooking Oils
12. Manufactured Ice
13. Breweries
14. Wines and Grape Liquors
15. Soft Drinks
16. Animal Foods
17. Cigars
18. Cigarettes
19. Cigars and Cigarettes
20. Cotton Spinning and Weaving
21. Men's, Women's, and Children's Underclothing
22. Sawmills
23. Wooden Containers
24. Miscellaneous Wood Products
25. Veneer and Plywood Plants
26. Wooden Furniture
27. Metal Furniture
28. Venetian Blinds and Shades
29. Book Publishing and Printing
30. Commercial Printing, Lithography, and Book Binding
31. Leather Tanning and Finishing

TABLE 3 (cont'd.)

32. Plastics
33. Organic Chemicals
34. Inorganic Chemicals
35. Fertilizers
36. Insecticides
37. Paints and Varnishes
38. Pharmaceuticals and Medicines
39. Soaps and Detergents
40. Perfumes and Toilet Articles
41. Petroleum Refining
42. Paving Mixtures, Blocks, Asphalt Felts, and Coatings
43. Lubricating Oils and Greases
44. Hydraulic Cement
45. Gypsum
46. Lime
47. Iron and Steel Foundries
48. Pottery and Related Products
49. Steel Pipes and Tubes
50. Metal Doors, Sash, and Trim
51. Metal Engraving
52. Metal Drums and Containers
53. Cutlery
54. Bolts, Nuts, Rivets, and Washers
55. Boilers and Boiler Shop Products
56. Farm Machinery and Equipment
57. Office Equipment and Machines
58. Motors, Generators, Electrical Transformers, Measurers, and Switchboards
59. Storage and Wet and Dry Batteries
60. Ship and Boat Building and Repairing
61. Locomotives and Parts
62. Tires and Inner Tubes
63. Motorcycles, Bicycles and Parts
64. Motor Vehicles and Parts
65. Opthalmic Instruments and Lenses
66. Dental Equipment
67. Musical Instruments

TABLE 4

VALUE OF PRODUCT (V) FOR MEXICO AND THE UNITED STATES, IN $1,000

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
1.	6,567	52,108	157,552	9,278,707	15,927,441	16,806,600
2.	5,962	68,678	140,101	2,302,546	10,081,555	11,199,909
3.	39	30,365	71,483	467,720	1,299,163	1,867,323
4.		9,177	16,515		312,061	423,022
5.		40,406	41,266		698,737	843,628
6.	1,497	62,048	125,786	2,056,946	5,081,157	5,656,144
7.	46,500	122,619	224,801	1,045,291	1,567,516	2,214,012
8.	1,225	22,180	70,153	1,034,955	1,229,277	1,454,512
9.	434	9,944	29,058	433,632	447,156	479,085
10.		7,993	17,936		185,054	224,848
11.	13,208	116,561	267,230	1,154,236	1,239,129	13,243,357
12.	2,681	9,627	14,131	170,674	149,552	122,550
13.	21,479	120,018	182,577	1,870,769	1,982,664	2,315,068
14.	7,292	18,548	33,669	100,394	263,963	368,281
15.	18,364	129,486	220,980	1,189,254	1,558,263	2,210,920
16.	618	36,933	103,702	2,981,435	3,238,414	3,880,122
17.		706	972		355,048	358,463
18.		70,231	132,013		2,159,987	2,655,346
19.	2,200			1,984,275		
20.	85,847			2,838,312		
21.		9,125	24,881		917,402	1,111,057
22.	5,594	25,728	50,589	2,783,978	3,006,695	3,252,377

TABLE 4 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
23.	546	6,021	11,083	418,136	409,773	401,529
24.	4,013			1,632,230		
25.		7,556	27,917		884,111	1,339,630
26.	1,648	15,055	45,474	1,806,835	2,327,967	2,942,710
27.	72	33,038	91,344	624,028	782,152	914,270
28.	54	1,345	1,456	196,479	189,618	199,552
29.		7,556	39,105		1,390,796	2,081,219
30.		52,358	128,283		4,280,788	5,291,398
31.	3,297	23,588	39,203	713,324	743,124	758,408
32.	197	33,680	121,698	2,481,639	3,732,544	5,736,932
33.		2,515			3,097,963	4,840,176
34.		25,660	88,820		2,754,427	3,493,870
35.	751	5,451	68,016	1,001,266	1,043,877	1,492,286
36.	4,863			275,152		
37.	736	26,546	59,572	1,579,887	1,878,733	2,456,361
38.	437	138,995	325,811	1,981,503	2,914,117	3,620,116
39.	3,401	74,543	128,912	1,593,706	1,605,935	2,127,789
40.		18,101	67,167		1,059,161	1,792,662
41.	31,805	415,722	799,639	12,182,245	14,530,055	16,496,896
42.		4,310	4,678		727,780	955,092
43.		10,866	11,626		281,377	471,229
44.	7,504	54,613	83,926	814,923	1,073,494	1,176,913
45.	69	1,799	3,089	295,564	364,947	425,108
46.	1,287	6,125	13,083	112,854	130,948	164,366
47.		121,147	224,605		2,245,591	3,173,520

TABLE 4 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
48.	195	11,215	30,761	257,983	416,883	492,989
49.		43,235	71,052		780,684	809,009
50.	177	13,195	25,478	568,146	1,037,371	1,253,814
51.	6			105,233		
52.	78			85,667		
53.	17	1,581	10,018	173,565	179,271	283,352
54.		8,003	51,327		880,328	1,218,247
55.		2,877	11,879		1,670,007	1,622,988
56.		6,735	14,993		2,421,873	2,842,243
57.		1,110	5,374		1,685,215	2,782,800
58.		9,798	66,686		3,670,920	4,275,677
59.		8,989	27,604		507,208	711,755
60.		1,410	2,443		1,954,663	2,039,973
61.		1,459	18,007		407,540	437,872
62.		62,273	103,494		2,577,788	2,949,673
63.		7,951	14,619		121,527	192,851
64.		178,967	462,724		20,830,059	3,618,007
65.	119	1,605	4,014	242,400	297,442	468,709
66.	37			79,171		
67.		290	1,595		236,750	314,407

TABLE 5

VALUE OF FIXED CAPITAL ASSETS (K) FOR MEXICO AND THE UNITED STATES, IN $1,000

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
1.	3,058	14,741	26,813	1,402,843	1,508,979	1,653,012
2.	1,463	41,196	40,952	1,833,616	2,129,440	2,567,211
3.	63	13,342	33,965	166,409	281,847	496,712
4.		4,598	6,354		47,440	57,837
5.		16,801	23,127		129,831	152,936
6.	1,116	14,646	23,025	1,071,836	1,320,785	1,714,793
7.	58,785	127,419	216,071	565,947	720,998	972,416
8.	347	7,107	21,320	232,258	281,022	345,261
9.	43	2,737	9,472	60,568	80,077	119,381
10.		1,633	3,645		40,309	62,194
11.	3,393	27,062	267,230	259,417	300,109	360,092
12.	3,009	11,381	15,703	146,719	156,954	171,077
13.	13,597	70,096	100,151	1,098,915	1,221,541	1,363,456
14.	1,585	17,750	13,110	39,964	70,093	118,888
15.	8,118	55,199	70,245	570,466	761,840	1,103,848
16.	234	8,884	19,994	383,161	496,823	694,984
17.		265	186		55,210	68,379
18.		21,575	27,991		265,131	413,039
19.	167			220,475		
20.	24,378			1,345,855		
21.		1,347	6,147		78,902	150,297
22.	1,778	19,043	28,920	1,033,977	1,301,438	1,713,445

TABLE 5 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
23.	408	2,040	2,784	93,195	114,493	105,941
24.	2,939			247,713		
25.		5,097	13,167		283,392	433,498
26.	629	5,482	11,779	431,870	501,352	581,549
27.	82	13,250	29,804	166,948	207,840	253,581
28.	12	251	250	25,652	34,169	48,871
29.		2,740	24,670		257,929	520,599
30.		26,222	51,471		1,829,752	2,370,160
31.	897	464	9,540	152,680	167,939	379,536
32.	136	17,324	53,186	938,757	1,623,129	3,218,125
33.		1,503			2,905,346	4,743,682
34.		19,765	59,503		1,662,323	2,511,067
35.	344	1,423	38,448	259,181	438,669	835,553
36.	3,400			60,010		
37.	145	7,466	14,962	299,355	409,323	605,059
38.	68	38,244	88,768	682,237	935,070	1,386,697
39.	729	17,643	30,967	345,638	425,432	561,454
40.		3,117	14,677		146,443	219,319
41.	40,077	996,819	1,893,560	6,566,123	7,932,629	10,124,269
42.		2,104	4,186		302,878	380,703
43.		2,412	4,362		109,026	135,873
44.	9,175	66,953	106,834	1,059,434	1,507,590	2,343,121
45.	11	759	1,079	188,475	264,198	402,971
46.	648	3,624	6,299	113,657	137,994	169,751
47.		150,540	127,855		1,299,101	1,607,909

TABLE 5 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
48.	27	6,705	12,545	194,236	227,217	267,442
49.		40,528	84,153		234,457	345,285
50.	17	5,401	7,367	172,991	219,057	294,255
51.	12			27,665		
52.	11			82,904		
53.	2	643	2,300	34,554	52,022	86,403
54.		5,588	27,970		467,411	540,298
55.		3,894	6,297		441,425	598,570
56.		2,455	6,260		756,982	928,070
57.		3,571	3,263		744,680	1,109,462
58.		2,909	18,379		1,186,435	1,371,808
59.		3,035	6,180		153,930	210,403
60.		1,779	5,133		518,064	620,589
61.		1,007	13,474		134,086	149,572
62.		19,417	36,151		916,219	1,384,042
63.		4,517	5,604		34,226	49,309
64.		24,644	137,217		6,429,226	8,027,447
65.	47	588	1,403	94,019	121,179	164,241
66.	4			17,893		
67.		107	559		60,206	68,224

TABLE 6

TOTAL EMPLOYMENT (L) FOR MEXICO AND THE UNITED STATES

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
1.	1,377	5,927	9,260	311,368	312,086	299,576
2.	2,054	11,381	10,452	283,431	294,805	256,828
3.	84	6,331	20,581	29,025	47,127	60,902
4.		3,273	1,666		3,843	4,256
5.		6,336	9,252		34,759	37,337
6.	9,728	27,227	44,762	291,100	302,307	280,145
7.	19,774	24,196	46,295	30,166	32,864	32,003
8.	845	5,293	6,845	66,799	66,504	63,643
9.	373	1,167	1,346	8,465	8,271	8,743
10.		775	1,316		5,576	5,558
11.	1,119	5,671	9,578	12,024	12,489	13,511
12.	1,380	4,707	4,261	20,854	14,557	10,757
13.	6,631	9,227	10,155	81,346	71,723	62,643
14.	4,468	1,707	2,153	5,724	5,941	6,111
15.	9,284	24,365	31,824	91,616	97,082	106,850
16.	339	2,430	4,103	59,890	57,313	54,649
17.		493	464		29,350	20,731
18.		5,503	8,172		33,832	35,568
19.	167			68,481		
20.	24,378			296,193		
21.		3,085	5,097		84,564	88,807
22.	1,778	11,639	22,025	181,804	253,083	214,529

TABLE 6 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
23.	408	3,191	4,246	52,307	38,308	30,945
24.	2,939			176,767		
25.		1,581	4,866		59,346	66,155
26.	629	10,569	18,576	184,347	199,095	215,348
27.	82	11,103	15,737	45,772	47,807	49,274
28.	12	493	621	13,784	11,309	10,689
29.		1,626	4,500		67,127	82,913
30.		19,956	31,348		319,322	333,524
31.	897	4,986	6,518	43,468	37,130	31,417
32.	136	9,233	22,984	133,112	167,311	227,681
33.		535			77,442	85,492
34.		4,026	6,779		89,874	82,430
35.	344	374	3,919	31,768	30,887	33,744
36.	3,400			6,510		
37.	145	3,444	4,409	56,580	58,770	61,267
38.	68	22,979	29,604	88,096	92,248	93,212
39.	729	5,690	7,055	46,224	29,603	30,794
40.		3,570	6,339		29,464	34,338
41.	40,077	33,337	40,788	153,072	146,025	119,297
42.		1,359	717		23,317	24,261
43.		634	755		7,568	8,433
44.	9,175	5,784	6,264	39,769	41,127	34,863
45.	11	599	966	10,966	11,502	11,491
46.	648	2,991	4,638	7,989	7,185	6,778
47.		14,714	10,732		182,033	199,635

TABLE 6 (cont'd.)

Countries	Mexico			United States		
Years	1956	1961	1966	1954	1958	1963
Industries						
48.	27	1,264	5,356	50,934	44,000	42,198
49.		4,869	6,847		23,911	22,882
50.	17	9,798	14,860	43,284	57,897	62,799
51.	16			12,305		
52.	77			10,585		
53.	17	667	3,525	15,102	11,831	11,837
54.		2,488	9,775		53,270	57,618
55.		1,562	2,202		90,551	75,018
56.		1,234	2,485		108,586	122,614
57.		550	1,757		121,615	137,138
58.		2,366	10,046		227,936	226,295
59.		1,978	3,037		23,020	25,990
60.		716	1,604		144,561	139,510
61.		1,421	2,286		15,282	14,337
62.		4,489	5,082		89,395	85,259
63.		1,962	3,049		7,578	9,662
64.		14,339	34,936		546,037	649,926
65.	102	863	1,250	27,213	25,407	32,220
66.	36			7,103		
67.		231	490		16,103	20,095

TABLE 7

CAPITAL-LABOR RATIOS $\left(\frac{K}{L}\right)$ AND VALUE OF PRODUCT PER UNIT OF LABOR $\left(\frac{V}{L}\right)$ FOR MEXICO AND THE UNITED STATES

Countries	Mexico						United States					
Years	1956		1961		1966		1954		1958		1963	
Industries	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$
1.	2.3	4.8	2.5	8.8	2.9	17.0	4.5	29.8	4.8	51.0	5.5	56.1
2.	0.71	2.9	3.6	6.0	3.9	13.4	6.5	8.1	7.2	34.2	10.0	43.6
3.	0.75	0.46	2.1	4.8	1.7	3.5	5.7	16.1	6.0	27.6	8.2	30.7
4.			1.4	2.8	3.8	9.9			12.3	81.2	13.6	99.3
5.			2.6	6.4	2.5	4.5			3.7	20.1	4.1	22.6
6.	0.11	0.15	0.54	2.3	0.51	2.8	3.7	7.1	4.4	16.8	6.1	20.2
7.	3.2	2.4	5.3	5.4	4.7	4.9	18.8	34.6	21.9	47.7	30.4	69.2
8.	0.41	3.5	1.3	4.2	3.1	3.3	3.5	15.5	4.2	18.5	5.4	22.9
9.	0.12	1.2	2.3	8.5	7.2	21.6	7.2	51.2	9.7	54.1	13.7	55.0
10.			2.1	10.3	2.8	13.6			7.2	33.2	11.1	40.5
11.	3.0	11.8	4.8	20.6	5.0	27.9	21.6	96.0	24.0	99.2	26.7	98.0
12.	2.2	1.9	2.4	2.0	3.7	3.3	7.0	8.2	10.8	10.3	16.0	11.4
13.	2.1	3.2	7.6	13.0	9.9	18.0	13.5	23.0	17.0	27.6	21.7	37.0
14.	0.35	1.6	10.4	10.7	6.1	15.6	7.0	17.5	11.8	44.4	19.5	60.3
15.	0.87	6.2	2.3	5.3	2.2	0.69	2.0	13.0	7.8	16.1	10.3	20.7
16.	0.69	6.4	3.7	15.2	4.9	25.3	1.8	49.8	8.7	56.5	12.7	71.0
17.			0.54	1.4	0.40	2.1			1.9	12.1	3.3	17.3

TABLE 7 (cont'd.)

Countries	Mexico						United States					
Years	1956		1961		1966		1954		1958		1963	
Industries	K/L	V/L	K/L	V/L	K/L	V/L	K/L	V/L	K/L	V/L	K/L	V/L
18.			3.9	12.8	3.4	16.2			7.8	63.8	11.6	74.7
19.	0.17	2.2					3.2	29.0				
20.	0.43	1.5					4.5	9.6				
21.			0.44	3.0	1.2	4.9			0.93	10.8	1.2	12.5
22.	0.43	1.4	1.7	2.2	1.3	2.3	5.7	15.3	5.1	11.9	8.0	15.2
23.	0.85	1.1	0.64	1.9	0.66	2.6	1.8	8.0	3.0	10.7	3.4	13.0
24.	0.73	1.4					0.99	9.2				
25.			3.2	4.8	2.7	5.7			4.8	14.9	6.6	20.2
26.	0.25	0.17	0.52	1.4	0.63	2.4	2.3	9.8	2.5	11.7	2.7	13.6
27.	1.5	1.3	1.2	3.0	1.9	5.8	3.6	13.6	4.3	16.4	5.1	18.6
28.	0.20	0.92	0.51	2.7	0.40	2.3	1.9	14.3	3.0	16.8	4.6	18.7
29.			1.7	4.6	5.5	8.7			3.8	20.7	6.3	25.1
30.			1.3	2.6	1.6	4.1			5.7	13.4	7.1	15.8
31.	0.55	2.0	0.09	4.7	1.5	6.0	3.5	16.4	4.5	20.0	12.1	24.1
32.	0.99	1.4	1.9	3.6	2.3	5.3	7.1	18.6	9.7	22.3	14.1	25.2
33.			2.8	4.7								
34.			4.7	6.1	8.8	13.1			37.5	40.0	30.5	42.4
35.	2.9	6.4	3.8	14.8	9.8	17.4	8.2	31.5	18.5	30.6	24.8	44.2
36.	3.2	4.6					9.2	42.3				
37.	0.70	3.6	2.2	7.7	3.4	13.5	5.3	27.9	7.0	32.0	9.9	40.1
38.	0.26	1.7	1.6	6.0	3.0	14.9	7.7	22.5	10.1	31.6	14.9	38.8
39.	0.90	4.2	3.1	13.1	4.4	18.3	7.5	34.5	14.4	54.2	18.2	69.1

TABLE 7 (cont'd.)

Countries	Mexico						United States					
Years	1956		1961		1966		1954		1958		1963	
Industries	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$
40.	11.4	9.1	0.87	5.1	2.3	10.6	42.9	79.6	5.0	36.0	6.4	52.2
41.			29.0	12.5	46.4	19.6			54.3	99.6	84.9	138.3
42.			1.5	3.2	5.8	6.4			13.0	31.2	15.7	39.4
43.			3.8	17.1	5.8	26.0			14.4	37.2	16.1	55.9
44.	2.7	2.2	11.6	9.4	17.1	13.4	26.6	20.5	36.7	26.1	67.2	33.8
45.	0.13	0.83	1.3	3.0	1.1	3.2	17.1	27.0	23.0	31.7	35.1	37.0
46.	0.48	0.96	1.2	2.0	1.4	2.8	14.2	14.1	19.2	18.2	25.0	24.2
47.			10.2	8.2	11.9	20.9			7.1	12.3	8.1	15.9
48.	0.08	0.59	5.3	8.9	2.3	5.7	3.8	5.1	5.2	9.5	6.6	11.7
49.			8.3	8.9	12.3	10.4			9.8	32.6	15.1	35.4
50.	0.07	0.77	0.55	1.3	0.50	1.7	4.0	13.1	3.8	17.9	4.7	20.0
51.	0.75	0.38					2.2	8.6				
52.	0.14	1.0					7.8	8.1				
53.	0.12	1.0	0.96	2.4	0.65	2.8	2.3	11.5	4.4	15.2	7.3	23.9
54.			2.2	3.2	2.9	5.3			8.8	16.5	9.4	21.4
55.			2.5	1.8	2.9	5.4			4.9	18.4	8.0	21.6
56.			2.0	5.5	2.5	6.0			7.0	22.3	7.6	23.2
57.			6.5	2.0	1.8	3.1			6.1	13.9	8.1	20.3
58.			1.2	4.1	1.8	6.6			5.2	16.1	6.6	18.9
59.			1.5	4.5	2.0	9.1			6.7	22.0	8.1	27.4
60.			2.5	2.0	3.2	1.5			3.6	13.5	4.4	14.6
61.			0.71	1.0	5.9	7.9			8.8	26.7	10.4	30.7

TABLE 7 (cont'd.)

Countries	Mexico						United States					
Years	1956		1961		1966		1954		1958		1963	
	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$
Industries												
62.			4.3	13.9	7.1	20.4			10.2	28.8	16.2	34.6
63.			2.3	4.1	1.8	4.8			4.5	16.0	5.1	20.0
64.			1.7	12.5	3.9	13.2			11.8	38.1	12.4	55.7
65.	0.46	1.2	0.68	1.9	1.1	3.2	3.5	8.9	4.8	11.7	5.1	14.5
66.	0.11	1.0					2.5	11.1				
67.			0.46	1.2	1.1	3.3			3.7	14.7	3.4	15.6

TABLE 8

RELATIVE VALUE OF PRODUCT PER UNIT OF LABOR (Y_1), RELATIVE CAPITAL-LABOR RATIOS (X_2), AND AVERAGE LEVELS OF CAPITAL INTENSITY (X_3) FOR MEXICO TO THE UNITED STATES

	Mexico: 1956 United States: 1954			Mexico: 1961 United States: 1963			Mexico: 1961 United States: 1958			Mexico: 1966 United States: 1963		
Industries	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
1.	0.16	0.51	3.4	0.16	0.46	4.0	0.17	0.52	3.7	0.30	0.53	4.2
2.	0.36	0.11	3.6	0.14	0.36	6.8	0.18	0.50	5.4	0.31	0.39	7.0
3.	0.03	0.13	3.2	0.13	0.21	5.2	0.17	0.35	3.8	0.11	0.21	5.0
4.				0.03	0.10	7.5	0.03	0.11	6.9	0.10	0.28	8.7
5.				0.28	0.63	3.4	0.32	0.70	3.2	0.20	0.61	3.3
6.	0.02	0.03	1.9	0.11	0.09	3.3	0.14	0.12	2.5	0.14	0.08	3.3
7.	0.07	0.16	10.9	0.07	0.17	17.9	0.11	0.24	13.6	0.07	0.16	17.6
8.	0.09	0.12	2.0	0.18	0.24	3.3	0.23	0.31	2.8	0.14	0.57	4.3
9.	0.02	0.02	3.7	0.16	0.17	8.0	0.16	0.24	6.0	0.39	0.53	10.5
10.				0.25	0.19	6.6	0.31	0.29	4.7	0.34	0.25	7.0
11.	0.12	0.14	12.3	0.21	0.18	15.7	0.21	0.20	14.4	0.29	0.19	15.9
12.	0.23	0.31	4.6	0.18	0.15	9.2	0.19	0.22	6.6	0.29	0.23	10.0
13.	0.14	0.16	7.8	0.35	0.35	14.7	0.47	0.45	12.3	0.49	0.46	15.8
14.	0.09	0.05	3.7	0.18	0.53	14.6	0.24	0.88	11.1	0.26	0.31	12.8
15.	0.15	0.14	3.54	0.26	0.22	6.3	0.33	0.30	5.1	0.03	0.21	6.3
16.	0.04	0.11	7.1	0.21	0.29	8.2	0.27	0.43	6.2	0.36	0.39	8.8

TABLE 8 (cont'd.)

Industries	Mexico: 1956 United States: 1954			Mexico: 1961 United States: 1963			Mexico: 1961 United States: 1958			Mexico: 1966 United States: 1963		
	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
17.				0.08	0.16	1.9	0.12	0.28	1.2	0.12	0.12	1.9
18.				0.17	0.34	7.8	0.20	0.50	5.9	0.22	0.29	7.5
19.	0.08	0.05	1.69									
20.	0.16	0.10	2.5									
21.				0.24	0.26	1.1	0.28	0.47	0.69	0.39	0.71	1.5
22.	0.09	0.08	3.1	0.15	0.21	4.9	0.19	0.33	3.4	0.15	0.16	4.7
23.	0.14	0.47	1.3	0.15	0.19	2.0	0.18	0.21	1.8	0.20	0.19	2.0
24.	0.11	0.52	1.1									
25.				0.24	0.49	4.9	0.32	0.67	4.0	0.28	0.41	4.7
26.	0.07	0.11	1.3	0.10	0.19	1.6	0.12	0.21	1.5	0.18	0.23	1.7
27.	0.10	0.42	2.6	0.16	0.24	3.2	0.18	0.28	2.8	0.31	0.37	3.5
28.	0.06	0.11	1.1	0.14	0.11	2.6	0.16	0.17	1.8	0.12	0.09	2.5
29.				0.18	0.27	4.0	0.22	0.45	2.8	0.34	0.87	5.9
30.				0.17	0.18	4.2	0.19	0.23	3.5	0.26	0.23	4.4
31.	0.12	0.16	2.0	0.20	0.01	6.1	0.24	0.02	2.3	0.25	0.12	6.8
32.	0.08	0.14	4.1	0.14	0.14	8.0	0.16	0.20	5.8	0.21	0.16	8.2
33.				0.08	0.05	29.2	0.12	0.08	20.2			
34.				0.14	0.15	17.6	0.20	0.25	11.6	0.31	0.29	19.7
35.	0.20	0.35	5.6	0.34	0.15	14.3	0.44	0.27	9.0	0.39	0.40	17.3
36.	0.11	0.35	6.2									
37.	0.13	0.13	3.0	0.19	0.22	6.1	0.24	0.31	4.6	0.34	0.34	6.7
38.	0.08	0.03	4.0	0.16	0.11	8.3	0.19	0.16	5.9	0.28	0.20	9.0

TABLE 8 (cont'd.)

	Mexico: 1956 United States: 1954			Mexico: 1961 United States: 1963			Mexico: 1961 United States: 1958			Mexico: 1966 United States: 1963		
Industries	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
39.	0.12	0.12	4.2	0.19	0.17	10.7	0.24	0.22	8.8	0.27	0.24	11.3
40.				0.10	0.14	3.6	0.14	0.17	2.9	0.20	0.36	4.4
41.	0.11	0.27	27.2	0.09	0.34	57.0	0.13	0.53	28.6	0.14	0.55	65.7
42.				0.08	0.10	8.6	0.10	0.12	7.3	10.8	0.37	0.16
43.				0.31	0.24	10.0	0.46	0.26	9.1	0.47	0.36	11.0
44.	0.11	0.10	14.7	0.28	0.17	39.4	0.32	0.32	24.2	0.40	0.25	42.2
45.	0.03	0.01	8.7	0.08	0.04	18.2	0.10	0.06	12.2	0.09	0.03	18.1
46.	0.07	0.03	7.3	0.08	0.05	13.1	0.11	0.06	10.2	0.12	0.06	13.2
47.				0.52	1.26	9.2	0.68	1.44	8.7	1.3	1.5	10.0
48.	0.12	0.02	2.0	0.76	0.81	6.0	0.94	1.02	5.3	0.49	0.35	4.5
49.				0.25	0.55	11.7	0.27	0.85	9.1	0.29	0.82	13.7
50.	0.06	0.02	2.0	0.07	0.12	2.6	0.07	0.15	2.2	0.09	0.11	2.6
51.	0.04	0.34	1.5									
52.	0.12	0.02	4.0									
53.	0.09	0.05	1.2	0.10	0.13	4.1	0.16	0.22	2.7	0.12	0.09	4.0
54.				0.15	0.23	5.8	0.19	0.25	5.5	0.25	0.31	6.2
55.				0.08	0.31	5.3	0.10	0.51	3.7	0.25	0.36	5.5
56.				0.24	0.26	4.8	0.25	0.29	4.5	0.26	0.33	5.1
57.				0.10	0.80	7.3	0.14	1.07	6.3	0.15	0.22	5.0
58.				0.18	0.21	3.9	0.26	0.23	3.2	0.35	0.27	4.2
59.				0.16	0.19	4.8	0.21	0.22	4.1	0.33	0.25	5.1
60.				0.14	0.57	3.5	0.15	0.69	3.1	0.10	0.73	3.8

TABLE 8 (cont'd.)

	Mexico: 1956 United States: 1954			Mexico: 1961 United States: 1963			Mexico: 1961 United States: 1958			Mexico: 1966 United States: 1963		
Industries	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
61.				0.03	0.08	5.6	0.04	0.08	4.8	0.26	0.57	8.2
62.				0.40	0.27	10.3	0.48	0.42	7.3	0.60	0.44	11.7
63.				0.21	0.45	3.7	0.26	0.51	3.4	0.24	0.35	3.5
64.				0.22	0.14	7.1	0.33	0.14	6.8	0.24	0.32	8.2
65.	0.13	0.13	2.0	0.13	0.13	2.9	0.16	0.14	2.7	0.22	0.22	3.1
66.	0.09	0.04	1.3									
67.				0.08	0.14	1.9	0.08	0.12	2.1	0.21	0.32	2.3

TABLE 8a

Y_1, X_2, AND X_3 FOR MEXICAN AVERAGES (1961+63) TO UNITED STATES AVERAGES (1958+63)

Industries	Y_1	X_2	X_3
1.	0.26	0.53	3.9
2.	0.25	0.45	6.2
3.	0.13	0.25	4.5
4.	0.06	0.17	7.6
5.	0.24	0.67	3.3
6.	0.14	0.10	2.9
7.	0.09	0.17	15.2
8.	0.37	0.48	3.6
9.	0.29	0.42	8.3
10.	0.34	0.27	5.9
11.	0.29	0.19	15.2
12.	0.25	0.23	8.0
13.	0.49	0.46	14.0
14.	0.26	0.31	10.3
15.	0.34	0.24	5.7
16.	3.4	0.42	7.5
17.	0.13	0.19	1.5
18.	0.21	0.37	6.7
19.			
20.			
21.	0.36	0.71	1.1
22.	0.17	0.22	3.9
23.	0.20	0.20	1.9
24.			
25.	0.31	0.49	4.3
26.	0.17	0.23	1.6
27.	0.26	0.33	3.2
28.	0.14	0.12	2.1
29.	0.33	0.92	5.0
30.	0.24	0.23	4.0
31.	0.25	0.11	4.4
32.	0.20	0.18	7.3
33.			
34.	0.29	0.30	21.8
35.	0.44	0.47	14.5
36.			
37.	0.31	0.34	5.7

TABLE 8a (cont'd.)

Industries	Y_1	X_2	X_3
38.	0.25	0.19	7.5
39.	0.26	0.23	10.1
40.	0.19	0.32	3.8
41.	0.14	0.57	53.4
42.	0.12	0.21	8.7
43.	C.47	0.32	10.1
44.	0.39	0.28	32.6
45.	0.09	0.04	15.1
46.	0.12	0.06	11.7
47.	0.96	1.43	9.3
48.	0.60	0.50	4.4
49.	0.29	0.86	11.5
50.	0.44	0.64	0.67
51.			
52.			
53.	0.14	0.24	3.6
54.	0.25	0.30	5.9
55.	0.20	0.43	4.5
56.	0.25	0.32	4.8
57.	0.16	0.22	4.4
58.	0.35	0.30	3.7
59.	0.29	0.24	4.6
60.	0.12	0.75	3.5
61.	0.18	0.41	6.8
62.	0.55	0.44	9.5
63.	0.25	0.42	3.4
64.	0.27	0.65	10.0
65.	0.20	0.19	3.0
66.			
67.	0.17	0.26	2.2

TABLE 9

SELECTED INDUSTRIES FOR PUERTO RICO AND THE UNITED STATES

1. Fluid Milk
2. Canned Fruits and Vegetables
3. Grain Mills
4. Bread and Related Products
5. Raw Cane Sugar
6. Distilled Liquor Except Brandy
7. Macaroni and Spaghetti
8. Knit Outerwear Mills
9. Throwing and Winding Mills
10. Women's and Children's Underwear
11. Corsets and Allied Garments
12. Fabric Dress and Work Gloves
13. Pleating and Stitching
14. Millwork and Related Products
15. Wood Furniture Not Upholstered
16. Metal Household Furniture
17. Corrugated Shipping Containers
18. Pharmaceuticals and Medicines
19. Perfumes and Toilet Preparations
20. Shoes Except Rubber
21. Luggage
22. Leather Gloves
23. Purses and Small Leather Goods
24. Concrete Block and Brick
25. Concrete Products
26. Ready Mixed Concrete
27. Metal Doors, Sash, and Trim
28. Sheet Metal Work
29. Special Industry Machinery
30. Lighting and Wiring Devices
31. Electronic Components
32. Sporting and Athletic Goods
33. Costume Jewelry and Notions

TABLE 10

VALUE OF PRODUCT (V), FIXED CAPITAL ASSETS (K), IN $1,000, AND TOTAL EMPLOYMENT (L) FOR PUERTO RICO

Years	1958			1963		
	V	K	L	V	K	L
Industries						
1.	26,662	13,126	1,118	48,043	17,557	1,567
2.	9,345	2,331	913	20,839	3,715	1,283
3.				59,380	1,095	580
4.	13,946	12,138	2,157	18,384	15,257	1,950
5.	122,017	263,524	7,108	150,970	347,693	6,966
6.	14,871	12,899	1,089	54,056	16,066	1,286
7.	1,073	443	117	1,346	587	139
8.	17,258	4,122	2,083	18,732	5,885	2,487
9.				2,522	717	74
10.				27,119	21,481	3,833
11.	22,688	2,390	4,913	54,934	3,174	9,021
12.	3,172	58	972	9,104	222	1,192
13.				2,415	938	880
14.	2,603	728	407	5,278	1,042	560
15.	8,734	10,806	1,715	12,447	12,890	1,938
16.	1,471	208	178	4,059	267	483
17.				9,045	13,943	1,936
18.	8,020	7,400	364	27,636	10,975	666
19.	1,537	364	103	4,614	544	219
20.	8,086	1,208	1,543	19,276	1,505	2,868
21.				2,086	164	277

TABLE 10 (cont'd.)

Years	1958			1963		
	V	K	L	V	K	L
Industries						
22.				1,743	159	433
23.	249	692	4,748	9,712	406	1,409
24.	2,623	748	512	6,060	1,045	789
25.	4,920	741	1,021	10,395	1,061	1,345
26.				17,256	1,298	739
27.	7,820	362	484	13,014	486	699
28.				3,138	2,784	288
29.	3,169	868	367	6,752	1,071	651
30.	3,955	9,810	190	10,163	15,232	581
31.	4,878	429	751	14,285	734	1,117
32.				8,972	2,389	1,568
33.				7,298	1,141	971

TABLE 11

VALUE OF PRODUCT (V), FIXED CAPITAL ASSETS (K), IN $1,000, AND TOTAL EMPLOYMENT (L) FOR THE UNITED STATES

Years	1958			1963		
	V	K	L	V	K	L
Industries						
1.	6,412,333	1,204,661	212,238	7,025,892	1,613,632	185,050
2.	2,333,885	552,220	108,414	2,742,787	815,035	102,388
3.				8,161,196	1,997,824	113,103
4.	4,098,612	1,083,605	257,846	4,505,995	1,362,047	236,984
5.	178,016	247,646	7,327	378,710	326,743	8,263
6.	941,312	279,255	20,528	1,090,462	335,046	18,009
7.	180,190	57,716	6,825	222,947	76,330	7,270
8.	813,577	119,566	60,586	1,045,470	170,696	68,570
9.				319,252	70,029	13,559
10.				976,108	132,743	76,723
11.	467,485	44,526	37,808	593,913	56,396	37,144
12.	118,749	5,962	13,941	149,503	14,394	12,771
13.				150,183	12,845	16,353
14.	2,251,961	543,282	135,078	3,013,552	765,248	147,244
15.	1,382,209	356,384	125,619	1,857,992	427,996	140,982
16.	496,147	76,196	30,338	524,305	97,897	29,346
17.				2,166,137	789,241	83,229
18.	2,924,117	935,070	92,242	3,314,323	1,386,694	93,212
19.	1,059,164	146,530	29,464	1,792,662	219,319	34,338
20.	2,161,612	220,313	226,928	2,372,727	274,418	212,767
21.				210,303	34,835	16,409

TABLE 11 (cont'd.)

Years	1958			1963		
	V	K	L	V	K	L
Industries						
22.				80,640	6,373	7,718
23.	369,162	24,438	35,628	439,356	39,843	36,980
24.	413,670	198,026	22,766	505,194	276,964	23,759
25.	720,111	286,603	46,283	925,677	410,880	52,297
26.				2,292,504	1,006,727	71,523
27.	1,037,371	219,057	57,897	1,253,814	294,255	62,799
28.				1,303,670	327,046	61,651
29.	2,427,940	966,744	162,262	3,303,290	1,193,256	171,528
30.	2,159,178	447,559	124,218	2,829,032	695,283	132,984
31.	2,245,936	782,406	197,910	3,909,772	1,336,313	288,527
32.				704,718	134,002	40,543
33.				280,478	44,426	21,655

TABLE 12

CAPITAL-LABOR RATIOS $\left(\frac{K}{L}\right)$ AND VALUE OF PRODUCT PER UNIT OF LABOR $\left(\frac{V}{L}\right)$ FOR PUERTO RICO AND THE UNITED STATES

Countries	Puerto Rico				United States			
Years	1958		1963		1958		1963	
	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$
Industries								
1.	11.7	23.8	11.2	30.7	5.8	30.2	8.7	38.0
2.	2.5	10.2	2.9	16.2	4.8	21.5	8.0	26.8
3.			1.9	102.4			17.7	72.2
4.	5.6	6.5	7.8	9.4	4.2	15.9	5.7	19.0
5.	37.0	17.2	49.9	21.7	33.8	24.3	39.5	45.8
6.	11.8	13.7	12.5	42.0	13.6	45.9	18.6	60.6
7.	3.8	9.2	4.2	9.7	8.5	26.4	10.5	30.7
8.	2.0	8.3	2.4	7.5	2.0	13.4	2.5	15.2
9.			9.7	34.1			5.2	23.5
10.								
11.	0.49	4.6	0.35	6.1	1.2	12.4	1.5	16.0
12.	0.06	5.3	0.17	7.6	0.43	8.5	1.1	11.7
13.			1.1	2.7			0.78	9.1
14.	1.8	6.4	1.9	9.4	3.9	16.7	5.2	20.5
15.	6.3	5.1	6.7	6.4	2.8	11.0	3.0	13.2
16.	1.2	8.3	0.55	8.4	2.5	16.4	3.3	17.9
17.			7.2	4.7			9.5	26.0
18.	20.3	22.0	16.5	41.5	10.1	31.7	14.9	35.6

TABLE 12 (cont'd.)

Countries	Puerto Rico				United States			
Years	1958		1963		1958		1963	
Industries	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$	$\frac{K}{L}$	$\frac{V}{L}$
19.	3.5	14.9	2.5	21.1	5.0	35.9	6.4	52.2
20.	0.78	5.2	0.52	6.7	0.97	9.5	1.3	11.2
21.			0.59	7.5			2.1	12.8
22.			0.38	4.0			0.82	10.4
23.	0.36	6.9	0.29	6.9	0.69	10.4	1.1	11.9
24.	1.5	5.1	1.3	7.7	8.7	18.2	11.7	15.0
25.	0.73	4.8	0.79	7.7	6.2	15.6	7.9	17.7
26.			1.8	23.4			14.1	32.1
27.	0.75	16.2	0.70	18.6	3.8	17.9	4.7	20.0
28.			9.7	10.9			5.3	21.1
29.	2.4	8.6	1.6	10.4	6.0	15.0	7.0	19.2
30.	51.6	21.0	26.2	17.5	3.6	17.4	5.2	21.3
31.	0.57	6.5	0.66	12.8	4.0	11.3	4.6	13.6
32.			1.5	5.7			3.3	17.4
33.			1.2	7.5			2.0	12.6

TABLE 13

RELATIVE VALUE OF PRODUCT PER UNIT OF LABOR (Y_1), RELATIVE CAPITAL-LABOR RATIOS (X_2), AND AVERAGE LEVELS OF CAPITAL INTENSITY (X_3) FOR PUERTO RICO TO THE UNITED STATES

	Puerto Rico: 1958 United States: 1958			Puerto Rico: 1963 United States: 1963			Averages Puerto Rico: 1958+1963 United States: 1958+1963		
Industries	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
1.	0.79	2.0	8.8	0.81	1.3	10.0	0.82	1.6	9.3
2.	0.47	0.52	3.7	0.60	0.36	5.5	0.31	0.23	7.3
3.				1.4	0.11	9.8			
4.	0.41	1.33	4.9	0.49	1.4	6.8	0.45	1.37	5.8
5.	0.72	1.09	35.4	0.47	1.2	44.7	0.54	1.17	40.1
6.	0.30	0.87	12.7	0.69	0.67	15.6	0.55	0.77	14.1
7.	0.35	0.45	6.2	0.32	0.40	7.4	0.32	0.41	6.9
8.	0.62	1.0	2.0	0.49	0.96	2.5	0.55	1.0	2.2
9.				1.45	1.87	7.5			
10.				0.56	3.3	3.7			
11.	0.37	0.41	0.85	0.38	0.23	0.93	0.39	0.29	0.90
12.	0.62	0.14	0.25	0.65	0.15	0.64	0.66	0.17	0.45
13.				0.30	1.4	0.94			
14.	0.38	0.46	2.9	0.46	0.36	3.6	0.43	0.39	3.2
15.	0.46	2.3	4.6	0.48	2.2	4.9	0.48	2.24	4.7
16.	0.51	0.48	1.9	0.47	0.17	1.9	0.49	0.25	1.81
17.				0.18	0.76	8.4			

TABLE 13 (cont'd.)

Industries	Puerto Rico: 1958 United States: 1958			Puerto Rico: 1963 United States: 1963			Averages Puerto Rico: 1958+1963 United States: 1958+1963		
	Y_1	X_2	X_3	Y_1	X_2	X_3	Y_1	X_2	X_3
18.	0.69	2.0	15.2	1.2	1.1	15.7	1.03	1.4	15.0
19.	0.42	0.70	4.3	0.40	0.39	4.5	0.43	0.49	4.3
20.	0.55	0.80	0.88	0.60	0.40	0.91	0.60	0.56	0.86
21.				0.59	0.28	1.4			
22.				0.38	0.46	0.60			
23.	0.66	0.52	0.53	0.58	0.26	0.70	0.62	0.35	0.60
24.	0.28	0.17	5.1	0.51	0.11	6.5	0.34	0.14	5.8
25.	0.31	0.12	3.5	0.44	0.10	4.4	0.39	0.11	3.9
26.				0.73	0.13	8.0			
27.	0.91	0.20	2.3	0.93	0.15	2.7	0.93	0.17	2.5
28.				0.52	1.8	7.5			
29.	0.57	0.40	4.2	0.54	0.23	4.3	0.56	0.29	4.2
30.	1.20	14.3	27.6	0.82	5.0	15.7	0.94	7.36	18.4
31.	0.58	0.14	2.4	0.94	0.14	2.6	0.81	0.14	2.5
32.				0.33	0.45	2.4			
33.				0.60	0.60	1.6			

TABLE 14

RESULTS OF THE REGRESSION ANALYSIS: MEXICO TO THE UNITED STATES

Mexico to the United States	Arithmetic					Logarithmic				
	b_2	b_3	R^2	$\bar{R}^2$	R	b_2	b_3	R^2	$\bar{R}^2$	R
1956 to 1954	1.14 (0.07)	1.00 (0.02)	0.09	0.03	0.30	1.31 (0.09)	1.08 (0.12)	0.22	0.18	0.47
1961 to 1958	1.36 (0.06)	1.00 (0.003)	0.31	0.29	0.56	1.47 (0.09)	1.09 (0.09)	0.28	0.24	0.52
1961 to 1963	1.35 (0.06)	1.00 (0.001)	0.31	0.28	0.56	1.38 (0.09)	1.05 (0.09)	0.19	0.16	0.43
1966 to 1963	1.62 (0.08)	1.00 (0.002)	0.39	0.36	0.62	1.57 (0.10)	1.09 (0.09)	0.28	0.26	0.53
Averages for 1961+66 to 1958+63	1.42 (0.08)	1.00 (0.002)	0.28	0.25	0.52	1.53 (0.09)	1.10 (0.07)	0.31	0.28	0.55

TABLE 15

PARTIAL AND ZERO ORDER CORRELATION COEFFICIENTS:
MEXICO TO THE UNITED STATES

	Arithmetic					
Mexico to the United States	Partial			Zero Order		
	$R_{12.3}$	$R_{13.2}$	$R_{23.1}$	R_{12}	R_{13}	R_{23}
1956 to 1954	0.30	0.03	0.03	0.30	0.04	0.04
1961 to 1958	0.56	0.06	0.01	0.56	0.09	0.06
1961 to 1963	0.56	-0.03	0.05	0.55		0.04
1966 to 1963	0.62	-0.008	0.06	0.62	0.04	0.07
Averages for 1961+66 to 1958+63	0.52	0.08	0.005	0.52	0.10	0.06

	Logarithmic					
Mexico to the United States	Partial			Zero Order		
	$R_{12.3}$	$R_{13.2}$	$R_{23.1}$	R_{12}	R_{13}	R_{23}
1956 to 1954	0.46	0.11	-0.04	0.46	0.11	0.02
1961 to 1958	0.50	0.12	-0.01	0.51	0.13	0.06
1961 to 1963	0.43	0.07	-0.004	0.43	0.08	0.03
1966 to 1963	0.52	0.13	-0.008	0.52	0.14	0.07
Averages for 1961+66 to 1958+63	0.54	0.18	-0.12	0.53	0.14	-0.03

TABLE 16

RESULTS OF THE REGRESSION ANALYSIS: PUERTO RICO TO THE UNITED STATES

Puerto Rico to the United States	Arithmetic					Logarithmic				
	b_2	b_3	R^2	$\bar{R}^2$	R	b_2	b_3	R^2	$\bar{R}^2$	R
1958 to 1958	1.60 (0.07)	1.00 (0.005)	0.06	-0.04	0.25	1.20 (0.09)	0.88 (0.06)	0.27	0.18	0.52
1963 to 1963	1.02 (0.05)	1.00 (0.007)	0.03	-0.03	0.18	0.94 (0.08)	1.13 (0.08)	0.08	0.02	0.29
Averages for 1958+63 to 1958+63	1.06 (0.03)	1.00 (0.005)	0.19	0.10	0.44	1.16 (0.08)	0.94 (0.08)	0.15	0.06	0.39

TABLE 17

PARTIAL AND ZERO ORDER CORRELATION COEFFICIENTS:
PUERTO RICO TO THE UNITED STATES

Puerto Rico to the United States	Arithmetic					
	Partial			Zero Order		
	$R_{12.3}$	$R_{13.2}$	$R_{23.1}$	R_{12}	R_{13}	R_{23}
1958 to 1958	0.19	0.09	0.36	0.24	0.17	0.38
1963 to 1963	0.08	0.13	0.27	0.12	0.16	0.29
Averages for 1958+63 to 1958+63	0.40	0.01	0.36	0.44	0.18	0.40

Puerto Rico to the United States	Logarithmic					
	Partial			Zero Order		
	$R_{12.3}$	$R_{13.2}$	$R_{23.1}$	R_{12}	R_{13}	R_{23}
1958 to 1958	0.45	-0.48	0.62	0.22	-0.29	0.52
1963 to 1963	-0.14	0.29	0.36	-0.03	0.26	0.34
Averages for 1958+63 to 1958+63	0.39	-0.17	0.54	0.36	0.06	0.53

TABLE 18

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR MEXICO, 1956, TO THE UNITED STATES, 1954

	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
1.	0.16	0.31	0.51	0.29	0.26	0.21	0.20	0.17
2.	0.36	3.30	0.11	2.62	1.69	0.87	0.69	0.45
3.	0.03	0.23	0.13	0.19	0.13	0.07	0.06	0.04
6.	0.02	0.67	0.03	0.47	0.23	0.10	0.06	0.03
7.	0.07	0.44	0.16	0.36	0.25	0.15	0.12	0.08
8.	0.09	0.75	0.12	0.61	0.40	0.21	0.17	0.11
9.	0.02	1.00	0.02	0.68	0.31	0.10	0.06	0.03
11.	0.12	0.86	0.14	0.70	0.48	0.26	0.22	0.15
12.	0.23	0.74	0.31	0.66	0.52	0.37	0.33	0.26
13.	0.14	0.88	0.16	0.73	0.50	0.30	0.24	0.17
14.	0.09	1.80	0.05	1.34	0.73	0.30	0.22	0.12
15.	0.15	1.07	0.14	0.88	0.59	0.33	0.27	0.18
16.	0.04	0.36	0.11	0.29	0.19	0.10	0.08	0.05
19.	0.08	1.60	0.05	1.20	0.65	0.27	0.20	0.11
20.	0.16	1.60	0.10	1.27	0.80	0.40	0.32	0.20
22.	0.09	1.13	0.08	0.87	0.53	0.25	0.19	0.12
23.	0.14	0.30	0.47	0.27	0.23	0.19	0.17	0.15
24.	0.11	0.21	0.52	0.18	0.17	0.14	0.13	0.12
26.	0.07	0.64	0.11	0.51	0.33	0.17	0.14	0.09

TABLE 18 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
27.	0.10	0.24	0.42	0.22	0.18	0.14	0.13	0.11
28.	0.06	0.55	0.11	0.44	0.28	0.15	0.12	0.07
31.	0.12	0.75	0.16	0.62	0.43	0.25	0.21	0.14
32.	0.08	0.57	0.14	0.45	0.32	0.18	0.14	0.10
35.	0.20	0.57	0.35	0.52	0.42	0.30	0.27	0.22
36.	0.11	0.31	0.35	0.28	0.23	0.17	0.15	0.12
37.	0.13	1.00	0.13	0.82	0.54	0.29	0.24	0.16
38.	0.08	2.67	0.03	1.88	0.93	0.33	0.23	0.11
39.	0.12	1.00	0.12	0.81	0.53	0.28	0.23	0.15
41.	0.11	0.41	0.27	0.36	0.27	0.19	0.16	0.13
44.	0.11	1.10	0.10	0.87	0.55	0.28	0.22	0.14
45.	0.03	3.00	0.01	2.70	2.10	1.20	0.90	0.30
46.	0.07	2.33	0.03	1.64	0.81	0.28	0.20	0.10
48.	0.12	6.00	0.02	4.06	1.85	0.57	0.39	0.18
50.	0.06	3.00	0.02	2.03	0.93	0.29	0.19	0.09
51.	0.04	0.12	0.34	0.11	0.09	0.06	0.06	0.04
52.	0.12	6.00	0.02	4.06	1.85	0.57	0.39	0.18
53.	0.09	1.80	0.05	1.33	0.73	0.30	0.22	0.12
65.	0.13	1.00	0.13	0.82	0.54	0.29	0.24	0.16
66.	0.09	2.25	0.04	1.62	0.86	0.33	0.24	0.12

TABLE 19

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR MEXICO, 1961, TO THE UNITED STATES, 1958

	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
1.	0.17	0.33	0.52	0.31	0.27	0.22	0.21	0.18
2.	0.18	0.36	0.50	0.34	0.29	0.24	0.22	0.19
3.	0.17	0.49	0.35	0.44	0.35	0.26	0.23	0.19
4.	0.03	0.27	0.11	0.22	0.14	0.07	0.06	0.04
5.	0.32	0.46	0.70	0.44	0.41	0.37	0.36	0.33
6.	0.14	1.17	0.12	0.94	0.62	0.33	0.26	0.17
7.	0.11	0.46	0.24	0.40	0.30	0.20	0.17	0.13
8.	0.23	0.74	0.31	0.66	0.52	0.37	0.33	0.26
9.	0.16	0.67	0.24	0.58	0.43	0.29	0.25	0.18
10.	0.31	0.94	0.29	0.94	0.74	0.51	0.45	0.35
11.	0.21	1.05	0.20	0.89	0.65	0.40	0.34	0.25
12.	0.19	0.86	0.22	0.74	0.55	0.35	0.30	0.22
13.	0.47	1.04	0.45	0.96	0.82	0.65	0.60	0.51
14.	0.24	0.27	0.88	0.27	0.26	0.25	0.25	0.24
15.	0.33	1.10	0.30	0.68	0.58	0.45	0.42	0.36
16.	0.27	0.63	0.43	0.57	0.49	0.38	0.35	0.29
17.	0.12	0.43	0.28	0.38	0.29	0.20	0.18	0.14
18.	0.20	0.40	0.50	0.37	0.33	0.26	0.25	0.22

TABLE 19 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
21.	0.28	0.60	0.47	0.55	0.48	0.38	0.35	0.30
22.	0.19	0.58	0.33	0.52	0.41	0.30	0.27	0.21
23.	0.18	0.86	0.21	0.73	0.54	0.34	0.29	0.21
25.	0.32	0.48	0.67	0.46	0.42	0.38	0.36	0.33
26.	0.12	0.57	0.21	0.49	0.36	0.22	0.19	0.14
27.	0.18	0.64	0.28	0.57	0.44	0.30	0.26	0.20
28.	0.16	0.94	0.17	0.79	0.55	0.32	0.27	0.19
29.	0.22	0.49	0.45	0.45	0.38	0.30	0.28	0.24
30.	0.19	0.83	0.23	0.71	0.53	0.35	0.30	0.22
31.	0.24	12.00	0.02	8.11	3.71	1.15	0.78	0.36
32.	0.16	0.80	0.20	0.68	0.49	0.30	0.26	0.19
33.	0.12	1.50	0.08	1.17	0.70	0.33	0.26	0.15
34.	0.20	0.80	0.25	0.70	0.53	0.35	0.30	0.23
35.	0.44	1.63	0.27	1.43	1.10	0.74	0.65	0.50
37.	0.24	0.77	0.31	0.69	0.54	0.38	0.34	0.27
38.	0.19	1.19	0.16	0.99	0.69	0.40	0.33	0.23
39.	0.24	1.09	0.22	0.94	0.69	0.44	0.38	0.28
40.	0.14	0.82	0.17	0.69	0.48	0.28	0.24	0.17
41.	0.13	0.25	0.53	0.23	0.20	0.17	0.16	0.14
42.	0.10	0.83	0.12	0.67	0.44	0.23	0.19	0.12
43.	0.46	1.77	0.26	1.55	1.18	0.79	0.69	0.53
44.	0.36	1.13	0.32	1.01	0.80	0.57	0.51	0.40
45.	0.10	1.67	0.06	1.26	0.72	0.31	0.23	0.13

TABLE 19 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
46.	0.11	1.83	0.06	1.39	0.79	0.34	0.26	0.12
47.	0.68	0.47	1.44	0.49	0.52	0.59	0.61	0.66
48.	0.94	0.92	1.02	0.92	0.93	0.93	0.93	0.94
49.	0.27	0.32	0.85	0.31	0.31	0.29	0.28	0.28
50.	0.07	0.47	0.15	0.39	0.26	0.15	0.12	0.08
53.	0.16	0.73	0.22	0.63	0.46	0.29	0.25	0.17
54.	0.19	0.76	0.25	0.66	0.50	0.33	0.29	0.22
55.	0.10	0.20	0.51	0.18	0.16	0.13	0.12	0.11
56.	0.25	0.86	0.29	0.76	0.60	0.41	0.36	0.28
57.	0.14	0.13	1.07	0.13	0.13	0.14	0.14	0.14
58.	0.26	1.13	0.23	0.98	0.73	0.48	0.40	0.30
59.	0.21	0.95	0.22	0.82	0.61	0.38	0.33	0.24
60.	0.15	0.22	0.69	0.24	0.22	0.19	0.18	0.16
61.	0.04	0.50	0.08	0.39	0.23	0.11	0.09	0.05
62.	0.48	1.14	0.42	1.05	0.88	0.68	0.62	0.52
63.	0.26	0.51	0.51	0.48	0.42	0.34	0.32	0.28
64.	0.33	2.36	0.14	1.94	1.31	0.72	0.59	0.40
65.	0.16	1.14	0.14	0.94	0.63	0.35	0.29	0.19
67.	0.08	0.67	0.12	0.54	0.35	0.19	0.15	0.10

TABLE 20

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR MEXICO, 1961, TO THE UNITED STATES, 1963

	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
1.	0.16	0.35	0.46	0.32	0.28	0.22	0.20	0.17
2.	0.14	0.39	0.36	0.35	0.29	0.21	0.19	0.16
3.	0.13	0.62	0.21	0.53	0.39	0.24	0.21	0.15
4.	0.03	0.30	0.10	0.24	0.15	0.08	0.06	0.04
5.	0.28	0.44	0.63	0.43	0.39	0.34	0.32	0.29
6.	0.11	0.82	0.09	0.96	0.59	0.29	0.23	0.14
7.	0.07	0.41	0.17	0.34	0.24	0.14	0.12	0.08
8.	0.18	0.75	0.24	0.65	0.49	0.32	0.28	0.21
9.	0.16	0.94	0.17	0.79	0.55	0.32	0.27	0.19
10.	0.25	1.32	0.19	1.11	0.80	0.49	0.41	0.30
11.	0.21	1.17	0.18	0.98	0.70	0.42	0.35	0.25
12.	0.18	1.20	0.15	0.99	0.68	0.38	0.32	0.22
13.	0.35	1.00	0.35	0.90	0.73	0.53	0.48	0.39
14.	0.18	0.34	0.53	0.32	0.28	0.23	0.22	0.19
15.	0.26	1.18	0.22	1.02	0.75	0.48	0.41	0.30
16.	0.21	0.72	0.29	0.64	0.50	0.34	0.30	0.24
17.	0.08	0.50	0.16	0.42	0.29	0.17	0.14	0.10
18.	0.17	0.50	0.34	0.45	0.36	0.26	0.24	0.19

TABLE 20 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
21.	0.24	0.92	0.26	0.81	0.62	0.41	0.36	0.27
22.	0.15	0.71	0.21	0.61	0.45	0.28	0.24	0.18
23.	0.15	0.79	0.19	0.67	0.48	0.29	0.25	0.18
25.	0.24	0.49	0.49	0.46	0.40	0.32	0.30	0.26
26.	0.10	1.00	0.10	0.80	0.50	0.25	0.20	0.13
27.	0.16	0.67	0.24	0.58	0.43	0.29	0.25	0.18
28.	0.14	1.27	0.11	1.02	0.66	0.34	0.27	0.17
29.	0.18	0.67	0.27	0.58	0.45	0.30	0.27	0.20
30.	0.17	0.94	0.18	0.80	0.56	0.34	0.28	0.20
31.	0.20	20.00	0.01	12.60	5.00	1.26	0.80	0.32
32.	0.14	1.00	0.14	0.86	0.55	0.31	0.25	0.17
33.	0.08	1.60	0.05	1.18	0.65	0.27	0.20	0.11
34.	0.14	0.93	0.15	0.77	0.53	0.30	0.25	0.17
35.	0.34	2.27	0.15	1.86	1.28	0.73	0.60	0.41
37.	0.19	0.86	0.22	0.74	0.55	0.35	0.30	0.22
38.	0.16	1.45	0.11	1.16	0.75	0.39	0.31	0.20
39.	0.19	1.12	0.17	0.94	0.66	0.39	0.32	0.23
40.	0.10	0.59	0.14	0.59	0.40	0.22	0.18	0.12
41.	0.09	0.26	0.34	0.24	0.19	0.14	0.13	0.10
42.	0.08	0.80	0.10	0.64	0.40	0.20	0.16	0.10
43.	0.31	1.29	0.24	1.12	0.84	0.56	0.48	0.36
44.	0.28	1.65	0.17	1.38	0.97	0.57	0.48	0.33
45.	0.08	2.00	0.04	1.45	0.76	0.29	0.21	0.11

TABLE 20 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
46.	0.08	1.60	0.05	1.18	0.65	0.27	0.20	0.11
47.	0.52	0.41	1.26	0.42	0.44	0.47	0.48	0.51
48.	0.76	0.94	0.81	0.92	0.87	0.82	0.81	0.78
49.	0.25	0.45	0.55	0.43	0.38	0.32	0.30	0.27
50.	0.07	0.58	0.12	0.47	0.31	0.16	0.13	0.09
53.	0.10	0.77	0.13	0.63	0.42	0.23	0.18	0.12
54.	0.15	0.65	0.23	0.56	0.42	0.28	0.23	0.17
55.	0.08	0.26	0.31	0.23	0.18	0.13	0.11	0.09
56.	0.24	0.92	0.26	0.81	0.62	0.42	0.36	0.27
57.	0.10	0.13	0.80	0.12	0.12	0.11	0.11	0.10
58.	0.18	0.86	0.21	0.73	0.54	0.34	0.29	0.21
59.	0.16	0.84	0.19	0.72	0.51	0.31	0.26	0.19
60.	0.14	0.25	0.57	0.23	0.21	0.18	0.17	0.15
61.	0.03	0.38	0.08	0.29	0.18	0.08	0.06	0.04
62.	0.40	1.48	0.27	1.30	1.00	0.68	0.59	0.46
63.	0.21	0.47	0.45	0.43	0.37	0.29	0.27	0.23
64.	0.22	1.57	0.14	1.29	0.87	0.48	0.40	0.27
65.	0.13	1.00	0.13	0.82	0.54	0.29	0.24	0.16
67.	0.08	0.57	0.14	0.46	0.32	0.18	0.14	0.10

TABLE 21

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR MEXICO, 1966, TO THE UNITED STATES, 1963

	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
1.	0.30	0.57	0.53	0.53	0.47	0.39	0.36	0.32
2.	0.31	0.79	0.39	0.72	0.60	0.45	0.41	0.34
3.	0.11	0.52	0.21	0.45	0.33	0.21	0.18	0.13
4.	0.10	0.36	0.28	0.31	0.24	0.17	0.15	0.11
5.	0.20	0.33	0.61	0.31	0.28	0.24	0.23	0.21
6.	0.14	1.75	0.08	1.36	0.82	0.38	0.30	0.18
7.	0.07	0.44	0.16	0.36	0.25	0.15	0.12	0.08
8.	0.14	0.25	0.57	0.23	0.21	0.18	0.17	0.15
9.	0.39	0.74	0.53	0.69	0.61	0.50	0.47	0.42
10.	0.34	1.36	0.25	1.18	0.90	0.59	0.52	0.39
11.	0.29	1.53	0.19	1.29	0.93	0.56	0.48	0.34
12.	0.29	1.26	0.23	1.09	0.81	0.54	0.45	0.33
13.	0.49	1.06	0.46	0.98	0.84	0.67	0.62	0.53
14.	0.26	0.84	0.31	0.74	0.59	0.42	0.37	0.29
15.	0.03	0.14	0.21	0.12	0.09	0.06	0.05	0.04
16.	0.36	0.92	0.39	0.84	0.70	0.52	0.48	0.40
17.	0.12	1.00	0.12	0.81	0.53	0.28	0.23	0.15
21.	0.39	0.55	0.71	0.53	0.50	0.45	0.43	0.40

TABLE 21 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
22.	0.15	0.94	0.16	0.78	0.54	0.31	0.26	0.18
23.	0.20	1.05	0.19	0.89	0.64	0.39	0.33	0.24
25.	0.28	0.68	0.41	0.62	0.52	0.40	0.36	0.31
26.	0.18	0.78	0.23	0.68	0.50	0.33	0.28	0.21
27.	0.31	0.84	0.37	0.76	0.62	0.46	0.42	0.34
28.	0.12	1.33	0.09	1.05	0.65	0.31	0.25	0.15
29.	0.34	0.39	0.87	0.39	0.38	0.36	0.36	0.35
30.	0.26	1.13	0.23	0.98	0.73	0.48	0.40	0.30
31.	0.25	2.08	0.12	1.68	1.10	0.58	0.47	0.31
32.	0.21	1.31	0.16	1.09	0.76	0.44	0.36	0.25
34.	0.31	1.07	0.29	0.94	0.74	0.51	0.45	0.35
35.	0.39	0.98	0.40	0.89	0.74	0.56	0.51	0.43
37.	0.34	1.00	0.34	0.90	0.72	0.52	0.47	0.39
38.	0.28	1.40	0.20	1.19	0.86	0.53	0.45	0.33
39.	0.27	1.13	0.24	0.98	0.73	0.49	0.42	0.31
40.	0.20	0.56	0.36	0.50	0.41	0.30	0.27	0.22
41.	0.14	0.25	0.55	0.24	0.21	0.18	0.17	0.15
42.	0.16	0.43	0.37	0.39	0.32	0.24	0.22	0.18
43.	0.47	1.31	0.36	1.18	0.96	0.71	0.64	0.52
44.	0.40	1.60	0.25	1.39	1.06	0.70	0.61	0.46
45.	0.09	3.00	0.03	2.12	1.05	0.37	0.26	0.13
46.	0.12	2.00	0.06	1.50	0.86	0.37	0.28	0.16
47.	1.30	0.87	1.50	0.91	0.98	1.11	1.15	1.25

TABLE 21 (cont'd.)

	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
48.	0.49	1.40	0.35	1.26	1.02	0.75	0.67	0.55
49.	0.29	0.35	0.82	0.35	0.33	0.31	0.31	0.30
50.	0.09	0.82	0.11	0.66	0.42	0.22	0.17	0.11
53.	0.12	1.33	0.09	1.05	0.65	0.31	0.25	0.15
54.	0.25	0.81	0.31	0.72	0.57	0.40	0.36	0.28
55.	0.25	0.69	0.36	0.63	0.51	0.38	0.34	0.28
56.	0.26	0.79	0.33	0.71	0.56	0.41	0.36	0.29
57.	0.15	0.68	0.22	0.59	0.43	0.27	0.24	0.17
58.	0.35	1.30	0.27	1.14	0.86	0.59	0.52	0.40
59.	0.33	1.32	0.25	1.15	0.87	0.57	0.50	0.38
60.	0.10	0.14	0.73	0.13	0.12	0.11	0.11	0.10
61.	0.26	0.46	0.57	0.43	0.38	0.33	0.31	0.28
62.	0.60	1.36	0.44	1.25	1.07	0.83	0.77	0.65
63.	0.24	0.69	0.35	0.62	0.50	0.37	0.33	0.28
64.	0.24	0.75	0.32	0.67	0.53	0.38	0.34	0.27
65.	0.22	1.00	0.22	0.86	0.64	0.40	0.35	0.26
67.	0.21	0.66	0.32	0.59	0.47	0.33	0.30	0.24

TABLE 22

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR MEXICAN AVERAGES (1961+63) TO UNITED STATES AVERAGES (1958+63)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
1.	0.26	0.49	0.53	0.46	0.41	0.34	0.31	0.28
2.	0.25	0.56	0.45	0.51	0.44	0.34	0.32	0.27
3.	0.13	0.52	0.25	0.45	0.34	0.23	0.20	0.15
4.	0.06	0.35	0.17	0.30	0.21	0.12	0.10	0.07
5.	0.24	0.36	0.67	0.34	0.32	0.28	0.27	0.25
6.	0.14	1.40	0.10	1.11	0.70	0.35	0.28	0.18
7.	0.09	0.53	0.17	0.44	0.31	0.18	0.15	0.11
8.	0.37	0.77	0.48	0.72	0.62	0.50	0.46	0.40
9.	0.29	0.69	0.42	0.63	0.53	0.41	0.38	0.32
10.	0.34	1.26	0.27	1.10	0.85	0.57	0.50	0.39
11.	0.26	1.37	0.19	1.16	0.83	0.51	0.43	0.31
12.	0.25	1.09	0.23	0.94	0.70	0.46	0.39	0.29
13.	0.49	1.07	0.46	0.98	0.84	0.67	0.62	0.53
14.	0.26	0.84	0.31	0.74	0.59	0.41	0.37	0.29
15.	0.34	1.42	0.24	1.23	0.92	0.62	0.52	0.39
16.	0.34	0.81	0.42	0.74	0.62	0.48	0.44	0.37
17.	0.13	0.68	0.19	0.58	0.42	0.25	0.21	0.15

TABLE 22 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
18.	0.21	0.57	0.37	0.51	0.42	0.31	0.28	0.23
21.	0.36	0.51	0.71	0.49	0.46	0.41	0.40	0.37
22.	0.17	0.77	0.22	0.66	0.49	0.31	0.27	0.20
23.	0.20	1.00	0.20	0.85	0.62	0.38	0.32	0.24
25.	0.31	0.63	0.49	0.59	0.51	0.41	0.38	0.33
26.	0.17	0.74	0.23	0.64	0.48	0.32	0.26	0.20
27.	0.26	0.79	0.33	0.71	0.56	0.41	0.36	0.29
28.	0.14	1.17	0.12	0.94	0.62	0.33	0.26	0.17
29.	0.33	0.36	0.92	0.36	0.35	0.34	0.34	0.34
30.	0.24	1.04	0.23	0.90	0.67	0.44	0.37	0.28
31.	0.25	2.27	0.11	1.82	1.17	0.60	0.48	0.31
32.	0.20	1.11	0.18	0.94	0.66	0.40	0.33	0.24
34.	0.29	0.97	0.30	0.59	0.51	0.40	0.37	0.31
35.	0.44	0.94	0.47	0.87	0.75	0.60	0.55	0.48
37.	0.31	0.91	0.34	0.82	0.66	0.48	0.43	0.35
38.	0.25	1.32	0.19	1.11	0.80	0.49	0.41	0.30
39.	0.26	1.13	0.23	0.98	0.73	0.48	0.40	0.30
40.	0.19	0.59	0.32	0.53	0.42	0.30	0.27	0.21
41.	0.14	0.25	0.57	0.23	0.21	0.18	0.17	0.15
42.	0.12	0.57	0.21	0.49	0.36	0.22	0.19	0.14
43.	0.47	1.47	0.32	1.31	1.04	0.74	0.66	0.53
44.	0.39	1.39	0.28	1.23	0.95	0.65	0.57	0.46
45.	0.09	2.25	0.04	1.63	0.86	0.33	0.24	0.16

TABLE 22 (cont'd.)

Industries	Mexican Labor Productivity	Mexican Capital Productivity	Mexican Capital-Labor Ratios	Mexican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
46.	0.12	2.00	0.06	1.50	0.86	0.37	0.28	0.16
47.	0.96	0.67	1.43	0.70	0.75	0.83	0.86	0.93
48.	0.60	1.20	0.50	1.12	0.98	0.79	0.74	0.66
49.	0.29	0.34	0.86	0.33	0.32	0.31	0.30	0.30
50.	0.44	0.69	0.64	0.66	0.66	0.53	0.50	0.46
53.	0.14	0.58	0.24	0.51	0.38	0.25	0.22	0.16
54.	0.25	0.83	0.30	0.51	0.44	0.34	0.32	0.27
55.	0.20	0.47	0.43	0.42	0.36	0.28	0.26	0.22
56.	0.25	0.78	0.32	0.70	0.56	0.39	0.35	0.28
57.	0.16	0.73	0.22	0.63	0.46	0.29	0.25	0.19
58.	0.35	1.17	0.30	0.72	0.61	0.48	0.44	0.38
59.	0.29	1.21	0.24	1.05	0.79	0.53	0.45	0.33
60.	0.12	0.16	0.75	0.16	0.15	0.13	0.13	0.12
61.	0.18	0.44	0.41	0.40	0.33	0.26	0.23	0.20
62.	0.55	1.25	0.44	1.15	0.87	0.76	0.70	0.60
63.	0.25	0.60	0.42	0.55	0.46	0.36	0.32	0.27
64.	0.27	0.42	0.65	0.40	0.37	0.32	0.31	0.28
65.	0.20	1.05	0.19	0.89	0.64	0.39	0.33	0.24
67.	0.17	0.65	0.26	0.57	0.44	0.29	0.25	0.19

TABLE 23

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR PUERTO RICO, 1958, TO THE UNITED STATES, 1958

	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
Industries								
1.	0.79	0.40	2.00	0.42	0.49	0.60	0.64	0.74
2.	0.47	0.90	0.52	0.84	0.74	0.61	0.57	0.50
4.	0.41	0.31	1.33	0.32	0.34	0.37	0.38	0.40
5.	0.72	0.66	1.09	0.67	0.68	0.70	0.70	0.71
6.	0.30	0.34	0.87	0.34	0.33	0.32	0.31	0.30
7.	0.35	0.78	0.45	0.72	0.61	0.48	0.44	0.38
8.	0.62	0.62	1.00	0.62	0.62	0.62	0.62	0.62
11.	0.37	0.90	0.41	0.83	0.69	0.53	0.48	0.40
12.	0.62	4.43	0.14	3.64	2.45	1.36	1.12	0.75
14.	0.38	0.83	0.46	0.76	0.65	0.52	0.48	0.41
15.	0.46	0.20	2.30	0.22	0.26	0.32	0.36	0.42
16.	0.51	1.06	0.48	0.99	0.85	0.68	0.64	0.55
18.	0.69	0.35	2.00	0.37	0.42	0.52	0.56	0.64
19.	0.42	0.60	0.70	0.58	0.54	0.48	0.47	0.44
20.	0.55	0.69	0.80	0.67	0.64	0.60	0.59	0.56
23.	0.66	1.27	0.52	1.19	1.04	0.86	0.80	0.70
24.	0.28	1.65	0.17	1.38	0.97	0.57	0.48	0.33

TABLE 23 (cont'd.)

Industries	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
25.	0.31	2.58	0.12	0.38	0.36	0.34	0.33	0.32
27.	0.91	4.55	0.20	3.87	2.81	1.73	1.48	1.07
29.	0.57	1.43	0.40	1.30	1.08	0.82	0.75	0.62
30.	1.20	0.08	14.30	0.11	0.19	0.41	0.54	0.92
31.	0.58	4.14	0.14	3.40	2.30	1.27	1.05	0.71

TABLE 24

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR PUERTO RICO, 1963, TO THE UNITED STATES, 1963

	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
Industries				0.9	0.7	0.4	0.3	0.1
1.	0.81	0.62	1.30	0.64	0.66	0.73	0.75	0.79
2.	0.60	1.67	0.36	1.51	1.20	0.90	0.82	0.67
3.	1.40	12.70	0.11	10.20	6.56	3.38	2.71	1.75
4.	0.49	0.35	1.40	0.36	0.39	0.43	0.44	0.47
5.	0.47	0.37	1.26	0.38	0.40	0.43	0.44	0.46
6.	0.69	1.03	0.67	0.99	0.91	0.81	0.78	0.72
7.	0.32	0.80	0.40	0.73	0.61	0.46	0.42	0.35
8.	0.49	0.51	0.96	0.51	0.50	0.50	0.50	0.49
9.	1.45	0.78	1.87	0.83	0.94	1.13	1.20	1.36
10.	0.56	0.17	3.30	0.19	0.24	0.35	0.39	0.50
11.	0.38	0.17	0.23	1.42	1.06	0.68	0.59	0.44
12.	0.65	4.33	0.15	3.59	2.45	1.38	1.15	0.78
13.	0.30	0.21	1.40	0.22	0.24	0.26	0.27	0.29
14.	0.46	1.28	0.36	1.15	0.92	0.69	0.63	0.51
15.	0.48	0.22	2.20	0.24	0.28	0.35	0.38	0.44
16.	0.47	2.76	0.17	2.31	1.62	0.95	0.80	0.56
17.	0.18	0.24	0.76	0.23	0.22	0.20	0.20	0.19

TABLE 24 (cont'd.)

Industries	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
18.	1.20	1.09	1.10	1.10	1.12	1.16	1.17	1.19
19.	0.40	1.03	0.39	0.93	0.77	0.58	0.53	0.44
20.	0.60	1.50	0.40	1.37	1.14	0.87	0.79	0.66
21.	0.59	2.10	0.28	1.84	1.44	0.98	0.86	0.67
22.	0.38	0.83	0.46	0.76	0.65	0.52	0.48	0.41
23.	0.58	2.23	0.26	1.95	1.49	0.99	0.87	0.66
24.	0.51	4.46	0.11	3.71	2.39	1.23	0.99	0.64
25.	0.44	4.40	0.10	3.50	2.21	1.11	0.88	0.55
26.	0.73	5.61	0.13	4.58	3.04	1.65	1.35	0.89
27.	0.93	6.20	0.15	5.13	3.51	1.99	1.74	1.12
28.	0.52	0.29	1.80	0.31	0.34	0.41	0.44	0.49
29.	0.54	2.35	0.23	2.02	1.51	0.97	0.84	0.63
30.	0.82	0.16	5.00	0.24	0.31	0.47	0.54	0.71
31.	0.94	6.71	0.14	5.51	3.72	2.06	1.69	1.14
32.	0.33	0.73	0.45	0.68	0.58	0.45	0.42	0.36
33.	0.60	1.00	0.60	0.96	0.86	0.74	0.70	0.63

TABLE 25

COMPARISON OF LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, CAPITAL-LABOR RATIO, AND LABOR EFFICIENCY IN SELECTED INDUSTRIES FOR PUERTO RICAN AVERAGES (1958+63) TO UNITED STATES AVERAGES (1958+63)

Industries	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent				
				0.9	0.7	0.4	0.3	0.1
1.	0.82	0.51	1.60	0.54	0.59	0.68	0.71	0.77
2.	0.31	1.35	0.23	1.16	0.87	0.56	0.48	0.36
4.	0.45	0.33	1.37	0.36	0.36	0.40	0.41	0.44
5.	0.54	0.46	1.17	0.47	0.48	0.51	0.52	0.53
6.	0.55	0.71	0.77	0.70	0.66	0.61	0.60	0.57
7.	0.32	0.78	0.41	0.71	0.60	0.46	0.42	0.35
8.	0.55	0.55	1.00	0.55	0.55	0.55	0.55	0.55
11.	0.39	1.34	0.29	1.19	0.93	0.64	0.57	0.44
12.	0.66	3.88	0.17	3.25	2.28	1.34	1.12	0.79
14.	0.43	1.10	0.39	1.00	0.83	0.63	0.57	0.47
15.	0.48	0.21	2.24	0.23	0.27	0.35	0.38	0.44
16.	0.49	1.96	0.25	1.71	1.29	0.85	0.74	0.56
18.	1.03	0.74	1.40	0.76	0.81	0.90	0.93	1.00
19.	0.43	0.88	0.49	0.82	0.71	0.57	0.53	0.46
20.	0.60	1.07	0.56	1.01	0.90	0.76	0.71	0.64
23.	0.62	1.77	0.35	1.60	1.29	0.94	0.85	0.69

TABLE 25 (cont'd.)

Industries	Puerto Rican Labor Productivity	Puerto Rican Capital Productivity	Puerto Rican Capital-Labor Ratios	Puerto Rican Labor Efficiency Under Assumed Values of the Capital Input Exponent 0.9	0.7	0.4	0.3	0.1
24.	0.34	2.43	0.14	1.99	1.35	0.75	0.61	0.41
25.	0.39	3.55	0.11	2.84	1.83	0.94	0.76	0.49
27.	0.93	5.47	0.17	4.58	3.22	1.89	1.58	1.11
29.	0.56	1.96	0.29	1.71	1.33	0.92	0.81	0.63
30.	0.94	0.13	7.36	0.16	0.23	0.42	0.52	0.77
31.	0.81	5.79	0.14	4.75	3.21	1.78	1.46	0.99

TABLE 26

CAPITAL AND LABOR WEIGHTED MEAN LABOR PRODUCTIVITY AND MEAN LABOR EFFICIENCY RATIOS FOR MEXICO

Mexico to the United States	Mean Labor Productivity Ratios		Mean Labor Efficiency Ratios Under Assumed Values of the Capital Input Exponent									
			Capital Weighted					Labor Weighted				
	Capital Weighted	Labor Weighted	0.9	0.7	0.4	0.3	0.1	0.9	0.7	0.4	0.3	0.1
1956 to 1954	0.11	0.13	0.61	0.41	0.26	0.19	0.13	0.93	0.59	0.30	0.24	0.15
1961 to 1958	0.22	0.22	0.48	0.37	0.29	0.27	0.24	0.77	0.55	0.36	0.32	0.25
1961 to 1963	0.17	0.18	0.48	0.36	0.26	0.23	0.19	0.87	0.57	0.33	0.28	0.20
1966 to 1963	0.20	0.23	0.67	0.59	0.51	0.49	0.47	0.74	0.56	0.38	0.33	0.26
Averages for 1961+66 to 1958+63	0.24	0.26	0.48	0.41	0.32	0.30	0.26	0.74	0.57	0.40	0.35	0.28

TABLE 27

RELATIVE SIZE OF THE MEAN LABOR EFFICIENCY RATIO TO THE MEAN LABOR PRODUCTIVITY RATIO FOR MEXICO

Mexico to the	Capital Weighted					Labor Weighted				
United States	0.9	0.7	0.4	0.3	0.1	0.9	0.7	0.4	0.3	0.1
1956 to 1954	5.50	3.70	2.40	1.70	1.20	7.20	4.50	2.30	1.80	1.20
1961 to 1958	2.20	1.70	1.30	1.20	1.10	3.50	2.50	1.60	1.50	1.10
1961 to 1963	2.80	2.10	1.50	1.40	1.10	4.80	3.20	1.80	1.60	1.10
1966 to 1963	3.40	3.00	2.60	2.50	2.40	3.20	2.40	1.70	1.40	1.10
Averages for 1961+66 to 1958+63	2.00	1.70	1.30	1.30	1.10	2.80	2.20	1.50	1.30	1.10

TABLE 28

CAPITAL AND LABOR WEIGHTED MEAN LABOR PRODUCTIVITY AND MEAN LABOR EFFICIENCY RATIOS FOR PUERTO RICO

Puerto Rico to the United States	Mean Labor Productivity Ratios		Mean Labor Efficiency Ratios Under Assumed Values of the Capital Input Exponent									
	Capital Weighted	Labor Weighted	Capital Weighted					Labor Weighted				
			0.9	0.7	0.4	0.3	0.1	0.9	0.7	0.4	0.3	0.1
1958	0.69	0.54	0.61	0.62	0.64	0.65	0.67	0.87	0.74	0.63	0.60	0.56
1963	0.52	0.53	0.49	0.48	0.49	0.49	0.51	1.35	1.02	0.73	0.66	0.56
Averages for 1958+63	0.57	0.53	0.51	0.51	0.53	0.54	0.55	1.14	0.91	0.69	0.64	0.56

TABLE 29

RELATIVE SIZE OF THE MEAN LABOR EFFICIENCY RATIO TO THE MEAN LABOR PRODUCTIVITY RATIO FOR PUERTO RICO

Puerto Rico to the United States	Capital Weighted 0.9	0.7	0.4	0.3	0.1	Labor Weighted 0.9	0.7	0.4	0.3	0.1
1958	0.88	0.90	0.93	0.94	0.97	1.61	1.37	1.17	1.11	1.04
1963	0.94	0.92	0.94	0.94	0.98	2.55	1.92	1.38	1.25	1.06
Averages for 1958+63	0.89	0.89	0.93	0.95	0.96	2.15	1.72	1.30	1.21	1.06

TABLE 30

RELATIVE MEXICAN LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, AND LABOR EFFICIENCY UNDER INCREASING RETURNS TO SCALE

		Estimated Capital Productivity Under Alternative Exponents for Capital and Labor			Mexican Labor Efficiency Under Alternative Exponents for Capital and Labor		
Industries	Mexican Labor Productivity	g=0.8 h=0.5 j=0.8 k=0.5	g=0.8 h=0.5 j=0.5 k=0.5	g=0.5 h=0.5 j=0.8 k=0.5	g=0.8 h=0.5 j=0.8 k=0.5	g=0.8 h=0.5 j=0.5 k=0.5	g=0.5 h=0.5 j=0.8 k=0.5
1.	0.16	0.10	22.00	0.13	0.10	13.20	0.02
2.	0.14	0.08	2.00	0.01	0.08	1.00	0.02
25.	0.24	0.14	2.00	0.06	0.14	1.14	0.11
32.	0.14	1.50	37.50	0.02	1.50	17.00	0.04
33.	0.14	1.50	30.00	0.02	1.50	10.80	0.06
38.	0.16	0.24	5.70	0.02	0.24	2.50	0.04
41.	0.09	0.03	0.32	0.0003	0.03	0.01	0.01
44.	0.28	18.30	55.00	0.23	18.30	15.60	8.10
49.	0.25	0.71	17.10	0.01	0.71	8.60	0.02
62.	0.40	6.30	95.00	0.09	6.30	41.20	0.21

TABLE 31

RELATIVE PUERTO RICAN LABOR PRODUCTIVITY, CAPITAL PRODUCTIVITY, AND LABOR EFFICIENCY UNDER INCREASING RETURNS TO SCALE

Industries	Puerto Rican Labor Productivity	Estimated Capital Productivity Under Alternative Exponents for Capital and Labor			Puerto Rican Labor Efficiency Under Alternative Exponents for Capital and Labor		
		g=0.8 h=0.5 r=0.8 s=0.5	g=0.8 h=0.5 r=0.5 s=0.5	g=0.5 h=0.5 r=0.8 s=0.5	g=0.8 h=0.5 r=0.8 s=0.5	g=0.8 h=0.5 r=0.5 s=0.5	g=0.5 h=0.5 r=0.8 s=0.5
2.	0.60	0.54	70.00	0.009	0.54	37.40	0.02
14.	0.46	6.00	150.00	0.10	6.00	93.00	0.16
17.	0.18	0.75	15.00	0.01	0.75	7.60	0.03
24.	0.51	5.40	70.00	0.14	5.40	33.50	0.29
25.	0.44	7.80	70.00	0.17	7.80	37.70	0.32