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2 Effective Protection and the Distribution of Personal Income by Sector in Colombia

T. Paul Schultz

2.1 Introduction

The high level of effective protection in many low-income countries and the wide dispersion in levels of protection across industries leads one to expect that these trade regimes pull considerable domestic resources into suboptimal patterns of production and trade. The structure of protection may also affect the relative prices of labor and capital, and the relative wages of skilled and unskilled labor, inducing firms to adopt techniques of production that employ factors in proportions that do not make the most efficient use of the country's resources. From a policy perspective, the distributional effects of protection among factors, sectors, firms, and persons are as important as the static effects of these distortions on the productivity of domestic resources (valued at world prices) or the more elusive dynamic consequences of these distortions on economic growth (Corden 1975). But the literature on effective protection that has grown rapidly after the initial contributions of Johnson, Corden, and Balassa in the mid-1960s has not proposed an empirical measure of these distributional consequences of protection on factor returns, sectoral incomes, or personal incomes. The NBER project on alternative trade strategies and employment documented factor proportions in categories of traded goods and compared rankings of these sectors by their factor content and

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trade status as predicted by the Heckscher-Ohlin-Samuelson (HOS) factor proportions trade theory as extended by Krueger (1977). This study derives a measure of the quasi rents that accrue to factors of production in Colombia associated with variation in effective protection. As in most schemes designed to measure market distortions or quasi rents that do not have a clear allocative function, one can also attribute unexplained variation in factor returns to qualitative differences in the factors, such as labor's productive skills, or to differences in managerial efficiency, or to the distribution of complementary untraded factors of production. But until these additional explanations for sectoral variation in factor returns are conceptualized, empirically measured, and jointly analyzed with data on effective protection, analyses of the sort presented below provide a prima facie case for a connection between effective protection and factor returns. The method proposed here is to analyze incomes of individuals as reported in the 1973 Colombian census 4 percent sample, by sex, age, education, job type, and sector of employment. Sectoral deviations in individual standardized incomes are then matched with trade and census of manufacturing sectoral data to estimate the partial association between effective protection and personal incomes.

The analysis is restricted by available data in several ways. Less highly aggregated industrial sectors would strengthen the empirical work, as would improved information on wage rates, earnings, and wealth for the individual workers in the census sample. A match between the characteristics and income of the individual worker and the characteristics of the production unit employing the worker, such as the firm's capital stock and other inputs, outputs, and trade relations, would greatly augment the range of questions one might study. Additional studies would help confirm the causal and intertemporal character of the association found here across industries in wages and protection. I would like to be able to evaluate the consequences *over time* of effective protection on factor returns and conversely to study factor mobility as a mechanism for eroding over time quasi rents among groups distinguished by their sectoral attachment, skills, and ownership of other productive factors. But protection estimates for Colombia are available for only one year, 1970. Another check on the evidence that emerges from this study would involve comparing the industrial structure of protection and worker incomes across a sample of low-income countries that presumably face similar technological options. Would special features of Colombian protection be associated with unusual deviations in the Colombian industrial structure of wages, holding constant other variables prescribed by theory? From this initial study, based on a single cross section from a single country, the evidence suggests that workers receive notably higher wages in sectors of the economy that are effectively protected, and the proportional increment to personal incomes that is associated with effective protection is slightly greater for Colombian employers than it is for Colombian employees.

The paper is organized as follows. First the concept of effective protection is outlined and the reasons are stated for the expectation that effective protection increases primarily the returns to capital. Second, the trade and tax regime of Colombia is described, as are the data sources for this study. Empirical evidence is then reported, first derived from regressions across individual workers, and subsequently across sectors. Finally, the character of the evidence is discussed and the problems with its causal interpretation are stated with the aim of identifying issues for further research.

2.2 Effective Protection

The incentive effects of trade policies, and perhaps also tax and subsidy policies, on specific economic activities in a country are often summarized in a single index of effective protection. In a trade regime of only tariffs that are sufficient to account for the divergence of domestic and foreign supply prices, the effective rate of protection is the nominal tariff on output minus the weighted average of the tariff on its inputs, expressed as a proportion of the value added per unit of output measured at world prices (Corden 1975). Different schemes for the treatment of nontraded inputs have been proposed, and here I follow Corden's convention of combining the primary factor content of nontraded inputs with value added and treating traded input content of nontraded inputs with directly traded inputs (Corden 1977).[1]

When quotas and import licensing controls are used to achieve protection, as in Colombia, nominal tariff rates no longer bear a necessary relation to effective protection (Musalem 1970). Under such a complex trade regime, comparisons between domestic and world prices must be collected to obtain implicit rates of protection, and these become the starting point for the calculation of rates of effective protection. When these price comparisons were performed for Colombia in 1969, domestic/world price ratios are not correlated, to a statistically significant degree, with the nominal tariff rates on the books (Hutcheson 1973).

But there are many reasons to be wary of calculated rates of effective protection, whether derived from direct tariff information or from price comparisons, and the most serious stem from the limitations of this partial equilibrium framework.[2] There are clear theoretical arguments why substitutability between primary inputs and (imported) intermediate inputs could reverse sectoral rankings according to effective protection and according to the actual incentive effects of tariff structures. Also, in a multicommodity world a higher tariff sector does not necessarily call forth resources from a lower tariff sector (Jones 1971). From an empirical point of view, compromises in the matching of aggregate sectoral data from a variety of sources introduce more than the usual problems of heterogeneity within sectors, and cascading errors may arise as one takes account of indirect input requirements of sectors. Nonetheless, without a viable alternative, rates of effective protection can be highly useful as a rough indicator of the sectoral incentives created by trade, tax, and subsidy policies. Rates of effective protection do not indicate, however, how much the structure of production is thereby altered; for an understanding of the magnitude of the response to any system of incentives, one must know at a minimum the domestic elasticities of factor supplies.

It was commonly argued in support of the import substitution policies adopted by many developing countries during the 1950s and 1960s that protection was justified because the shadow value of labor was below the market wage in manufacturing.[3] Although subsequent analyses indicate it may be preferable to subsidize the agricultural wage (Bhagwati and Srinivasan 1974), the case for protection given domestic labor market distortions led to the consideration of a uniform rate of effective protection *for labor*, calculated by assigning the nonlabor share of value added to traded inputs (Corden 1974). A divergence between the private wage and the social shadow wage might then be eliminated by setting the level of effective protection *for labor* uniformly across sectors, to favor industries in proportion to their labor share in value added. In the Colombian case, on the contrary, effective protection appears to favor industries with above-average capital intensity and with a larger proportion of skilled and educated workers.[4]

Protection may be needed to induce production where domestic costs of production are higher than elsewhere. If protection exceeds this cost margin, this "excess" effective protection should be associated with quasi rents accruing to factors in the industry.[5] In the short run, factor mobility across sectors may determine how the quasi rents are allocated within the sector, whereas in the longer run the monopoly position of the industry and the specific character of the factor and its supply elasticity would modify the persistence and factoral distribution of the quasi rent associated with the "excess" effective protection.

In the two-factor case, without intermediate good inputs, labor might be assumed to be mobile and competitively supplied, whereas capital is perfectly inelastically supplied across industries. In this instance capital returns would be increased by the margin of "excess" effective protection divided by the share of income received by capital. The owners of equity capital have the residual claim on rents in a capitalist economy where labor is supplied competitively. Such reasoning may have guided Hutcheson and Schydlowsky's (1977) analysis of Colombian effective protection, for they attributed all the gains of sectoral protection to capital.[6]

Conversely, one might assume that capital and entrepreneurship were mobile across sectors but that labor supplies were inelastically supplied (i.e., restricted) to the protected sectors, perhaps through unionization and sheltered government arrangements. In this situation, labor incomes might be expected to increase by the margin of effective protection divided by labor's share in factor income. If labor's share were about half, the elasticity of wages with respect to "excess" effective protection (net of higher domestic costs) could range from zero to two. Conversely, the comparable elasticity of capital returns with respect to effective protection could range from two to zero. Although it is practically impossible to adjust (by industry) for the domestic cost premium required to sustain Colombian production, the empirical objective of this study is more modest. It is to estimate the relationship between labor income and effective protection and thereby shed some light on how the quasi rents generated or sustained by protection are currently distributed among the factors of production.

There are at least two reasons one might find no relationship between labor incomes and effective protection by sector, controlling for other productive characteristics of workers. Effective protection may only offset higher production costs, and therefore generate or sustain no clear pattern of factor quasi rents at the level of aggregation studied. Alternatively, the sectoral advantage associated with effective protection may have been appropriated by capital, with labor mobility bidding away any quasi rents going to workers. To test the latter hypothesis, one can examine personal incomes of self-employed workers and employers who should stand to share in some of the quasi rents received by capital. If the incomes of these "capitalist" groups are also independent of whether they work in a relatively protected sector, then the empirical evidence would support the null hypothesis that the pattern of effective protection is not responsible for redistributing personal income by sector.[7] Before proceeding to the empirical analysis, the next section reviews the evolution and liberalization of Colombian postwar trade policies.

2.3 Colombian Trade Regime

During the Great Depression, Colombia, like many other countries in Latin America, instituted foreign exchange and trade controls. Postwar periods of increasing coffee prices encouraged domestic expansion and permitted some liberalization of this inherited trade regime; periods of falling coffee prices tightened the restrictive aspects of the system. The overriding features of the early period are summarized by Díaz-Alejandro: "Before 1968, there were not only severe restrictions on the importation of capital goods, but also erratic stop-go fiscal and monetary policies, with expansionary binges being followed by restrictive policies.

Austerity in fiscal and monetary matters, when applied, did help the balance of payments, but at the cost of slowing GNP expansion and generating excess capacity even in sectors where direct and indirect demand for imported inputs was small, such as construction" (1976, p. 237). Beneath this pattern of foreign-exchange-constrained growth and stagnation, Colombia pursued from at least the late 1950s to 1967 a policy of import substitution. The new tariff of 1959 was higher and less uniform than that of 1950, and reforms in 1962 added further to dispersion in tariff rates. Although the tendency was for final manufactured products to be more protected than intermediate goods, and for primary products to be least protected, this generalization has to be amended to recognize that substantial disparities existed between final manufactured goods.[8]

Imports were controlled by three instruments: tariffs, which were often redundant; variable advanced deposits on imports, which added only about 2 percent as much as did tariff revenues to the direct cost of imports but were far more restrictive when credit was rationed; and import licensing, which had the greatest restrictive effect on Colombian trade. Import tax exemptions for intermediate goods imports were exchanged for assurances that output would be exported, and import duty exemptions were also extended broadly to the government and the church. Multiple exchange rates taxed exports of coffee, oil, and sugar, whereas capital subsidies accrued to all who could secure government-controlled credit in which nominal interest rates were less than inflation rates. Overall, the structure of incentives up to 1967 penalized agriculture and oil and sheltered manufacturing unevenly; effective protection on finished goods tended to exceed that on unfinished goods, and the dispersion in rates of protection on intermediate goods was substantial. Finally, certain major capital goods projects were undertaken with government support or participation and were heavily subsidized. The degree of concentration of investment and growth in capital-intensive activities is reflected in the fact that a quarter of total investment in manufacturing from 1962 to 1967 occurred in the chemical and petrochemical sectors (Thoumi 1980).

With the shift from a fixed and chronically overvalued exchange rate to a creeping-peg system in 1967, a systematic effort began to redress the imbalance between incentives for import substitution and those for export promotion. A 15 percent subsidy (Certificado de Abono Tributario) was granted on "nontraditional" exports, and credit arrangements were established for exporters. Price controls in the domestic market and taxes on exports also introduced an added divergence between the protection levels in the domestic and export market for a sector; consequently, an average of the two is analyzed here. By 1970, when the most detailed estimates of Colombian effective protection are available, the ratio of the Corden index of effective protection to value added is negative in agriculture and mining, is less than +10 percent in construction materials and processed food, +10 to 20 percent in intermediate goods (and processed food without sugar), and ranges from +20 to 40 percent in beverages, tobacco, durable and nondurable consumer goods, and machinery, to over 100 percent in transport equipment (Hutcheson and Schydlowsky 1977, table 2A).

Examining factor proportions and trade status of Colombian industries in 1970 and 1973, Thoumi (1977) finds evidence that by 1973 export-oriented manufacturing industries had become more labor-intensive and less skill-intensive than those sectors that were classified as either importing or import-competing. Thus the pattern of Colombian trade in 1973, six years after the start of the export-oriented trade liberalization program, appears to be explained fairly well by the factor intensity trade theory of comparative advantage.[9] But Thoumi's analysis of labor inputs and its skill composition is restricted to manufacturing and to the distinction between blue- and white-collar workers. Also, data from the manufacturing census and DANE's (Departamento Administrativo Nacional de Estadística) sample of firms tend to reflect developments in larger firms and to underrepresent small firms that employ on average less modern and more labor-intensive technologies. These standard data sources, therefore, do not adequately describe what is often called the "craft" or "informal" sector. To analyze in greater detail the incomes and characteristics of all Colombian workers by industry, a 4 percent sample of the 1973 census of population is considered in the next section. Representative of all private households in the twenty-two departments of Colombia plus the special district of Bogotá, this census sample reflects more accurately the balance of employment in small and large firms but provides less information on industry categories.

2.4 Empirical Evidence

In this section Colombian data on individual incomes reported in the population census are analyzed by sector to determine whether industry specific income levels are associated with the sector's level of effective protection. I shall return later to a discussion of the difficulties that stem from using a single cross section on incomes and protection and to how one is to interpret such an association, if one exists. To obtain an estimate of the elasticity of labor income with respect to effective protection, one among several restrictions must be imposed on a simple interindustry model of an income-generating function.

2.4.1 A Statistical Model: Alternative Restrictions

The income-generating function of years of schooling and years of postschooling experience has been used to describe cross-sectional variation in the logarithms of worker incomes in many countries and in many time periods. Though this specification of the income-generating function has its origins in the human capital framework (Mincer 1974), it is used here as a set of controls for the schooling, skills, and maturity of workers that might be presumed to influence worker productivity and thereby affect labor incomes among workers in a competitive market. The model fitted is of the following form:

$$(1) \qquad \ln Y_i = \alpha_0 + \alpha_1 S_i + \alpha_2 X_i + \alpha_3 X_i^2 + e_i, \quad i = 1, 2, \ldots, N$$

where $\ln Y_i$ is the natural logarithm of the ith individual worker's monthly income, S_i is his years of schooling, X_i is his years of postschooling experience proxied by his age minus schooling minus 7, (i.e., age of school entry), and X_i^2 is the experience variable squared (and generally divided by 100). The αs are estimated by ordinary least squares over a sample of N workers, and the es are assumed to be well-behaved independent, constant-variance disturbances. Two restrictions implicit in this specification are (1) that proportionate increase in income associated with an additional year of schooling is constant across educational levels, and (2) that the quadratic in "experience" adequately captures the cross-sectional life-cycle variation in income. Both of these functional restrictions are considered and accepted by Fields and Schultz (1977) in their analysis of these census data. This very parsimonious three-parameter function for individual incomes fits the Colombian census data nearly as well as an unrestricted analysis of variance model, within which the parsimonious model is nested, with its many additional fitted parameters. Only about a third of the logarithmic variance of incomes is accounted for by the three variables, yet this level of explanatory power when working with individual data is somewhat higher than noted in similar exercises performed with census data from the United States and other countries.

To this conventional income function (1) an additional variable is added for the percentage of effective protection, P_j, in the jth sector employing the individual. The estimated coefficient on this sector-specific protection variable is then interpreted as an estimate of the elasticity of labor incomes in a sector with respect to effective protection. All the variables in the conventional income-generating function relate to individual characteristics of workers supplying labor. Now a sectoral characteristic of the firm that demands labor has also been included. If labor markets are geographically separated or institutionally insulated from one another by distortions or long-term commitments, different premiums may be attached at any moment in time to schooling and experience in different industries. In this situation, the parameters to the initial income function may differ across industries, and one would like to estimate the following equation:

$$(2) \qquad \ln Y_i = \alpha_{0j} + \alpha_{1j}S_i + \alpha_{2j}X_i + \alpha_{3j}X_i^2 + \alpha_4 P_j + u_i, \quad i = 1, 2, \ldots, N; \; j = 1, 2, \ldots, J$$

where the α_{0j}, α_{1j}, α_{2j}, and α_{3j} differ across J industrial sectors.

Since P takes on only J different values, a linear combination of the industry-specific constant terms, α_{0j}, could equal P_j, and thus equation (2) is singular and cannot be estimated directly; too much information is being asked of the data. If one knew how the parameters to the conventional income functions varied across industries, or which groups of sectors shared a common income function, this added information might be imposed as restrictions on the specification of equation (2). I lack a satisfactory basis for imposing these restrictions.

Three approaches to estimating the parameter α_4 are followed here. The first is to assume that the conventional income function parameters, α_0 through α_3, are identical across industries, as is the common practice in the literature on labor market behavior and human capital; that is, $\alpha_{kj} \equiv \alpha_k$, $k = 0, 1, 2, 3; j = 1, 2, \ldots, J$. There is no problem, then, with estimation, but one cannot examine directly how sectoral incomes differ, in order to determine if anomalous sectoral observations are associated with peculiar factor demands, regional location, ownership, capital intensity, or trade status. It is possible, nonetheless, to add other characteristics of the firms demanding labor in the sector, such as capital intensity, yet these indicators of industrial characteristics do not have a clear theoretical interpretation in an income-generating function, and they are employed here largely to test the robustness of the estimate of α_4 with respect to the inclusion of other potentially collinear features of the sector.

The second approach estimates a set of unrestricted industry-specific intercepts in the income-generating function and then regresses these on protection levels by sector. First, estimates are obtained for the following equation:

$$(3) \qquad \ln Y_i = \alpha_1 S_i + \alpha_2 X_i + \alpha_3 X_1^2 + \sum_{j=1}^{I} \delta_j D_{ji} + u_i, \quad i = 1, 2, \ldots, N$$

where D_{ji} is one if the ith worker is in sector j and otherwise zero, and δ_j represents the level of the logarithmic income function for each of the $j = 1, 2, \ldots, I$ sectors (for the benchmark individual with no schooling or experience). Second, the estimated values of δ are regressed on the sector's level of effective protection:

$$(4) \qquad \hat{\delta}_j = \beta_0 + \beta_1 P_j + \omega_j, \qquad j = 1, 2, \ldots, I$$

where β_1 is a second estimate of the elasticity of incomes with respect to sectoral effective protection. Since the errors in (4) are probably heteroskedastic across the different-sized sectors, generalized least-squares estimates are more efficient than the unweighted ordinary least-squares estimates. The working hypothesis adopted here is that the error in (4) is due to estimation error of δ in (3), or, in other words, $\omega_j = \hat{\delta}_j - \delta_j$.[10] In the individual regressions it is assumed that each worker observation is subject to an independent, constant-variance error, u_i. If the allocation of workers by sector is independent of this error, the variance of a sector's error is inversely proportional to the square root of the number of workers observed in the sector $1/\sqrt{n_j}$. This weight for ω_j is therefore initially assumed to be this simple function of the number of "workers" in the sector when aggregate second-stage estimates are obtained. A better procedure appears to be to use the variance/covariance matrix of the coefficient estimates of δ in (3), which provides information on the precision of the sector intercept estimates used as the dependent variable in (4). This weighting procedure is referred to as the "covariance" matrix weights. The first set of estimates across individuals, and the second covariance two-stage estimates across sectors, should yield similar estimates for α_4 and β_1, respectively, if protection is not correlated with u_i and the assumed structure of ω_j is correct.

If parameters of the income-generating function differed markedly from industry to industry, a third hybrid model might document the shortcomings of the previous schemas, though the third model necessitates aggregate comparisons of incomes based on the average characteristics of a representative worker. The parameters of the income-generating function are first estimated by ordinary least squares *within* each industrial sector:

$$\ln Y_{ij} = \alpha_{0j} + \alpha_{1j} S_i + \alpha_{2j} X_i + \alpha_{3j} X_i^2 + e_i. \qquad \begin{matrix} i = 1, 2, \ldots, N \\ j = 1, 2, \ldots, J \end{matrix} \tag{5}$$

In the second stage, a predicted wage is calculated by cross-multiplying the industry-specific estimates and the mean worker characteristics of the entire sample, denoted by the bars:

$$\widehat{\ln Y_j} \equiv \hat{\alpha}_{0j} + \hat{\alpha}_{1j}\bar{S} + \hat{\alpha}_{2j}\bar{X} + \hat{\alpha}_{2j}\bar{X}^2. \qquad j = 1, 2, \ldots, J$$

The predicted sectoral income is then regressed on the sectoral level of effective protection,

$$\widehat{\ln Y_j} = \gamma_0 + \gamma_1 P_j + v_j. \qquad j = 1, 2, \ldots, J \tag{6}$$

Again, one anticipates that the error, v_j, will be heteroskedastic. As a simple approximation, the "worker weights" of each sector are used to increase the efficiency of the estimate γ_1 of the elasticity of labor incomes with respect to effective protection.

2.4.2 Data: Sectoral Aggregates and Types of Workers

Matching industries across three data sources—(1) the 1973 population census sector-of-employment (DANE), (2) the effective protection indexes (Hutcheson and Schydlowsky 1977), and (3) trade status indexes (Thoumi, 1978)—involves an inevitable loss of sectoral detail and undoubtedly some mismatching as well as the creation of broad heterogeneous categories of production. The 1973 population census 4 percent sample distinguishes some forty-four industrial sectors that contain more than seventy male employees reporting the personal variables examined here. Appendix table 2.A.3 reports the logarithmic income function estimates for male employees allowing for the level of income to vary independently across each of these forty-four industry categories. To match with the protection series, the census sectors are reaggregated into thirty-eight sectors (reported in appendix table 2.A.4), losing primarily the ability to distinguish among activities in mining: coal, oil and gas, metals, others, and not specified elsewhere.[11] Of these thirty-eight sectors, protection indexes are available for only thirty-five, which requires the omission of plastics, pottery, and glass products. Three small categories are also omitted as probably unreliable for this exercise, because most of the workers in these census industry categories report the residual code "not specified elsewhere," whereas the subsectors for which protection and trade data are most applicable are specified elsewhere in the census codes.[12] Of these thirty-two consistently defined sectors, six are treated as untradables in the protection and trade data. Five of these untradables are clearly justified—electricity and water-related utilities, construction, personal services, and professional and business services—but printing and publishing is called an untradable in the protection series, perhaps for lack of comparable world and domestic price series. I am left, therefore, with a sample of twenty-six sectors producing tradable commodities, of which twenty-two are manufacturing. But the sectors omitted for lack of good matching data employed less than 4 percent of the male employee labor force, according to the 1973 census sample. The sectors classified as producing untraded goods, on the other hand, contained about one-sixth of the male employees.

Two sectors warrant special attention, the first small and readily overlooked, the second large and defying generalizations. The first case is the refining sector, which employs ninety-one men and nine women in the sample. Entirely government-operated and highly capital-intensive, the refining sector is sheltered by an oil export tax, which creates a subsidized market for domestic consumption of oil products. This small sector pays its employees 50 to 80 percent more than is common elsewhere in the Colombian economy and is predictably an outlier in any intersectoral comparison of personal incomes, regardless of sex or level of education.

The second outlying sector is agriculture, but it includes more than half of male employees and therefore dominates any weighted comparison of sectoral incomes and protection. The negative effective protection afforded Colombian agriculture represents a large transfer of resources from agricultural producers to others in the economy. This is predominantly a reflection of the tax on coffee exports that reduces by some 50 percent the peso equivalent obtained per dollar of f.o.b. value exported. Aside from coffee, Colombian agriculture receives about 14 percent effective protection on exports and a 2 percent level of protection in the domestic market. When broader redistributive policies are considered, such as the direct taxation system and credit subsidies, the margin of effective protection plus subsidies received by agricultural commodities other than coffee sums to 24 percent of value added of exports and 2.6 percent on the domestic market (Hutcheson and Schydlowsky 1977, table 2d).

It is impossible here to distinguish between wages received in different segments of agriculture subject to these contrary incentives.[13] Regional differences could be explored, but the distinction would be blurred even in coffee-producing regions, because many landless and landowning agricultural workers earn only a small fraction of their income from coffee production, and the possibilities of substitution among agricultural activities cannot be ignored. A major uncertainty in such an investigation is whether agriculture, with its heterogeneity, can be usefully analyzed here. If agriculture is excluded, then the smaller loss of forestry, fishing, and mining leaves one with the residual sample of much less variability for which all sectors are represented in the DANE manufacturing survey, with its energy utilization and value added per worker proxies for capital stock.

Three samples of sectors are therefore considered in the following analysis. The first includes all thirty-two traded and untraded sectors. The second includes the twenty-six traded sectors, and the third sample is restricted to the twenty-two manufacturing sectors, most importantly excluding agriculture. The analysis relies on the 1973 Colombian census of population, from which a 4 percent sample has been prepared by the National Statistical Office (DANE). Several groups of workers can be distinguished, but the most useful are male employees between the ages of fifteen and sixty-five reporting last month's income.[14] It would be desirable to eliminate unearned income and divide the earned income by the time worked (during the month) to obtain a proper wage rate, but the data do not permit either adjustment to be performed. Later analysis turns to the much smaller group of male employers, to determine if this group, with its greater returns from entrepreneurship and capital, is also affected by sectoral levels of protection.[15] There are only 14 percent as many female as male employees in the census sample, and their sectoral concentration is sufficient to yield high-variance estimates of incomes for many sectors. Male and female employee income levels are strongly positively correlated across sectors, but for several reasons analysis is restricted here to males.[16]

2.4.3 Empirical Findings

Estimates of the first model are reported in table 2.1, where the units of observation are male employees. Since proxies for capital stock per worker are available only for manufacturing, the first four regressions are for the quarter of the employees in manufacturing, and the last two regressions include all male employees in traded sectors, including primarily the addition of agriculture. Regressions (1) and (5) show the conventional income-generating functions that reveal similar returns to schooling in both samples, that is, 20 percent, but more steeply sloped experience-income profiles in manufacturing.

Table 2.1 Income Function Estimates for Male Employees with Proxies for Capital Stock per Worker in Manufacturing

Explanatory Variables	Twenty-two Manufacturing Sectors				All Twenty-six Traded Sectors	
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	.200	.195	.194	.191	.197	.163
	(94.4)	(91.2)	(90.6)	(88.5)	(126.)	(95.7)
Experience	.0897	.0889	.0880	.0867	.0563	.0528
	(50.5)	(50.2)	(49.8)	(49.1)	(56.0)	(53.7)
(Experience squared)/100	−.126	−.124	−.123	−.121	−.0776	−.0723
	(37.2)	(36.9)	(36.7)	(36.2)	(46.3)	(44.2)
Corden index of effective protection		.339	.384	.323		1.24
		(10.7)	(12.0)	(10.2)		(45.1)
Horsepower 1969 per worker			.0190			
			(9.91)			
(Value added 1969 per worker)/100				.190		
				(13.1)		
Constant term	4.89	4.91	4.86	4.85	5.00	5.33
	(203.)	(204.)	(198.)	(200.)	(355.)	(341.)
R^2	.473	.478	.483	.487	.308	.342
Standard error of of the estimate	.689	.686	.683	.681	.828	.807
Sample size	10,919	10,919	10,919	10,919	38,547	38,547

NOTE: Dependent variable is the natural logarithm of the monthly income variable from the 1973 census of population sample.

The central issue of this study is the estimate on the Corden index of effective protection in regressions (2) and (6). Across all traded sectors the estimated elasticity of male employee incomes with respect to effective protection is 1.24, whereas across only the manufacturing sectors the elasticity estimate is one-fourth as large, or 0.34, but both estimates are far from zero.[17]

Within the more restricted range of the manufacturing sector, it might be thought that higher incomes would accrue to workers employed in more capital-intensive sectors, because of imperfections in labor markets or the greater selectivity of employers in these sectors. The two proxies available for capital stock per worker are a measure of installed horsepower capacity and value added (see table 2.A.2).[18] These data, however, come from the DANE survey of manufacturing establishments, which may not sample the full range of smaller firms that should be represented in the population census. The measure of horsepower capacity, for all its conceptual inadequacies, is also weakly correlated from year to year across sectors, suggesting to me that it may be subject to substantial sampling variability. Value added per worker, on the other hand, includes payments for wages and salaries, which are likely to be correlated with productive characteristics of the sector's work force, such as education and postschooling experience. Adding the horsepower capacity variable in regression (3) increases the coefficient on protection by 13 percent, and including the value added per worker variable in regression (4) decreases it 5 percent. Though only poorly specified proxies for the capital stock are available in Colombia, the magnitude of the partial relationship between employee incomes and sectoral protection does not appear very sensitive to the inclusion of these types of capitallike variables.

It is also noteworthy that the "returns" to schooling are not greatly affected by sectoral levels of protection across manufacturing (18.9 versus 18.5 percent), whereas given the lower educational attainment of workers in agriculture the protection variable does depress the partial association between schooling and employee incomes across all traded sectors, from 22.2 to 19.8 percent.

One can decrease the dependence of these estimates of the effect of protection on the inclusion or exclusion of agriculture by adding to the income function an "effect" for distinctly different levels of income in rural and urban areas. This could be justified if the prevalence of nonmonetized income payments were greater in the rural sector, such as the provision of food and shelter, and the general cost of living were lower in rural than in urban areas, closing the apparent difference between reported money income and *real* incomes. Including such a rural/urban residence dummy variable in regression (6) in table 2.1 confirms that rural male employee money incomes are some 20 percent lower than urban, and allowing for this difference the estimate on the protection variable decreases a third from 0.0124 to 0.0084.[19] But this procedure would be warranted only if one believed that rural and urban *real* incomes in Colombia were similar for male employees, given their education, experience, and sector of employment. The historical and continuing pace of rural/urban migration and the widely documented evidence of differences in real incomes between the rural and urban sectors of the Colombian economy indicate, on the contrary, that the above adjustment blurs rather than sharpens our capacity to measure the magnitude of the real differential in incomes between the agricultural and nonagricultural sectors, and hence this adjustment of the income function leads to an underestimate of the slope of the partial relationship between real incomes and effective protection. Later estimates of the second and third formulation of the model, based on aggregate sectoral data, will clarify how the extreme situation of agriculture alters the relationship. In sum, the choice of sectors for inclusion in the study sample has a marked and unavoidable effect on the final estimates; given the other factors depressing agricultural incomes, it may be reasonable to concentrate our attention on the more homogeneous sample of manufacturing sectors.

2.4.4 Employers and Self-Employed: Additional Evidence

Here I advance for testing the hypothesis that a portion of the variation in returns to factors across sectors and employment groups can be linked to the incentive effects of effective protection. Examining the incomes of population groups other than employees may add to our understanding of this relationship. The self-employed represent about a fifth of the male labor force in Colombia, but disparate groups are included in this category. They are predominantly small-scale farmers, both landowners and probably tenant farmers, whose excess demands for labor are largely satisfied within the family. Without a basis for imputing a share of the self-employed incomes to unpaid family workers and to owned land and capital, reported incomes are a mixture of factor returns.[20] In nonagricultural sectors self-employed are engaged in a variety of activities, but since they do not by definition employ other workers, their incomes are likely to be predominantly returns to their own labor and entrepreneurship.[21]

Employer income is also a mixture of returns to labor, capital, and entrepreneurship, but this group may be more comparable across sectors. No information, however, is available on the capitalization of employers in their own activity, not even information on firm size or employer capitalization by sector. Thus, interpretation of the partial association between employer incomes and sectoral levels of effective protection must still be approached with considerable caution. This appears, nonetheless, to be one indicator of the returns to a mixture of entrepreneurial factors, whereas the relation with employee incomes is a purer indicator of the effect of protection on labor incomes only.

The same regressions as reported in table 2.1 for male employees are reported for male employers in table 2.2. A strong positive partial association is again found between the level of personal incomes and effective protection in the sector of employment. For employers the elasticity estimate is higher than for employees, 1.98 across all traded sectors, and 0.49 across manufacturing sectors. Adding the available proxies for sectoral capital intensity increases the income effect of protection in the case of installed capacity and decreases the effect for value added. Though the samples are much smaller and the levels of statistical significance on the effect of protection are less for employers than employees, the pattern of sectoral variation in employer incomes suggests that they benefit proportionately by a larger margin than do employee incomes by the incentive effects of effective protection.

2.4.5 Returns to Schooling and Protection

The educational coefficient is not particularly sensitive to the inclusion of the protection variable (compare regressions 1 and 2, table 2.1), suggesting that sectoral levels of protection are not closely associated

Table 2.2 Income Function Estimates for Male Employers with Proxies for Capital Stock per Worker in Manufacturing

Explanatory Variables	Manufacturing Sectors				All Traded Sectors	
	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	.189	.185	.182	.180	.222	.198
	(22.6)	(21.7)	(21.2)	(20.9)	(45.3)	(38.3)
Experience	.0475	.0485	.0487	.0483	.0335	.0347
	(5.28)	(5.39)	(5.43)	(5.40)	(7.06)	(7.42)
(Experience squared)/100	.0639	.0648	.0656	−.0647	−.0346	−.0352
	(4.79)	(4.87)	(4.94)	(4.89)	(5.46)	(5.65)
Corden index of effective protection		.494	.540	.379		1.98
		(2.06)	(2.25)	(1.58)		(13.)
Horsepower 1969 per worker			.0251			
			(2.32)			
(Value added 1969 per worker)/100				.351		
				(3.70)		
Constant term	5.83	5.85	5.78	5.72	5.36	5.78
	(36.2)	(36.3)	(35.6)	(35.0)	(61.4)	(63.1)
R^2	.330	.333	.336	.341	.295	.317
Standard error of of the estimate	1.006	1.005	1.003	.999	1.118	1.100
Sample size	1,160	1,160	1,160	1,160	5,108	5,108

NOTE: Dependent variable is the natural logarithm of the monthly income variable from the 1973 census of population sample.

Table 2.3 Income Function Pooled for Male Employees and Employers (Colombia 1973, All Twenty-six Traded Sectors)

	Employee (1)	Employer (2)
Explanatory variable		
Schooling	.195	.175
	(49.)	(33.)
Experience	.0303	.0284
	(8.55)	(7.99)
(Experience squared)/100	−.0298	−.0272
	(6.33)	(5.76)
Corden index of effective protection	1.98	2.79
	(17.)	(15.)
Corden index × education		.124
		(5.72)
Constant Term	5.87	6.06
	(82.)	(77.)
Employee interaction		
Schooling	−.0334	−.0147
	(7.66)	(2.59)
Experience	.0223	.0241
	(6.03)	(6.50)
(Experience squared)/100	−.0424	−.0447
	(8.46)	(8.90)
Corden index of effective protection	−.740	−1.46
	(6.27)	(7.79)
Corden index × education		.108
		(4.73)
Constant term	−.532	−.709
	(7.28)	(8.78)
R^2	.3508	.3514
Standard error of the estimate	.846	.845
Sample size	43,655	43,655

with the returns to schooling *within* a sector. Direct calculations, however, indicate that sectors with a larger proportion of their labor force above primary school level tend to be sectors with above-average effective protection.[22] To consider the interaction between schooling and effective protection directly, and also test for differences in the income generating functions of male employees, employers and self-employed, pooled regressions for these groups are reported in table 2.3. All the coefficients in the income-generating function are allowed to differ between the employment groups. Hence, regression (1) in table 2.3 is literally a combination of regressions (6) from tables 2.1 and 2.2. For example, the elasticity of employer income with respect to effective protection is 1.98 and employees 1.24 (i.e., 1.98 − .74). Regression (2) introduces an interaction variable between the return to schooling and the level of protection. For employees it is negligible (−.124 + .108), whereas for employers it appears negative. The evidence is again that sectoral protection does not alter the relative levels of employee incomes by education but does shift demands generally to skill-intensive sectors that should indirectly augment the premium schooling receives in the overall labor market.

2.4.6 Aggregate Sectoral Comparisons

Estimates for the first stage of the second model represented in equation (3) are shown in table 2.4. Regressions for all traded sectors and for only manufacturing are reported for male employees in columns 3 and 4 and for male employers in columns 6 and 7. The sample employment weights of the sectors are reported for male employees and employers in columns 3 and 5, respectively. The industry-specific coefficients represent the natural logarithm of the monthly wage of a worker in that sector with no schooling or postschooling experience. Differences between sectoral coefficients reflect proportional differences in the levels of incomes in the two sectors, for example, in column 3 male employees in refining report monthly incomes 35 percent (6.395 − 6.042) higher than those in industrial chemicals. The direct inclusion of industry dummy variables clearly depresses the schooling and experience variables, since for some workers entry into particular sectors may depend in part on precisely these characteristics.

Regressing the estimated industry deviation in income level from table 2.4 on the Corden index of effective protection, one obtains estimates of equation (4) shown in table 2.5. Various samples of sectors are examined, both unweighted (panel A), and with "worker" (panel B) and "covariance" (panel C) weights. The covariance weighted estimates are the preferred estimates analogous to those obtained in tables 2.1 and 2.2 based directly on the individual data. For male employees across all traded sectors the elasticity of incomes with respect to effective protection is the same as with the first formulation, 1.24, and across only the manufacturing sectors it is 0.35 compared with the previous estimate of 0.34. For male employers the aggregate estimates in panel C of table 2.5 imply an elasticity of incomes with respect to effective protection of 1.92 and 0.49 across all traded and manufacturing sectors, respectively, which are also quite close to the individual estimates reported in table 2.2.

Employee income estimates are plotted against the levels of effective protection by sector in figure 2.1. The small weights assigned to several outlying sectors, such as refining (19) and transport equipment (31), improve the fit of the weighted regression. Figure 2.1 also indicates how the inclusion of the heavily weighted agricultural (1) sector increases the

Table 2.4 **Income Functions for Male Employees and Employers with Unrestricted Shifts Associated with Twenty-six Census Sectors of Employment That Can Be Matched with Trade and Protection Indexes**

			Employee Regressions			Employer Regressions	
Sector	ISIC Category (1)	Number of Employees (2)	All Traded Sectors (3)	Manufacturing Sectors (4)	Number of Employers (5)	All Traded Sectors (6)	Manufacturing Sectors (7)
Agriculture	11	26,816	5.078		3,870	5.324	
Forestry	12	194	5.360		18	5.490	
Fishing	13	90	5.522		17	5.597	
Mining	2	618	5.514		45	5.880	
Food processing	311	2,379	5.557	4.947	267	5.959	5.895
Other food	312, 31–	102	5.635	4.981	26	5.816	5.789
Beverages	313	500	5.977	5.253	11	6.104	6.147
Tobacco	314	103	5.751	5.057	5	6.408	6.306
Textiles	321	1,486	5.972	5.256	68	5.968	5.924
Apparel	322	509	5.569	4.920	146	5.912	5.843
Leather	323	225	5.625	5.002	38	5.834	5.792
Footwear	324, 32–	806	5.415	4.807	123	5.820	5.728
Wood	331, 33–	538	5.492	4.888	78	5.730	5.688
Furniture	332	740	5.476	4.872	156	5.836	5.778
Paper	341, 34–	218	5.955	5.234	11	6.500	6.437
Industrial chemicals	351	161	6.042	5.300	8	6.079	6.070
Other chemicals	352	386	5.996	5.240	25	6.217	6.188
Refining	353	91	6.395	5.575	4	7.087	7.036
Rubber	355	138	5.984	5.263	6	6.273	6.189
Nonmetallic minerals	369	712	5.561	4.948	56	5.878	5.842
Basic iron, steel	371	318	5.931	5.210	21	6.319	6.263
Nonferrous metals	372, 37–	100	5.830	5.183	4	6.114	6.077

Table 2.4 (continued)

Sector	ISIC Category (1)	Number of Employees (2)	Employee Regressions: All Traded Sectors (3)	Employee Regressions: Manufacturing Sectors (4)	Number of Employers (5)	Employer Regressions: All Traded Sectors (6)	Employer Regressions: Manufacturing Sectors (7)
Fabricated metals	381	562	5.656	5.017	71	6.037	5.963
Machinery	382	211	5.866	5.180	21	5.966	5.907
Electrical equipment	383	293	5.935	5.226	14	6.339	6.301
Transport equipment	384	251	5.960	5.268	5	5.943	5.893
Schooling			.134	.181		.191	.179
			(75.)	(80.)		(36.)	(20.)
Experience			.0486	.0839		.0325	.0477
			(50.)	(48.)		(6.96)	(5.22)
(Experience squared)/100			−.0665	−.116		−.0323	−.0630
			(41.)	(35.)		(5.19)	(4.66)
R^2			.370	.497		.328	.342
Standard error of the estimate			.788	.673		1.09	1.01
Sample size			38,547	10,919		5,108	1,160

Note: Matching of sectors is described in appendix table 2.A.1 and associated notes. Income functions estimated with thirty-eight census sectors defined, including sectors without estimates of effective protection are reported in appendix table 2.A.2. The maximum number of census sectors is forty-four, which are used in appendix table 2.A.3 regressions.

Table 2.5 **Aggregate Association between Worker Incomes and Effective Protection by Sector**

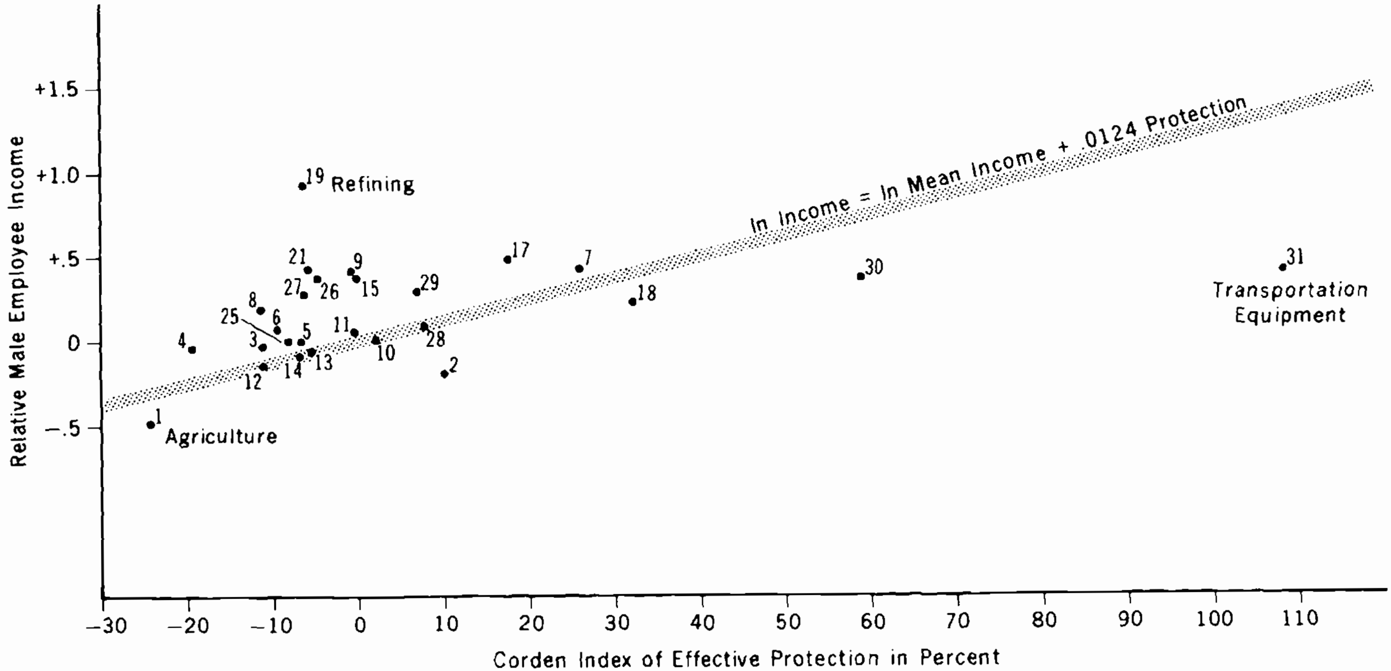
	Male Employees		Male Employers	
Weighting Scheme of Regression	All Twenty-six Traded Sectors (1)	Twenty-two Manufacturing Sectors (2)	All Twenty-six Traded Sectors (3)	Twenty-two Manufacturing Sectors (4)
A. Unweighted				
Corden index of effective protection	.421 (2.18)	.233 (1.67)	.178 (.68)	.0311 (.13)
Constant	5.71 (109.)	5.10 (128.)	6.01 (85.)	6.05 (87.)
R^2	.165	.123	.019	.0008
B. Weighted by number of workers by sector from table 2.4, cols. 2 and 5				
Corden index of effective protection	1.44 (6.36)	.388 (2.55)	2.01 (7.83)	.546 (2.25)
Constant	5.50 (104.)	5.04 (152.)	5.85 (103.)	5.88 (187.)
C. Weighted using covariance matrix of sectoral coefficients				
Corden index of effective protection	1.24 (5.20)	.350 (2.35)	1.92 (6.98)	.494 (1.98)
Constant	5.34 (39.)	4.91 (41.)	5.78 (33.)	5.85 (34.)

Note: Sectoral regression coefficients from columns 3, 4, 6, and 7 of table 2.4 are regressed on the sectoral index of effective protection from table 2.A.2.

slope of the overall income relationship with respect to effective protection.

The final empirical exercise is a two-stage procedure based on estimates of income-generating functions *within* sectors (equation 5) that are reported in appendix table 2.A.8. Multiplying these within-sector estimates by the average schooling and experience characteristics of all employees (table 2.A.9), a sector-predicted income estimate is obtained (table 2.A.10). This prediction of employee income is then regressed on the effective protection by sector, and these estimates of equation (6) are reported in table 2.6. Panel A presents the unweighted results and panel B the "worker" weighted results. The protection effects are very similar to those reported in table 2.5, panel B, with the same weighting scheme: 1.36 and 0.39 for all traded sectors and manufacturing, versus 1.44 and 0.39. The third and fourth regressions exclude the atypical government-operated refining sector and the large outlying agricultural sector to

Fig 2.1 Plot of relative male employee income against effective protection, by sector (weighted regression line provided for reference).



Source: Corden index of effective protection and sectoral code numbers from table 2.A.1.

Table 2.6 **Aggregate Regression of Within-Sector Predicted Male Employee Income on Corden Index of Effective Protection**

Weighting Scheme and Explanatory Variable	Sample Composition: All Traded Sectors (1)	Manufacturing Sectors (2)	Traded Sectors Less Refineries (3)	Traded Sectors Less Refineries and Agriculture (4)
A. Unweighted				
Corden index of effective protection	.342	.221	.389	.304
	(2.04)	(1.41)	(3.02)	(2.82)
Constant	6.67	6.72	6.64	6.67
	(147.)	(150.)	(186.)	(222.)
R^2	.148	.090	.284	.265
Standard error of the estimate	.228	.202	.175	.142
F	4.18	1.99	9.12	7.95
(Degrees of freedom)	(1,24)	(1,20)	(1,23)	(1,22)
Sample size	26	22	25	24
B. Weighted by Number of Employees by Sector Table 2.4, Column 2				
Corden index of effective protection	1.36	.385	1.35	.407
	(6.33)	(2.66)	(6.41)	(3.33)
Constant	6.46	6.66	6.46	6.64
	(129.)	(211.)	(131.)	(252.)
Standard error of the estimate	7.07	3.25	6.95	2.83
F	40.1	7.08	41.1	11.1
(Degrees of freedom)	(2,24)	(2,20)	(2,23)	(2,22)
Sample size	26	22	25	24

NOTE: The logarithm of the individual income is regressed within each sector on schooling and a quadratic in postschooling experience (appendix table 2.A.8). These sector-specific parameters are multiplied by the overall sample mean values of the explanatory variables (table 2.A.9) to obtain a sector predicted logarithmic income. These sector predicted income levels are then regressed on the Corden index, without and with worker weights. In weighted regressions R^2 is not comparable.

confirm that the omission of refining does not alter the results (compare regressions 1 and 3) and that most of the difference between all traded sectors and manufacturing is due to the omission of agriculture (compare regressions 2 and 4).

2.5 Conclusions

All three statistical formulations of the interactions between the parameters of the income-generating function and the level of effective protection have yielded parallel findings. The individual and the aggregate two-stage estimates suggest that in examining all traded sectors of the economy one obtains a very high elasticity estimate on the order of 1.24 for male employees, but this large value is clearly a function of the inclusion of agriculture. Given the reservations expressed earlier regarding any interpretation of the effect of protection on agriculture in Colombia, it is preferable here to rely on the smaller elasticity estimate across only the manufacturing sectors of between 0.34 and 0.35. In the case of manufacturing, effective protection of 30 percent is associated with male employee incomes' being 10 percent higher. Among male employers in the manufacturing sectors, a 30 percent level of sectoral effective protection is associated with 15 percent more income.

Two interpretations can attach to this strong association between levels of effective protection and levels of employee and employer incomes. Without speculating on the original reason for more protected industries to pay employees higher incomes, one may assume that once such pay differentials are established, the protected industries attract better than average workers within the rough schooling/experience categories held constant here. Competitive pressures of labor and product markets are assumed, under this interpretation, to create offsetting differentials in unobserved quality and productivity of workers by sector to justify the historically given intersectoral pay differentials. This explanation is then consistent with a stable equilibrium in factor markets and an absence of distortions or factor quasi rents.

I prefer a second interpretation, which assumes that intersectoral differentials to some degree represent real distortions in the labor market that sustain "excess" factor returns above the level needed to retain the services of the factor. As I indicated earlier, the best way to discriminate between these two explanations of the sectoral pattern in income and protection that are documented here is to examine changes in the Colombian economy over time. Are factors drawn to the sectors incurring "excess" returns? Or are trade restrictions on imported investment goods administered to prevent factor markets from responding to "excess" returns, at least when capacity in the sector is thought to be underutilized (Díaz-Alejandro 1976)? Do new changes in the structure of effective protection generate shifts in factor returns across sectors? Although these avenues for empirical research cannot be followed in this chapter, it is interesting to examine how sectoral income levels are related to trade status by sector.

Trade status is summarized for a particular sector by a T index defined as the quantity of imports minus exports expressed as a share of domestic consumption. Table 2.7 reports unweighted and weighted regressions of the male employee income levels on trade status by sector. There is a positive association, suggesting that, where employee incomes are unusually high, Colombia is on balance not an exporter but an importer. Conversely, where incomes are relatively low, Colombia tends to be

Table 2.7 Regressions of Male Sectoral Income Levels on Sectoral Trade Status Index

	Sample Composition		
Regression	Traded Sectors Only (A)	Traded Sectors Less Refineries (B)	Traded Sectors Less Refineries and Agriculture (C)
Unweighted regression			
Trade index, T	.593	.708	.626
	(2.43)	(4.15)	(3.71)
Constant	1.17	1.12	1.14
	(20.)	(27.)	(28.)
R^2	.180	.399	.355
Standard error of the estimate	.294	.204	.195
F	5.92	17.2	13.8
(Degrees of freedom)	(1,27)	(1,26)	(1,25)
Sample size, N	29	28	27
Weighted regression[a]			
Trade index, T	1.52	1.51	.685
	(6.77)	(7.08)	(3.07)
Constant	1.01	1.00	1.14
	(22.)	(23.)	(28.)
Standard error of the estimate[b]	6.59	6.26	4.48
F	45.8	50.1	9.42
(Degrees of freedom)	(2,27)	(2,26)	(2,25)
Sample size, N	29	28	27

NOTE: The trade index, T, is defined as the sector's (imports-exports)/(domestic consumption). Source is Thoumi (1978), reported in table 2.A.1.

[a]Regression weighted by the number of male employees in the sector in the 1973 census sample. The dependent variable is the relative wage effects for the thirty-eight census sectors obtained from regression 1, table 2.A.4.

[b]This is an estimate of σ where the model is $Y_i = \beta X_i + \varepsilon_i$ is normally distributed, $N(0, \sigma^2 1/n_i)$, and n_i is the number of the employees in the ith industry. To obtain estimated standard deviation of the wage for an individual in the ith industry, the reported SEE should be multiplied by $\sqrt{n_i}$.

capable of exporting domestic production. As one would expect, the magnitude of the relationship is again sensitive to whether agriculture is included or excluded in the sample of sectors analyzed.

The country studies volume associated with this NBER project (Krueger et al. 1981) indicates how effective protection and comparative advantage interact to influence the allocation of domestic resources and the trade status of sectors as exporting, import-competing, or predominantly importing. No simple correlations or ranking among sectors according to factor returns, protection, factor proportions, and trade status can confirm causal relations; nonetheless, the sectoral patterns among these variables are suggestive. Import substitution policies in the 1950s and early 1960s led to substantial and uneven levels of effective protection. Where economies of scale or market structure inhibited the development of competitive pressures in the protected domestic market, high levels of effective protection appear to have resulted in quasi rents for factors employed in the more protected sectors.

Low or negative levels of effective protection are associated with lower employee incomes across the groups of sectors arranged by trade status in table 2.8; the less protected sectors also tend to be labor-intensive activities where Colombia's comparative advantage for exports may lie. In the 1970s these less protected sectors were Colombia's export sectors, and they were also relatively labor-intensive, according to Thoumi (1977). Protection in Colombia has therefore favored in its structure more capital-intensive sectors, and, as I observed earlier, it has provided more protection for sectors using a more educated labor force. But within protected and unprotected sectors the proportionate variation in incomes associated with years of schooling does not appear to behave systematically.

To summarize the overall magnitude of the distributional effects associated with the structure of protection, it is useful to construct two measures, though they are only illustrative given the partial equilibrium framework used in this investigation. The first measure is called the *gross* distributional effect and the second the *net* effect, which would allow sectors with decreased income to offset sectors with increased income.

Table 2.8 Male Employee Wages and Effective Protection by Trade Status of Sector

Trade Status of Sectors[a] (Number of Sectors)	Net Corden Effective Protection[b]	Relative Wage Deviation[c]
Exports, all (16)	−11.6	−.0608
Excluding refining and and agriculture (14)	−3.95	.135
Import-competing (11)	+16.0	.324
Imports (5)	+58.2	.356
Untraded (6)	—	.152

[a]Groups defined in terms of a trade status index, T, defined by Thoumi (1978) as the sector's (imports-exports)/(domestic consumption): exports $T<0$; import-competing $0<T<0.4$; imports $.4<T<1.0$. See table 2.A.1, col. 4.

[b]Net Corden protection index, Table 2.A.1, weighted by domestic price value added.

[c]Relative wage effects by industry derived from regression 1, table 2.A.4 weighted by domestic price value added.

The distributional effects are approximated by multiplying the level of effective protection in each manufacturing sector by the estimated elasticity of employee incomes with respect to protection, or 0.34 (table 2.1, regression 2), and weighting it by the share of manufacturing male employees in that sector. The sectoral income weights could also be adjusted to accord with average schooling and experience levels in each sector, but for simplicity employees are treated equally here.[23] These sectoral weighted income effects are then summed, without regard to sign, to obtain the total *gross* shift of resources in 1973 associated with the structure of effective protection in 1970. In manufacturing this gross redistributional effect in Colombia is 3.9 percent of male employee income, whereas the *net* effect is an increase in male employee incomes of 1.0 percent. If the same elasticity of employee income-to-protection is also applied to the traded sectors outside of manufacturing, primarily agriculture and mining, the gross redistributional effect increases to 7.0 percent, and the net effect of protection is to decrease male employee incomes by 5.5 percent. The empirical evidence suggests that the effects are somewhat larger for male employers (table 2.2), and markedly larger if the estimates obtained across all traded sectors including agriculture are accepted at face value. As already noted, however, this appears to attribute too much of the responsibility for the depressed state of agricultural incomes in Colombia to the policies restraining free trade in agricultural commodities.[24]

In most studies of labor markets and trade policies, it is not possible to analyze wage and income variation across sectors, except at the aggregate level or sometimes by gross classifications of workers into blue- and white-collar jobs and into production and nonproduction employment. This study has sacrificed the international comparative aspect to deal with individual income data by sector in greater detail, but from only one country: Colombia. Since workers differ in formal education and post-schooling experience, it is appropriate that at least these productive features of the work force be "held constant" when measuring intersectoral income differences. Employment type and sex are also straightforward bases for stratification. Undoubtedly, more satisfactory measures of the quasi rents accrued by labor owing to their sector of employment can be fashioned in the future, standardizing perhaps for other generally productive characteristics of workers, such as their investments in job-related skills, ability, and motivation: variables that are unfortunately difficult to measure and unavailable for study here. When large and visible rents are to be earned in a society, one may also presume that economic and political resources will be expended to appropriate them (Krueger 1974). Nonetheless, the close relationship found here between levels of effective protection and unexplained variation in labor incomes provides a prima facie case that development and trade policies have played a role in generating or at least maintaining intersectoral differences in factor incomes that look like quasi rents.

Because the structure of protection is a political manifestation of a balance struck between private interest groups and broader developmental goals of a society, it is not clear what economic and social consequences would follow from the systematic removal of protection barriers. Would newfound efficiencies and the loss of quasi rents that now serve no allocative function leave resources allocated as they are today? Certainly it cannot be argued that jobs would be lost if labor can be substituted between sectors, for the structure of protection in Colombia in 1970 favored capital-intensive sectors. Protection may have increased the returns to both labor and capital in the more protected sectors, but the proportionate gains for employers exceed those received by employees, and the absolute gains are even more highly skewed toward employers. With both of these biases in the distributional consequences of protection, it seems reasonable to conclude that the structure of effective protection in Colombia in 1970 increased the inequality in personal income distribution, induced a misallocation in factors of production among sectors, and stimulated rent-seeking activity that is commonly associated with a deadweight loss to the society.

Appendix

Table 2.A.1 Sources and Data Used in Constructing Compatible Measures of Incomes: Trade Status (t) and Net Effective Protection by Industry

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (t) (5)	Net Nominal Effective Protection Index: Balassa (6)	Net Nominal Effective Protection Index: Corden (7)
1 Agriculture and hunting					−.212	−24.6[a]	−24.2[a]
	1 Coffee	11– Agriculture and hunting	5335	.31	−.212	−56.3	−56.0
	2 Agriculture and cattle-raising		24290	.69		−20.3	−9.8
2 Forestry and logging					−.004	10.4	10.2
	3 Forestry	12– Forestry and logging	376				
3 Fishing					−.048	−12.1	−11.2
	4 Fishing	130 Fishing	406				
4 Mining and quarrying					−.223	−20.6	−19.4
	5 Mining	2– Mining and Quarrying	262				
5 Food processing					−.090	−8.4	−6.9
	6 Meat preparation	3111 Meat preparation	93		.127	−6.4	−5.0
	7 Milk products	3112 Dairy products	746		−.002	−1.3	−1.0
	8 Canning fruits and vegetables	3113 Canning fruits and vegetables	67		−.004	20.7	15.2
	9 Canning and preserving fish products	3114 Canning and preserving fish products	8		−1.574	−3.9	−1.7
	10 Milling	3116 Mill products	20		−.004	6.1	4.3

Table 2.A.1 (continued)

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (t) (5)	Net Nominal Effective Protection Index: Balassa (6)	Net Nominal Effective Protection Index: Corden (7)
	11 Baked goods	3117 Baked goods	193		.000	−24.7	−14.4
	12 Sugar refining	3118 Sugar refining	879		−.246	−19.6	−17.4
	13 Candy	3119 Confectionery	444		−.006	3.6	2.9
		3115 Vegetable and animal oils			.059		
6 Food processing not specified above					.024[b]	−17.7	−9.5
	14 Diverse food	3121 Other food	341		.012	−17.7	−9.5
		3122 Animal feed			.036		
7 Beverage industries					.053	30.6	25.8
	15 Spiritous beverages	3131 Spirits	985		.051	30.7	26.1
	16 Wine-making	3132 Wine industry	20		.157	24.3	15.0
	97 Breweries	3133 Malt liquors					
	98 Soft drinks	3134 Soft drinks					
8 Tobacco manufactures					.118	−13.0	−11.5
	17 Cigarettes and cigars	3140 Tobacco manufactures	754				
9 Manufacture of textiles					−.047	.3	−.6
	18 Spinning industry	3211 Spinning, weaving, finishing textiles	267		−.059[c]	−1.5	−1.1
	21 Cotton textiles		1739			−7.0	−5.8
	22 Wool textiles		133			−8.2	−4.1
	23 Artificial fibers		251			34.4	19.8

	31 Nonclothing textile products	3212 Nonclothing textile products	25	.016	−18.5	−11.8
	19 Knitting mills	3213 Knitting mills	348	−.002	22.1	15.4
	25 Other textiles	3214 Carpets and rugs	13	−.001	−22.6	−8.6
	20 Rope	3215 Cordage, rope, twine	126	.030	−5.5	−4.6
	24 Hard textile fabrics	3219 Other textiles	8	−.011	9.8	5.7
	25 Other textiles		13		−22.6	−8.6
10 Manufacture of wearing apparel				−.004	2.3	1.8
	27 Men's clothing	3220 Wearing apparel	699	−.004	3.7	2.8
	28 Women's clothing		59		−6.0	−3.0
	29 Children's clothing		42		2.5	1.8
	30 Hat-making		20		−15.2	−12.1
	32 Other clothing		13		−8.7	−6.1
11 Manufactured leather and leather products				−.166	−.6	−.4
	43 Tanneries	3231 Tanneries	176	−.194	−2.2	−1.6
		3232 Fur dressing and dyeing				
	44 Leather products	3233 Leather products, except footwear	26	−.013	8.0	6.2
	45 Leather industrial products		4		10.6	8.1
	46 Leather sporting goods		1		9.4	6.6
12 Manufacture of footwear				−.079	−15.7	−11.2
	26 Shoemaking	3240 Footwear manufacture	91			
13 Manufacture of wood and wood products				−.043	−8.8	−5.8
	33 Wood preparation	3311 Wood mills	130	−.054	−8.9	−5.7
	34 Wood for construction		19		−7.4	−4.6
		3312 Cane ware		.000		
	35 Wood toys	3319 Wood and cork products	6	.019	−13.9	−8.2

Table 2.A.1 (continued)

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (t) (5)	Net Nominal Effective Protection Index: Balassa (6)	Corden (7)
	36 Toothpicks		4			−7.2	−5.9
	37 Other wood products		4			−8.0	−6.3
	38 Cork products		12			−9.0	−6.9
14 Manufacture of wood furniture					−.006	−10.8	−7.2
	39 Wood furniture	3320 Wood furniture	97				
	100 Bamboo furniture						
15 Manufacture of pulp and paper products					.226	−.6	−.2
	40 Pulp and paper	3411 Pulp and paper	538		.301	1.6	.9
	42 Cardboard	3412 Paper boxes	142		.011	2.0	1.4
	41 Paper goods	3419 Paper products	122		.144	−13.5	−6.8
16 Printing, publishing, and allied industries							
	101 Printing	3420 Printing and publishing			.148	—[d]	—[d]
	102 Photogravure						
	103 Bookbinding						
	104 Other graphic arts						
	105 Matches						
17 Manufacture of industrial chemicals					.390[e]	23.0	17.4
	51 Chemical products	3511 Basic industrial chemicals	1381	.56	.455	23.0	17.4

		3512 Fertilizers and pesticides		.30	.152		
		3513 Resins and plastics		.14	.640		
18 Manufacture of other chemicals					.123	47.3	32.1
	55 Paints	3521 Paints and lacquers	214		.168	55.3	32.6
	53 Drugs	3522 Drugs and medicines	1341		.138	65.3	45.4
	54 Soap	3523 Soap and cosmetics	475		.030	−8.3	−5.5
	56 Glues and waterproofing	3529 Other chemical products	29		.550	36.1	24.1
	57 Other chemical products		5			162.8	38.0
19 Petroleum refineries					−.058	−9.3	−6.6
	58 Petroleum refining	3530 Petroleum refining	510		−.058	−9.8	−6.9
	52 Fats and oils		51			−4.5	−3.4
20 Products of petroleum and coal					−.889	−1.2	−1.0
	60 Coke and other coal and oil derivatives	3540 Products of petroleum and coal	7		−.889	−3.4	−2.5
	59 Asphalt		18			−.4	−.4
21 Manufacture of rubber products					.043	−6.5	−5.7
	47 Tires and tubes	3551 Tires and tubes	655		−.007	−8.8	−7.6
	48 Shoes and household goods	3592 Other rubber products	144		.216	−5.4	−4.8
	49 Industrial products		34			25.3	20.6
	50 Sporting goods		10			17.8	14.3
22 Manufacture of plastic products					.014		
		3560 Plastic products					
23 Manufacture of pottery, china and earthenware					−.002		
		3610 Pottery, china, earthenware					

Table 2.A.1 (continued)

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (*t*) (5)	Net Nominal Effective Protection Index	
						Balassa (6)	Corden (7)
24 Manufacture of glass and glass products					−.018		
		3620 Glass and glass products					
25 Manufacture of other nonmetallic minerals					.001[f]	−11.1	−8.1
	107 Bricks	3691 Structural clay products		.08	.060		
	63 Cement	3692 Cement, lime, and plaster	331	.47	−.085	−13.9	−10.4
	64 Asbestos and cement products	3699 Other nonmetallic mineral products	267	.45	.080	−11.2	−8.1
	65 Other nonmetallic mineral products		15			54.6	42.7
26 Iron and steel basic industries					.437	16.8	−4.7
	66 Basic iron and steel	3710 Iron and steel basic industries	86		.437	6.4	4.1
	67 Manufactures of iron and steel		268			20.2	−7.5
27 Nonferrous metals basic industries					.405	−21.4	−6.1
	68 Basic nonferrous metals	3720 Nonferrous metal basic industries	1		.405	17.5	11.1
	69 Manufactures of nonferrous metals		20			−23.4	−7.0

28 Manufacture of fabricated metal products				.093	11.4	7.7
	71 Hand tools and knives	3811 Cutlery, hand tools, and general hardware	87	.173	15.0	12.3
	72 Cutlery		72		−1.3	−1.1
	73 Kitchenware		54		14.4	11.2
		3812 Metal fixtures and furniture		.073		
	76 Foundry products	3813 Structural metal products	144	.098	−9.8	−7.1
	70 Tin plate manufactures	3819 Other fabricated metal products	305	.076	38.3	27.9
	74 Aluminum articles		164		6.7	4.7
	75 Wire products		214		−.1	−.1
	77 Diverse metal products		320		1.5	1.1
	78 Other metal manufactures		21		92.0	18.2
29 Manufactures of machinery not electrical				.717	9.9[h]	6.9[h]
	79 Motor-driven machinery	3821 Engines and turbines	7	.930	35.0	20.6
	80 Agricultural machinery	3822 Agricultural machinery	115	.729	−.8	−.6
	81 Industrial machinery	3823 Metal and wood-working machinery	110	.941	10.0	7.1
		3824 Industrial machinery		.832		
	83 Other machinery	3825 Office machinery	80	.425	38.2	38.1
		3829 Other		.478		
	82 Parts for machinery		28		−29.9	−8.5
30 Manufacture of electrical equipment				.363	143.1[h]	59.2[h]
	84 Electrical machinery	3831 Electrical industrial machinery	243	.702	29.6	17.9

Table 2.A.1 (continued)

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (t) (5)	Net Nominal Effective Protection Index: Balassa (6)	Net Nominal Effective Protection Index: Corden (7)
	85 Radio and television apparatus	3832 Radio, television, and communication apparatus	142		.485	296.2	52.6
	95 Phonograph records		71			−2.6	−2.3
	86 Electrical appliances	3833 Electrical appliances	102		.471	77.3	46.0
	87 Wire and cable	3839 Other electrical supplies	169		.063	−113.8	−3417.8
	88 Light bulbs		16			−21.9	−10.8
	89 Other electrical		213			210.8	97.8
31 Manufacture of transport equipment					.528[h]	160.7[h]	108.1[h]
	110 Ship repair	3841 Ship building and repair		.07	.616		
	111 Railroad equipment repair	3842 Railroad equipment manufacturing		.03	.779		
	90 Auto and truck assembly	3843 Motor vehicles	758	.83	.472	164.9	112.0
	112 Auto repair						
	91 Bicycle manufacture	3844 Motorcycle and bicycle manufacturing	16	.04	.178	47.5	25.4
	113 Airplane repair	3845 Aircraft		.12	.891		
		3849 Other transport equipment		.01	.335		

32 Manufacture of scientific and professional instruments						
	92 Medical and scientific equipment	3851 Professional and scientific equipment	33	.710	−21.0	−16.2
	93 Optical goods	3852 Photographic and optical goods	13	.764	−12.2	−10.8
		3853 Watches and clocks		.978		
33 Other manufacturing industries						
	94 Jewelry	3901 Jewelry	34	−.001	−13.9	−12.0
		3902 Musical instruments		.653		
	96 Diverse industries	3903 Sporting goods	619	.727	74.5	49.6
		3909 Other industries				
34 Electricity, gas and steam				*Untraded Sectors* values not relevant or calculated.		
	119 Electricity, gas, and water	410 Electricity, gas, and steam				
35 Waterworks and supply						
	119 Electricity, gas and water	420 Waterworks and supply				
	106 Compressed gases					
36 Construction						
	116 Construction	500 Construction				
37 Trade, transport and communication, financing, business, community, and social services						
	117 Transportation	710 Transportation				
	118 Communications	720 Communication				

Table 2.A.1 (continued)

Title from Census	Hutcheson Code and Description (1)	ISIC Code and Description (2)	Domestic Price Value Added (3)	Sector Share of Value Added (4)	Trade Status (*t*) (5)	Net Nominal Effective Protection Index: Balassa (6)	Net Nominal Effective Protection Index: Corden (7)
	120 Banks and insurance	800 Financing, insurance, real estate, and business services					
	121 Commerce, professional services and artisans	900–949 Community and social services					
		600 Commerce					
38 Personal services							
	114 Watch repair	95 Personal services					
	115 Dental laboratories						
	99 Shoe repair						

Sources

Column 3: Domestic price value added from Hutcheson's computer output table labeled annex table 2, VDSTAR.

Column 5: F. Thoumi's "Colombian *t* values by ISIC II codes" (1978) defined as (imports-exports)/domestic consumption.

Columns 6 and 7: Net nominal effective protection to value added (average of exports and domestic); Hutcheson and Schydlowsky (1977), annex table 5c.

Note: The Colombian census of 1973 reports employment sector according to three-digit ISIC II codes. If only the two digits are reported, the individual is allocated to the "not specified elsewhere" category, which is indicated by a dash in the final code column. This treatment of individuals with missing third codes casts some doubt on the information content of three sectors that include mostly such unspecified activities: coal and oil derivatives (20), scientific equipment (32), and other manufacturing (33). Several sectors were aggregated to match trade and protection series: mining (4) agriculture (1), and wood products other than furniture (13). The nontraded categories, following Thoumi (1977) and Hutcheson (1973), are printing and publishing (16), electricity, gas, and steam (34), waterworks and supply (35), construction (36), trade and professional services (37), and personal services (38). Hutcheson's (1973) protection figures that are the starting point for the protection estimates used here did not include three sectors: plastics, pottery and china, and glass. These sectors were therefore not used in the subsequent analysis of protection effects, but are included in the income functions for male employees in table 2.1. Balassa and Corden effective protection indexes and trade status figures were often aggregated to correspond with the broader sectoral categories reported in the 1973 population census. The weights for aggregation were generally drawn from Hutcheson's computer output for detailed sectoral breakdowns on "domestic price value added" (column 3). When these figures are not available or inappropriate, alternative bases for weights are shown in column 4 and their source is explained in the subsequent notes.

[a]In agriculture the value-added weights at domestic prices are roughly 5.3 for coffee to 24.3 for cattle and all else, whereas at world price the value-added weights are 11.0 and 24.4, respectively. The latter weights are used because of the international trade importance of coffee. The data source in both instances is Hutcheson's computer output.

[b]In other foods and animal feed, ISIC categories 3121 and 3122, no estimates of value added were obtained, and a simple average was used.

[c]In textiles Thoumi's worksheet for ISIC category 3211 (spinning, weaving, and finishing) reports two trade status t values: $-.093$ and $-.023$. An average of these is used here.

[d]Treated as a home good.

[e]In basic chemicals the t values of the components are weighted by "value added in factor prices" 1970 from the *U.N. Yearbook of Industrial Statistics, 1975,* volume 1, (New York, 1977), p. 96; basic industrial chemicals—459; fertilizers and pesticides—246; resins—114.

[f]In nonmetallic minerals the t values are weighted by "valor agregado bruto," *Industria Manufacturera Nacional, 1969* (Bogotá, Colombia: DANE, n.d.), table 1: (in 100,000 pesos) structural clay products—616; cement, lime, and plaster—3,765; other nonmetallic mineral products—3,617.

[g]In transport equipment the t values are weighted from the source cited in note 5: shipbuilding—450; railroad equipment, construction, and repair—182; construction of automobiles—3,142; construction of bicycles—222; repair of automobiles and bicycles—1,555; construction and repair of airplanes—75; other—33.

[h]In machinery other than electrical, electrical equipment, and transport equipment the Corden and Balassa figures were not calculated as weighted averages but were obtained directly from Hutcheson and Schydlowsky (1977), table 5c.

Table 2.A.2 **Colombian Estimates of Effective Protection and Proxies for Capital Stock per Worker by Sector, 1969–70**

	Traded Sectors	Corden Index of Effective Protection (%) (1)	Value Added per Worker in 1969 (1,000 Pesos) (2)	Horsepower Energy Capacity per Hundred Workers in 1969 (3)
1	Agriculture	−24.2	n.d.	n.d.
2	Forestry	10.2	n.d.	n.d.
3	Fishing	−11.2	n.d.	n.d.
4	Mining	−19.4	n.d.	n.d.
5	Food processing	−6.9	55.1	53.0
6	Other foods	−9.5	84.9	164.0
7	Beverages	25.8	157.5	300.1
8	Tobacco	−11.5	229.3	32.0
9	Textiles	−.6	52.2	353.7
10	Apparel	1.8	27.2	7.5
11	Leather	−.4	378.0	61.7
12	Footwear	−11.2	18.9	5.5
13	Wood	−5.8	26.9	75.0
14	Furniture	−7.2	25.9	20.0
15	Paper	−.2	83.9	651.2
17	Industrial chemicals	17.4	121.2	819.2
18	Other chemicals	32.1	86.5	69.0
19	Refining	−6.6	380.2	5997.0
21	Rubber	−5.7	69.1	444.0
25	Nonmetallic minerals	−8.1	38.1	163.4
26	Basic iron and steel	−4.7	77.2	242.1
27	Nonferrous metals	−6.1	64.2	166.9
28	Fabricated metals	7.7	41.0	114.1
29	Machinery	6.9	34.9	69.9
30	Electrical equipment	59.2	57.5	82.4
31	Transport equipment	108.1	27.8	33.6

SOURCE: Col. 1, table 2.A.1, col. 7; cols. 2 and 3, Departamento Administrativo Nacionale de Estadistica, *Industria, Manufacturera Nacionale 1969*, Bogotá.

NOTE: n.d. means no data available for nonmanufacturing sectors.

Table 2.A.3 Relative Wage Effects Associated with Forty-four Industrial Sectors Distinguished in 1973 Census: Semilogarithmic Regression for Male Employees

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	Regression Coefficients[a] (2)
1	111	Agriculture and livestock production	25,984	−.474	−.349
2	112, 113, 11–	Agricultural services and hunting	828	−.237	−.152
3	12	Forestry and logging	194	−.194	−.0978
4	13	Fishing	90	−.0273	.0069
5	21	Coal mining	172	−.0374	.0605
6	22	Crude petroleum and natural gas production	70	.810	.803
7	23	Metal ore mining	108	−.332	−.292
8	29	Other mining	173	−.126	−.100
9	2–	Mining, not further specified	95	−.222	−.141
10	311	Food processing	2,379	0	0
11	312, 31–	Other food processing not specified above	102	.0715	.0635
12	313	Beverage industries	498	.403	.378
13	314	Tobacco manufactures	103	.182	.158
14	321	Manufacture of textiles	1,486	.400	.381
15	322	Manufacture of wearing apparel	508	.0064	−.0147
16	323	Manufacture of leather and leather products	225	.0662	.0471
17	324, 32–	Manufacture of footwear	806	−.142	−.171
18	331	Manufacture of wood products	457	−.0704	−.0744
19	332	Manufacture of wood furniture	740	−.0807	−.105
20	33–	Other wood manufacturing, not specified	81	−.0320	−.0477
21	341, 34–	Manufacture of paper and paper products	218	.382	.361
22	342	Printing, publishing, and allied industries	494	.319	.294
23	351	Manufacture of industrial chemicals	161	.466	.449

Table 2.A.3 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
24	352	Manufacture of other chemicals	385	.418	.399
25	353	Petroleum refineries	91	.809	.787
26	354, 35–	Manufacture of coal and oil derivatives; chemical manufactures not further specified	90	.455	.440
27	355	Manufacture of rubber products	138	.411	.391
28	356	Manufacture of plastic products	153	.277	.252
29	361, 36–	Manufacture of pottery, china, and earthenware	159	.104	.102
30	362	Manufacture of glass and glass products	164	.278	.258
31	369	Manufacture of other nonmetallic mineral products	712	.0044	−.0011
32	371	Iron and steel basic industries	318	.358	.353
33	372, 37–	Nonferrous metal basic industries	100	.268	.239
34	381	Manufacture of metal products except machinery and equipment	562	.0948	.0654
35	382	Manufacture of machinery except electrical	211	.298	.274
36	383	Manufacture of electrical equipment	293	.364	.340
37	384	Manufacture of transport equipment	251	.391	.366
38	385, 38–	Manufacture of scientific equipment; manufacture of metals not further specified	163	.321	.295
39	39, 3–	Other manufacturing industries, manufacturing not further specified	1,003	.142	.118
40	41	Electric, gas, steam	449	.400	.382
41	42	Waterworks and supply	178	.334	.324
42	50	Construction	5,408	−.0663	−.0860

Table 2.A.3 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
43	600–949	Trade, transportation and communication, finances, professional, miscellaneous	766	.342	.329
44	95	Personal services	302	−.492	−.460
Other conditioning variables (and t-statistics)					
Experience (age − schooling − 7)				.0526	.0524
				(61.)	(61.)
(Experience squared)/100				−.0717	−.0720
				(50.)	(50.)
Years of education				.141	.138
				(95.)	(92.)
Rural/urban zone of residence (rural = 1)					−.195
					(.18)
Constant				5.479	5.529
				(275.)	(275.)
R^2				.415	.419
Standard error of the estimate				.771	.768
F				738.	734.
(Degrees of freedom)				(46,47821)	(47,47820)
Sample size			47,868		

[a]Food processing (ISIC–311) sector is omitted; sectoral coefficients represent, therefore, the proportionate deviation of wages in the specific sector from those received in food processing, holding constant for the proportionate effects of years of schooling completed, postschooling experience, experience squared, and, in regression 2, rural/urban zone of residence. The choice of food processing as the numeraire is arbitrary and has no effect on the estimated differentials. The food processing sector is a large industry with about average incomes for male employees.

Table 2.A.4 Relative Wage Effects Associated with Thirty-eight Aggregated 1973 Census Sectors Matched to Trade and Protection Categories: Semilogarithmic Regression for Male Employees

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
1	11	Agriculture and hunting	26,812	−.463	−.334
2	12	Forestry	194	−.193	−.0924
3	13	Fishing	90	−.0252	.0103
4	2	Mining	618	−.0460	.0095
5	311	Food processing	2,379	0	0
6	312, 31–	Other food processing, not specified above	102	.0693	.0612
7	313	Beverage industries	498	.398	.373
8	314	Tobacco manufactures	103	.178	.153
9	321	Manufacture of textiles	1,486	.395	.376
10	322	Manufacture of wearing apparel	508	.0031	−.0185
11	323	Manufacture of leather and leather products	225	.0646	.0448
12	324, 32–	Manufacture of footwear	806	−.143	−.174
13	331,33–	Manufacture of wood products	538	−.0651	−.0711
14	332	Manufacture of wood furniture	740	−.0820	−.107
15	341, 34–	Manufacture of paper and paper products	218	.377	.356
16	342	Printing, publishing, and allied industries	494	.314	.288
17	351	Manufacture of industrial chemicals	161	.459	.442
18	352	Manufacture of other chemicals	385	.410	.391
19	353	Petroleum refineries	91	.800	.779
20	354, 35–	Manufacture of coal and oil derivatives; chemical manufactures not further specified	90	.448	.433
21	355	Manufacture of rubber products	138	.406	.386
22	356	Manufacture of plastic products	153	.271	.246

Table 2.A.4 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
23	361, 36–	Manufacture of pottery, china, and earthenware	159	.104	.101
24	362	Manufacture of glass and glass products	164	.275	.251
25	369	Manufactures of other, nonmetallic mineral products	712	.0046	−.0012
26	371	Iron and steel basic industries	318	.354	.349
27	372, 37–	Nonferrous metal basic industries	100	.265	.235
28	381	Manufacture of metal products, except machinery and equipment	562	.0920	.0616
29	382	Manufacture of machinery except electrical	211	.292	.268
30	383	Manufacture of electrical equipment	293	.358	.334
31	384	Manufacture of transport equipment	251	.386	.360
32	385, 38–	Manufacture of scientific equipment; manufacture of metals, not further specified	163	.317	.291
33	39, 3–	Other manufacturing, manufacturing not further specified	1,003	.138	.114
34	41	Electric, gas, steam	449	.395	.377
35	42	Waterworks and supply	178	.330	.320
36	50	Construction	5,408	−.0661	−.0867
37	600–949	Trade, transportation and communication, financial, professional, miscellaneous	766	.337	.324
38	95	Personal services	302	−.489	−.457

Table 2.A.4 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
Other conditioning variables (and t-statistics)					
Experience (age – schooling – 7)				.0528	.0526
				(61.)	(62.)
(Experience squared)/100				–.0720	–.0722
				(50.)	(50.)
Years of education				.143	.140
				(96.)	(94.)
Rural/urban zone of residence					–.204
(rural = 1)					(19.)
Constant				5.469	5.523
				(274.)	(275.)
R^2				.413	.417
Standard error of the estimate				.772	.769
F				841.	836.
(Degrees of freedom)				(40,47827)	(41,47826)
Sample size			47,868		

[a]Food processing (ISIC–311) sector is omitted; sectoral coefficients represent, therefore, the proportionate deviation of wages in the specific sector from those received in food processing, holding constant for the proportionate effects of years of schooling completed, postschooling experience, experience squared, and, in regression 2, rural/urban zone of residence. The choice of food processing as the numeraire is arbitrary and has no effect on the estimated differentials. The food processing sector is a large industry with about average incomes for male employees.

Table 2.A.5 **Relative Wage Effects Associated with Thirty-eight Aggregated 1973 Census Sectors Matched to Trade and Protection Categories: Semilogarithmic Regression for Female Employees**

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	Regression Coefficients[a] (2)
1	11	Agriculture and hunting	758	−.321	−.0562
2	12	Forestry	7	−.124	−.126
3	13	Fishing	9	.344	.387
4	2	Mining	48	−.632	−.506
5	311	Food processing	434	.000	.000
6	312, 31–	Other food processing, not specified above	37	.0779	.109
7	313	Beverage industries	83	.430	.428
8	314	Tobacco manufactures	129	−.193	−.212
9	321	Manufacture of textiles	686	.221	.230
10	322	Manufacture of wearing apparel	1,421	−.0117	−.0125
11	323	Manufacture of leather and leather products	58	.0913	.0868
12	324, 32–	Manufacture of footwear	159	.106	.0966
13	331,33–	Manufacture of wood products	27	−.183	−.177
14	332	Manufacture of wood furniture	40	.236	.221
15	341, 34–	Manufacture of paper and paper products	58	.334	.325
16	342	Printing, publishing, and allied industries	197	.157	.151
17	351	Manufacture of industrial chemicals	36	.507	.506
18	352	Manufacture of other chemicals	246	.263	.262
19	353	Petroleum refineries	9	.768	.776
20	354, 35–	Manufacture of coal and oil derivatives; chemical manufactures not further specified	30	.474	.470
21	355	Manufacture of rubber products	38	.525	.517
22	356	Manufacture of plastic products	88	.227	.217

Table 2.A.5 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
23	361, 36–	Manufacture of pottery, china, and earthenware	43	.197	.224
24	362	Manufacture of glass and glass products	21	.350	.339
25	369	Manufactures of other, nonmetallic mineral products	45	.0846	.0740
26	371	Iron and steel basic industries	20	.448	.465
27	372, 37–	Nonferrous metal basic industries	10	−.211	−.180
28	381	Manufacture of metal products, except machinery and equipment	71	.276	.269
29	382	Manufacture of machinery except electrical	27	.538	.541
30	383	Manufacture of electrical equipment	76	.302	.298
31	384	Manufacture of transport equipment	27	.464	.484
32	385, 38–	Manufacture of scientific equipment; manufacture of metals, not further specified	28	.262	.262
33	39, 3–	Other manufacturing, manufacturing not further specified	373	.162	.161
34	41	Electric, gas, steam	46	.426	.434
35	42	Waterworks and supply	18	.475	.482
36	50	Construction	142	.391	.394
37	600–949	Trade, transportation and communication, financial, professional, miscellaneous	324	.301	.309
38	95	Personal services	1,026	−.354	−.373

Table 2.A.5 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
Other conditioning variables (and t-statistics)					
Experience (age − schooling − 7)				.0567	.0553
				(24.)	(24.)
(Experience squared)/100				−.0923	−.0895
				(19.)	(19.)
Years of education				.172	.165
				(48.)	(47.)
Rural/urban zone of residence					−.442
(rural = 1)					(11.)
Constant				5.020	5.077
				(109.)	(110.)
R^2				.476	.486
Standard error of the estimate				.704	.698
F				155.	158.
(Degrees of freedom)				(40,6854)	(41,6853)
Sample size			6,895		

[a]Food processing (ISIC–311) sector is omitted; sectoral coefficients represent, therefore, the proportionate deviation of wages in the specific sector from those received in food processing, holding constant for the proportionate effects of years of schooling completed, postschooling experience, experience squared, and, in regression 2, rural/urban zone of residence. The choice of food processing as the numeraire is arbitrary and has no effect on the estimated differentials. The food processing sector is a large industry with about average incomes for male employees.

Table 2.A.6 Relative Wage Effects Associated with Thirty-eight Aggregated 1973 Census Sectors Matched to Trade and Protection Categories: Semilogarithmic Regression for Male Employers

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	Regression Coefficients[a] (2)
1	11	Agriculture and hunting	3,870	−.641	−.140
2	12	Forestry	18	−.477	.0854
3	13	Fishing	17	−.369	−.0720
4	2	Mining	45	−.0786	.0349
5	311	Food processing	267	0.00	0.00
6	312, 31–	Other food processing, not specified above	20	−.131	−.115
7	313	Beverage industries	11	.182	.367
8	314	Tobacco manufactures	5	.450	.359
9	321	Manufacture of textiles	68	.0189	.0162
10	322	Manufacture of wearing apparel	146	−.0435	−.0911
11	323	Manufacture of leather and leather products	38	−.120	−.188
12	324, 32–	Manufacture of footwear	123	−.143	−.306
13	331,33–	Manufacture of wood products	78	−.226	−.211
14	332	Manufacture of wood furniture	156	−.129	−.262
15	341, 34–	Manufacture of paper and paper products	11	.549	.524
16	342	Printing, publishing, and allied industries	62	.417	.368
17	351	Manufacture of industrial chemicals	8	.145	.173
18	352	Manufacture of other chemicals	25	.273	.210
19	353	Petroleum refineries	4	1.14	1.09
20	354, 35–	Manufacture of coal and oil derivatives; chemical manufactures not further specified	2	.0286	.220
21	355	Manufacture of rubber products	6	.310	.162
22	356	Manufacture of plastic products	16	.120	.100

Table 2.A.6 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
23	361, 36–	Manufacture of pottery, china, and earthenware	88	−.876	−.783
24	362	Manufacture of glass and glass products	4	.619	.545
25	369	Manufactures of other, nonmetallic mineral products	56	−.0758	−.0836
26	371	Iron and steel basic industries	21	.369	.292
27	372, 37–	Nonferrous metal basic industries	4	.173	.301
28	381	Manufacture of metal products, except machinery and equipment	71	.0823	−.0459
29	382	Manufacture of machinery except electrical	21	.0181	−.0359
30	383	Manufacture of electrical equipment	14	.399	.357
31	384	Manufacture of transport equipment	5	.0021	−.0138
32	385, 38–	Manufacture of scientific equipment; manufacture of metals, not further specified	16	.0673	−.0761
33	39, 3–	Other manufacturing, manufacturing not further specified	129	.213	.157
34	41	Electric, gas, steam	15	−.0247	−.0511
35	42	Waterworks and supply	3	−.544	−.452
36	50	Construction	277	−.0479	−.0927
37	600–949	Trade, transportation and communication, financial, professional, miscellaneous	134	.473	.502
38	95	Personal services	3	−.437	−.456

Table 2.A.6 (continued)

Industry Number	ISIC Category Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
Other conditioning variables (and t-statistics)				
Experience (age − schooling − 7)			.0353	.0312
			(8.44)	(7.69)
(Experience squared)/100			−.0371	−.0345
			(6.54)	(6.28)
Years of education			.187	.155
			(41.)	(33.)
Rural/urban zone of residence				−.863
(rural = 1)				(20.)
Constant			5.94	6.36
			(58.)	(63.)
R^2			.406	.445
Standard error of the estimate			1.08	1.04
F			98.	112.
(Degrees of freedom)			(40,5736)	(41,5735)
Sample size		5,777		

[a]Food processing (ISIC–311) sector is omitted; sectoral coefficients represent, therefore, the proportionate deviation of wages in the specific sector from those received in food processing, holding constant for the proportionate effects of years of schooling completed, postschooling experience, experience squared, and, in regression 2, rural/urban zone of residence. The choice of food processing as the numeraire is arbitrary and has no effect on the estimated differentials. The food processing sector is a large industry with about average incomes for male employees.

Table 2.A.7 Relative Wage Effects Associated with Thirty-eight Aggregated 1973 Census Sectors Matched to Trade and Protection Categories: Semilogarithmic Regressions for Male Self-Employed

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
1	11	Agriculture and hunting	6,136	−.573	−.177
2	12	Forestry	97	−.0982	.292
3	13	Fishing	218	−.306	−.128
4	2	Mining	177	−1.64	−1.32
5	311	Food processing	229	0.0	0.0
6	312, 31–	Other food processing, not specified above	10	.0601	.0443
7	313	Beverage industries	18	.120	.0552
8	314	Tobacco manufactures	0	NA	NA
9	321	Manufacture of textiles	60	−.629	−.470
10	322	Manufacture of wearing apparel	269	−.160	−.162
11	323	Manufacture of leather and leather products	43	.321	.274
12	324, 32–	Manufacture of footwear	174	−.178	−.236
13	331,33–	Manufacture of wood products	196	−.0740	−.0241
14	332	Manufacture of wood furniture	273	−.0766	−.0832
15	341, 34–	Manufacture of paper and paper products	11	−.575	−.629
16	342	Printing, publishing, and allied industries	33	.312	.261
17	351	Manufacture of industrial chemicals	6	.0800	.0556
18	352	Manufacture of other chemicals	20	−.468	−.453
19	353	Petroleum refineries	3	−.210	−.121
20	354, 35–	Manufacture of coal and oil derivatives; chemical manufactures not further specified	1	−.172	−.096
21	355	Manufacture of rubber products	11	.616	.543
22	356	Manufacture of plastic products	12	.676	.655

Table 2.A.7 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
23	361, 36–	Manufacture of pottery, china, and earthenware	18	−.213	−.239
24	362	Manufacture of glass and glass products	4	.140	.078
25	369	Manufactures of other, nonmetallic mineral products	49	−.184	−.185
26	371	Iron and steel basic industries	9	.577	.528
27	372, 37–	Nonferrous metal basic industries	3	.508	.465
28	381	Manufacture of metal products, except machinery and equipment	91	.242	.229
29	382	Manufacture of machinery except electrical	12	.145	.128
30	383	Manufacture of electrical equipment	6	.845	.823
31	384	Manufacture of transport equipment	8	−.073	−.122
32	385, 38–	Manufacture of scientific equipment; manufacture of metals, not further specified	15	.500	.467
33	39, 3–	Other manufacturing, manufacturing not further specified	130	.225	.220
34	41	Electric, gas, steam	6	.336	.273
35	42	Waterworks and supply	4	.650	.550
36	50	Construction	952	.0694	.0339
37	600–949	Trade, transportation and communication, financial, professional, miscellaneous	167	.543	.525
38	95	Personal services	18	−.386	−.304

Table 2.A.7 (continued)

Industry Number	ISIC Category	Description	Number of Individuals in Regression	Regression Coefficients[a] (1)	(2)
Other conditioning variables (and t-statistics)					
Experience (age – schooling – 7)				.0495	.0475
				(16.)	(16.)
(Experience squared)/100				–.0617	–.0605
				(14.)	(14.)
Years of education				.157	.138
				(30.)	(26.)
Rural/urban zone of residence (rural = 1)					–.610
					(18.)
Constant				5.43	5.63
				(58.)	(61.)
R^2				.2191	.2443
Standard error of the estimate				1.19	1.17
F				66.	74.
(Degrees of freedom)				(40,9448)	(41,9447)
Sample size				9,489	9,489

[a]Food processing (ISIC–311) sector is omitted; sectoral coefficients represent, therefore, the proportionate deviation of wages in the specific sector from those received in food processing, holding constant for the proportionate effects of years of schooling completed, postschooling experience, experience squared, and, in regression 2, rural/urban zone of residence. The choice of food processing as the numeraire is arbitrary and has no effect on the estimated differentials. The food processing sector is a large industry with about average incomes for male employees.

Table 2.A.8 Within-Sector Semilogarithmic Income Function for Male Employees

Industry Number	ISIC Category	Description	Number of Male Employees	Experience	(Experience Squared)/100	Years of Education	Constant	R^2	Standard Error of the Estimate
1	11	Agriculture and hunting	26,816	.0351 (30.)	−.0491 (26.)	.0885 (32.)	5.34 (336.)	.059	.813
2	12	Forestry	194	.0254 (1.67)	−.0226 (.88)	.187 (10.)	5.42 (27.)	.362	.758
3	13	Fishing	90	.0203 (1.14)	−.0194 (.70)	.128 (4.68)	5.84 (24.)	.205	.767
4	2	Mining	618	.0776 (7.75)	−.110 (6.56)	.209 (.18)	4.89 (35.)	.387	.950
5	311	Food processing	2,379	.0808 (21.)	−.110 (16.)	.180 (35.)	4.98 (99.)	.388	.699
6	312, 31–	Other food processing, not specified above	102	.101 (4.65)	−.158 (4.13)	.187 (8.92)	4.84 (16.)	.455	.745
7	313	Beverage industries	500	.0729 (9.23)	−.0856 (5.46)	.164 (19.)	5.41 (48.)	.452	.574
8	314	Tobacco manufactures	103	.0761 (3.33)	−.0692 (1.47)	.239 (12.)	4.63 (18.)	.628	.740
9	321	Manufacture of textiles	1,486	.0952 (19.)	−.137 (14.)	.197 (35.)	5.04 (69.)	.461	.622
10	322	Manufacture of wearing apparel	509	.0735 (8.27)	−.102 (6.01)	.168 (13.)	5.11 (39.)	.288	.740
11	323	Manufacture of leather and leather products	225	.115 (8.57)	−.171 (6.40)	.181 (11.)	4.71 (28.)	.445	.655
12	324, 32–	Manufacture of footwear	806	.0983 (15.)	−.151 (12.)	.162 (14.)	4.79 (51.)	.312	.722
13	331, 33–	Manufacture of wood products	538	.0706 (10.)	−.100 (8.68)	.158 (13.)	5.15 (48.)	.288	.713

14	342	Manufacture of	740	.0676	−.0923	.140	5.23	.225	.714
		wood furniture		(11.)	(8.20)	(11.)	(55.)		
15	341, 34–	Manufacture of paper	218	.0745	−.0784	.216	4.99	.548	.656
		and paper products		(6.19)	(3.38)	(16.)	(28.)		
16	342	Printing, publishing,	494	.0822	−.104	.161	5.32	.493	.564
		and allied industries		(13.)	(8.22)	(17.)	(57.)		
17	351	Manufacture of	161	.101	−.141	.229	4.76	.609	.621
		industrial chemicals		(6.02)	(4.35)	(15.)	(20.)		
18	352	Manufacture of	386	.0857	−.110	.207	4.98	.656	.624
		other chemicals		(8.37)	(4.98)	(27.)	(41.)		
19	353	Petroleum refineries	91	.0714	−.0883	.148	5.94	.428	.510
				(3.67)	(2.07)	(7.71)	(20.)		
20	354, 35–	Manufacture of coal	90	.0819	−.106	.213	5.03	.719	.544
		and oil derivatives;		(4.38)	(2.53)	(15.)	(23.)		
		chemical manufactures							
		not further specified							
21	355	Manufacture of	138	.0769	−.101	.181	5.32	.475	.670
		rubber products		(4.30)	(2.93)	(11.)	(22.)		
22	356	Manufacture of	153	.0903	−.117	.178	5.07	.466	.667
		plastic products		(5.63)	(3.45)	(11.)	(24.)		
23	361, 36–	Manufacture of pottery,	159	.0941	−.149	.135	5.18	.275	.662
		china and earthenware		(5.62)	(4.72)	(6.53)	(23.)		
24	362	Manufacture of glass	164	.0823	−.0903	.210	4.93	.604	.544
		and glass products		(7.54)	(4.20)	(15.)	(32.)		
25	369	Manufacture of	712	.0805	−.111	.179	4.99	.363	.748
		other nonmetallic		(9.73)	(7.02)	(19.)	(49.)		
		mineral products							
26	371	Iron and steel	318	.0731	−.105	.176	5.40	.496	.541
		basic industries		(7.63)	(5.69)	(18.)	(39.)		
27	372, 37–	Nonferrous metal	100	.0829	−.0998	.160	5.24	.389	.549
		basic industries		(4.07)	(2.30)	(7.07)	(20.)		

Table 2.A.8 (continued)

Industry Number	ISIC Category	Description	Number of Male Employees	Experience	(Experience Squared)/100	Years of Education	Constant	R^2	Standard Error of the Estimate
28	381	Manufacture of metal products, except machinery and equipment	562	.0856 (12.)	−.129 (9.28)	.171 (16.)	5.09 (48.)	.369	.677
29	382	Manufacture of machinery except electrical	211	.0889 (8.47)	−.132 (6.33)	.169 (13.)	.5.24 (35.)	.493	.508
30	383	Manufacture of electrical equipment	293	.0853 (8.70)	−.0962 (4.34)	.175 (16.)	5.17 (39.)	.532	.534
31	384	Manufacture of transport equipment	251	.0946 (7.61)	−.137 (5.07)	.186 (16.)	5.14 (34.)	.541	.598
32	385, 38–	Manufacture of scientific equipment; manufacture of metals, not further specified	38	.0889 (5.38)	−.111 (2.95)	.180 (12.)	5.14 (27.)	.522	.583
33	39, 3–	Other manufacturing, manufacturing not further specified	1,003	.0995 (17.)	−.151 (12.)	.193 (30.)	4.86 (67.)	.507	.631
34	41	Electric, gas, steam	449	.0695 (9.41)	−.0967 (7.01)	.151 (20.)	5.60 (50.)	.482	.485
35	42	Waterworks and supply	178	.0660 (5.16)	−.0832 (3.66)	.169 (14.)	5.44 (29.)	.537	.585
36	50	Construction	5,408	.0610 (24.)	−.0818 (18.)	.153 (40.)	5.25 (146.)	.256	.744
37	600–949	Trade, transportation and communication, financial, professional, miscellaneous	769	.0769 (12.)	−.111 (9.05)	.190 (32.)	5.25 (62.)	.577	.634
38	95	Personal services	298	.0777 (6.93)	−.113 (5.60)	.164 (7.78)	4.70 (37.)	.241	.757

Table 2.A.9 Variable Means and Standard Deviation for 1973 Census Sample of Employees

Explanatory Variable	Male	Female	Both Sexes
Number of persons	47,875	6,895	54,770
Years of schooling	3.13 (3.02)	4.81 (3.13)	3.34 (3.09)
Years of experience (age − schooling − 7)	21.8 (14.2)	15.8 (11.5)	21.0 (14.1)
(Experience squared)/100	6.76 (8.31)	3.83 (5.56)	6.39 (8.07)
Actual wages (pesos per month)	980.5 (1624.)	909.4 (981.5)	971.5 (1558.)
Actual wages urban sector	1,469 (2139.)	965.8 (1010.)	1,363
Actual wages rural sector	512.3 (577.3)	390.3 (386.7)	572.3
Percentage of employees in urban sector	48.9	90.2	54.1

Table 2.A.10 Relative Wage Effect of Schooling within Sectors and Predicted Sectoral Wage for Representative Worker

Industrial Sector Code	Schooling Coefficient within Industries[a]		Wage Predicted within Industry[b]	
	Male	Female	Male	Female
1	.08852	.17587	429.00	359.94
2	.18668	.27611	626.97	100.25
3	.12822	.18225	711.30	1625.9
4	.20848	.46057	672.39	168.19
5	.17985	.17331	714.97	490.14
6	.18717	.16219	720.26	463.76
7	.16352	.17698	1032.4	771.78
8	.23859	.22335	722.52	416.88
9	.19721	.19189	920.05	570.87
10	.16811	.14593	707.77	473.73
11	.18063	.22539	751.65	524.55
12	.16207	.13227	625.79	618.85
13	.15799	.20308	681.34	340.43
14	.13995	.15618	685.89	641.91
15	.21555	.19271	874.78	657.35
16	.16068	.14895	1010.2	622.76
17	.22912	.17002	852.05	971.31
18	.20662	.19807	872.31	586.38
19	.14752	.20534	1583.7	752.22
20	.21344	.17076	884.81	922.89
21	.18129	.11218	984.77	1031.1
22	.17757	.14791	912.27	611.57
23	.13540	.17964	782.11	623.31
24	.20950	.13416	885.50	936.39
25	.17929	.21194	716.54	456.08
26	.17623	.17272	944.22	762.06
27	.15961	.24480	969.50	677.72
28	.17126	.20819	764.56	635.53
29	.16846	.20245	923.34	841.23
30	.17481	.13625	1022.0	845.44
31	.18599	.17218	964.43	817.39
32	.18043	.23588	991.89	239.85
33	.19275	.17557	755.39	593.20
34	.15085	.06676	1042.6	1345.1
35	.16878	.22564	947.88	573.55
36	.15300	.16992	679.68	730.42
37	.19029	.18411	890.23	611.67
38	.16408	.10981	475.34	330.49

[a]Obtained from within-industry regressions of logarithm of monthly income on schooling and quadratic in postschooling experience. See appendix table 2.A.8.

[b]Coefficients from within-industry male income functions reported in appendix table 2.A.8 are multiplied by sample mean characteristics for both men and women reported in appendix table 2.A.9 to obtain industry predicted wage for males. Underlying income functions for women not reported.

Notes

1. Balassa (1965) incorporates tariffs on traded inputs that are contained in nontraded inputs. Appendix table 2.A.1 reports the level of Colombian effective protection as of 1970 according to both the Corden and the Balassa procedures. The Corden index is somewhat less variable than the Balassa index, though industry orderings are very similar. The regression results reported are based on the Corden index as indicated in the text.

2. Input-output coefficients required to infer the indirect requirements per unit of output are often insufficiently disaggregated or matched to the categories available in trade and tariff schedules (Corden 1974). Moreover, some degree of averaging of tariffs across heterogeneous sectors is unavoidable, preferably with domestic production weights, with potentially serious error (Tumlir and Tilly 1971). Finally, of course, the method is essentially a partial equilibrium approach. The only alternative is to specify, often from very limited data, a vastly more complex general equilibrium system to evaluate the consequences of trade distortions or perhaps employ a disaggregated programming model that also neglects substitution possibilities with fixed factor proportions (Evans 1971: Henderson, this volume, chap. 1).

3. The "best solution" is free trade without domestic distortions, but in the presence of certain domestic distortions it is often preferable to subsidize the factor whose market price exceeds its shadow price (Corden 1974). An exception is the Todaro (1969) model in which rural/urban migration and urban unemployment leads to a rejection of manufacturing wage subsidy argument. In this domestic distortion framework, with urban unemployment providing the clearing mechanism between the rural and urban wage differential, the best solution becomes a subsidy to agricultural wage (employment) that reduces the social loss of urban unemployment (Bhagwati and Srinivasan 1974; Corden and Findlay 1975).

4. One might anticipate that industries with effective protection rates on labor above a uniform rate on labor should contract in the long run as a more uniform rate is adopted, and that those currently below the uniform rate should expand. But this is far from certain, given the general equilibrium relations that are neglected in the effective protection formulation. In addition to the composition of tradables adapting to the structure of incentives provided by effective protection rates across industries, the relative returns to factors are also likely to change, if the factor proportions in the more protected industries differ from the average. A uniform rate of effective protection on labor is justified on the basis of encouraging disproportionately industries with greater labor content in their value added. This protection strategy provides an inducement for using more labor-intensive techniques within industries as well as for shifting the composition of tradables toward the more labor-intensive sectors (Corden 1974).

5. There is no obvious way to determine how much effective protection is required to establish domestic production in the face of domestic handicaps such as small scale, skill constraints, technology, and limitations of management. Thus there is no way to estimate the residual amount of "excess" effective protection remaining as an incentive to reallocate factors of production. Better data than are available here might permit one to develop a dynamic "infant industry" framework that would estimate factor supply elasticities and the sources of changing total factor productivity by sector, and hence the time dimension to production costs or a learning-by-doing accumulation of expertise. A more finely disaggregated breakdown of industry would, of course, facilitate such an analysis, and information on the size of firms might serve as a useful proxy for the continuum of modern to traditional technologies that coexist in many sectors of the Colombian economy (Nelson, Schultz, and Slighton 1971).

6. Because Hutcheson and Schydlowsky (1977) did not have reliable capital stock figures by sector for Colombia, they calculated the incentive effects of effective protection relative to sectoral cash flow, their choice of the best proxy available for current value of capital stock.

7. Such distributional effects are *thought* to be important in Colombia. Hutcheson and Schydlowsky (1977), among others, cite evidence that trade, tax, and subsidy policies were on balance responsible for reducing substantially the cost of capital, particularly capital imports, and raising the cost of labor. Díaz-Alejandro (1976) reports that these factor price distortions caused Colombia in the 1960s to export capital-intensive commodities.

8. This can be seen in the last columns of appendix table 2.A.1.

9. Berry and Díaz-Alejandro (1977) express doubt that the "new" Colombian exports have proved to be labor-intensive and to have contributed to a reduction in income inequality.

10. It might be more realistic to assume that ω embodies both the estimation error of δ and a stochastic error. In this case the appropriate weight would be the inverse of the sum of the variance of the estimation error of δ (used here) and the variance of the stochastic error. Following the simpler error specification set forth in the text, round-off errors in computation are reduced by partitioning the variance/covariance matrix of the estimated coefficients from equation (3) as follows: $X'X = \begin{pmatrix} A & B \\ B' & D \end{pmatrix}$, where A is the three-by-three matrix corresponding to the coefficients on education, experience, and experience squared variables in X, D is the I-by-I diagonal matrix corresponding to the number of persons in each of the I industries, and B and B' are the remaining matrixes of dimension 3-by-I and I-by-3, respectively. The "covariance" matrix of weights used here is expressed as $(D - B'A^{-1}B)^{-1}$. If the covariances between the industry dummies and the education, experience, and experience squared variables, $B'A^{-1}B$, is sufficiently small, the "worker" weights, D^{-1}, provide satisfactory estimates (compare panels B and C in table 2.5).

11. Also, agriculture is no longer divided into livestock and crops versus hunting and agricultural services (3 percent of the agricultural total), and wood products other than furniture no longer distinguishes a residual "not-specified-elsewhere" group (15 percent of wood products other than furniture).

12. These three sectors are coal and oil derivatives; other chemicals, scientific equipment, etc.; and a sizable miscellaneous grouping of manufactured products.

13. The International Coffee Agreement, subscribed to by Colombia, could be used to discourage coffee production. This policy could be premised on the assumption that the world price for Colombian coffee will increase by a greater proportion than the proportion by which exports are restricted, increasing export revenues. The tax on coffee producers is rationalized in terms of judgments on the elasticity of world coffee demand and supply schedules, which are beyond the scope of this investigation. Although the export tax on coffee is a distortion in the static sense that contributes to the low level of factor returns in agriculture, negative protection is not the only reason for low labor incomes in Colombian agriculture.

14. Between 75 and 90 percent of male employees in various age groups reported a monthly income. Nonresponses are omitted from the sample. Eight male employees out of 47,868 were eliminated from the file for reporting unreasonably large incomes. The rule applied was that those with more than 20,000 pesos monthly incomes and no more than a primary education were dropped from the file, as was any employee with a monthly income over 50,000 pesos. No employers or self-employed workers were eliminated, since capital income might explain their response.

15. The self-employed are a much more heterogeneous group than employers or employees, particularly when rural and urban sectors are combined. Only a few illustrative regressions were calculated for male self-employed (see table 2.4 and table 2.A.7).

16. The simple unweighted correlation between the male and female sectoral income effect obtained from estimating equation (3) as reported in appendix tables 2.A.5 and 2.A.6 is 0.78, based on the following regression:

ln female income = .22 + .84 ln male income $\qquad R^2 = .61$
(1.56) (7.48) $\qquad$ sample size 38

where t ratios are reported beneath the regression coefficients in parentheses. The female employee income data would be less suited to our purposes even if women were more numerous, since women more often work part time than do men, and the monthly income reported in the census does not take account of this. Also, the postschooling experience variable (i.e., age-schooling-7) may be a reasonable proxy for accumulated labor market experience across men, but it introduces much noise for women, whose attachment to the labor force is more often interrupted over the life cycle.

17. Because the dependent variable is the logarithm of the income variable and the effective protection variable is the percentage of value added, the elasticity is the regression coefficient multiplied by one hundred. The confidence intervals around the point estimates are very narrow. For all traded sectors, two standard deviations above and below the point estimate should include the "true" value with 95 percent probability. This range is from 1.30 to 1.18. For the manufacturing sectors alone, the analogous range is from .402 to .276.

18. The measure of installed horsepower per worker has a variety of limitations, in addition to its partial representation of multifaceted capital stock. By not reflecting how much time the capital stock is actually used, a firm with several shifts of workers would report much lower "capital stock" per worker than a comparable firm working only a single shift. If depreciation and obsolescence of the capital stock were independent of its rate of utilization, then installed capacity might still be a defensible proxy for the opportunity cost of capital per worker. Conversely, if the opportunity cost of capital increased proportionately with its rate of utilization, then installed capacity would misrepresent capital costs across firms with different numbers of shifts of workers. The former assumption is closer to reality than the latter. Installed horsepower capacity per worker may not adequately convey differences in capital available per worker at a moment in production that is associated with technology. Value added per worker, on the other hand, mixes returns to physical and human capital into a more comprehensive measure of "inputs" employed per worker. But, in the current study, this combination of human and physical capital blurs the distinction on which the analysis is based. The direct standardization of the labor force by its human capital characteristics makes it even less clear what value added per worker measures in this context.

19. For example, the simple correlation between the industry effects, that is the δs in model 2, estimated with and without allowing for the rural/urban shift in incomes are correlated across sectors at .99 (table 2.A.4, regressions 1 and 2). The rankings of sectors are therefore not particularly sensitive to the inclusion of the rural/urban dummy variable, but the magnitude of the slope coefficient in a subsequent regression on effective protection is reduced by its inclusion. Specifically, agricultural incomes are 46 percent lower than food processing (the omitted category in table 2.A.4) when the rural/urban dummy is excluded, but only 33 percent lower when it is included. The average absolute magnitude (unweighted) of the industry coefficients is reduced by 8 percent when the rural/urban dummy is included.

20. Small "self-employed" farmers often hire additional labor in peak periods of seasonal demand and work for wages off-the-farm at other times during the year. They do not, therefore, fit neatly into one category of "employment type" as provided on the census questionnaire. How they categorize themselves is unclear, though most who rely on family unpaid labor to meet their swings in excess demand for labor probably are counted as independent self-employed. Tenant and sharecropping farmers may also fail to assign themselves consistently to this self-employed category.

21. The heterogeneity of the self-employed category of workers is reflected in the tendency for self-employed to have a higher income than employees in the urban sector, but a lower income than employees in the rural sector of the Colombian economy. More generally, the simple correlation of incomes of male employees and employers by sector is high, .78 for the full sample of thirty-two traded and untraded sectors. But for employees and self-employed, the correlation by sector is only .32, and for employers and self-employed it falls to .14. Thus, little effort is expended here to account for the variation in self-employed incomes.

22. The simple correlation between a measure of the education intensity of a sector's

male labor force and its Corden index of effective protection is .47 across the twenty-six traded sectors. The measure of education intensity used here is the proportion of the male employees with at least some secondary schooling divided by the national average, that is, 0.2478.

23. For example, the work force in the electrical equipment manufacturing sector had a better than average education, and therefore the pesos increase in employee incomes in that sector associated with its 59.2 percent level of effective protection would be greater than the same level of protection would elicit in a sector with a less educated labor force. All workers are treated equally in this illustrative calculation of summary effects. If a general equilibrium framework were available, the net distributional effect for all employment groups and sectors in the population should approach zero, but within portions of the economy for portions of the work force, no such aggregation constraints are even suggested.

24. The male employee income elasticity estimated directly for all traded sectors is 1.24 (table 2.1, regression 6). This parameter estimate would imply that the structure of protection in Colombia was associated in 1970–73 with a gross redistribution of 24 percent of male employee incomes, with a net effect of decreasing male employee incomes by one-fifth.

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