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**MARKET STRUCTURE, FIRM SIZE AND EXPORTS OF MANUFACTURES  
AN ECONOMETRIC ANALYSIS OF 12,435 FIRMS**

This study forms part of the work program of the IPEA/CEPAL Agreement.

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## INTRODUCTION

More than a decade ago CEPAL, in co-operation with IPEA, sponsored a pioneering study of the relationship between market structure and exports of manufactures in Brazil (Fajnzylber 1971). The study found that in 1968 over half of the industrial exports of Brazil were from industries with relatively low levels of concentration, i.e. from industries with large numbers of small and medium-sized firms. Data for a sample of 283 firms which exported in 1967 suggested that export performance was a decreasing function of firm size, and (except for foreign-owned firms) an increasing function of capital intensity (Fajnzylber, appendix 7).

Since the late 1960s, Brazil's exports of manufactured goods have undergone impressive growth and diversification. For this reason it has been possible to assemble a large data base which has allowed us, with the aid of statistical techniques of analysis, to reach quite definite conclusions concerning the effect of market structure and economic policies on export performance. The data were assembled from the returns of direct and indirect taxes that industrial corporations filed with the Brazilian government in 1978 and 1979. Nonetheless, no individual company is identified in the data base, and particular care has been taken to insure the confidentiality of data for individual firms.

The plan of the report is as follows. The first chapter consists of a non-technical summary of the main empirical findings along with a discussion of their policy implications. It is intended as a concise, self-contained report that is accessible to the general reader. Details are provided in the remaining chapters. Chapter II discusses various hypotheses to be tested that are drawn from the literature of international trade and industrial economics. Chapter III provides a description of the data base along with some nonparametric tests of the relationship between firm size and exports, and between firm size and export subsidies. The last two chapters contain the main econometric analyses: chapter IV specifies and estimates a logit model of the determinants of the probability of exporting while chapter V utilizes ordinary least squares techniques to find the determinants of inter-firm differences in the performance of exporters.

## SUMMARY AND CONCLUSIONS

The purpose of this study is to determine first what factors distinguish exporters from nonexporters and, secondly, what factors influence the performance of firms once they enter export markets. To accomplish this task, a vast micro data base has been assembled. It contains data for the fiscal year 1978 for 12 435 firms, 3 345 of which registered at least some exports. Only 21 firms (eight exporters) are public enterprises. Nonresident ownership of equity exceeds ten percent in 841 firms (610 exporters). These subsidiaries of transnational enterprises and joint ventures of foreign with local capital account for 33.0% of the domestic sales and 38.8% of the total exports of firms in our sample. An additional 245 firms (148 exporters) have license agreements with overseas firms which allow them access to foreign technology and trademarks.

### 1. EMPIRICAL FINDINGS

Firm size is without doubt the most important factor affecting both the probability that a firm will export and its subsequent export performance. To export even the smallest volume of output requires incurrence of the costs involved in dealing with government bureaucracies, obtaining market information, and setting up overseas sales organizations. Because of the existence of these fixed costs of exporting, larger firms are more likely to export than are small firms. However, among firms that do export, those with a small domestic market exhibit the largest ratio of exports to sales, for they have the most to gain from scale economies (cost reductions) through exports.

Both observed relationships -- the positive effect of firm size on the probability of exporting and the negative effect of size on subsequent export performance -- persist when the effect of other relevant variables are accounted for. Moreover this is true not for isolated industries, but rather for industries throughout Brazil's manufacturing sector. On average, each one percent increase in the total sales of a firm is associated with a 0.8 to 0.9 percent increase in the odds of exporting. Among exporters, each increase of one percent in domestic sales results, on average, in a decrease of 0.8 to 0.9 percent in the ratio of exports to domestic sales.

These findings regarding firm size imply that increased concentration of domestic sales in large enterprises has a negative effect on exports first because small firms may fail to reach the critical size required for exports and secondly because larger firms export a smaller proportion of their output. These indirect effects are quite strong and are offset only partially by positive direct effects of concentration on export performance: other things equal, very small exporters and very large enterprises export more if they are located in concentrated industries than if they are in relatively unconcentrated industries. Nonetheless, for the vast majority of firms -- over 70% of the firms in our sample -- increased concentration has no positive effect whatsoever on exports, whereas it does have a substantial, though indirect, negative effect through changes in the size distribution of firms in an industry.

Exporters use more physical plant and equipment per unit of output and a more skilled labor force than nonexporters. The statistical analysis of this report shows clearly, however, that this is the product of two separate relationships: i) large firms are skill- and capital-intensive compared to small firms, and ii) exporters happen also to be relatively large compared to nonexporters. Controlling for differences in firm size and other variables, increases in capital intensity and average skill levels decrease the probability that a firm will export. This result is consistent with the predictions of the conventional theory of international trade for a country like Brazil which is well endowed with unskilled labor, but lacks abundant capital and skilled labor.

Among firms that export, physical capital intensity (but not human skills) has a positive impact on export performance once account is taken of variations in domestic sales and other relevant variables. In other words, the greater the requirements of physical plant and equipment per unit of output, the greater, on average, is the volume of exports. This finding is opposite that which might be predicted by standard trade theory, but it is consistent with considerations of economies of scale in production. Investment in plant and equipment tends to be indivisible or "lumpy," so a firm using capital-intensive techniques of production requires a large market to reduce average costs to a minimum. For two firms with equal domestic sales but differing techniques of production, the one with a large investment in capital has a need to spread capital costs over a larger volume of exports than does the firm that utilizes more labor and fewer or less sophisticated machines.

Advertising expenditures show a very strong and positive relationship with both the probability of exporting and export performance. Markets in which advertising is important are "monopolistically competitive," i.e. the products sold are not standardized and firms compete with advertising and a proliferation of brand names. When local producers are protected from import competition, high prices and high profits encourage new entrants to set up production facilities, so such markets

tend also to have large numbers of plants of suboptimal size. Firms operating in protected, but monopolistically competitive markets thus have a strong incentive to export at prices below those prevailing in the local market in order to obtain economies of scale and a reduction in costs per unit of output.

State ownership appears to have a negative effect on the probability of exporting and a positive effect on export/sales ratios once this ratio is greater than zero. It is difficult to ascribe much importance to this result, however, since few firms in the sample are public enterprises.

In contrast, license agreements have a significant and positive effect on both the probability of exporting and the performance of exporters. It is sometimes thought that owners of technology and trademarks impose severe restrictions on licensees, hindering exports of such firms. For the firms in our data base, however, the existence of license agreements with overseas firms implies, on average, an increase of up to 100% in the odds that a firm will export, and an increase of 100 to 150% in subsequent exports. Licensed technology and brand names thus appear to be a prerequisite for, rather than an obstacle to, export success in Brazil.

Foreign ownership of equity is also associated with a larger number of exporters and a larger volume of exports even after controlling for the effect of other relevant variables such as industry, size and capital intensity. Subsidiaries of transnational enterprises or joint ventures of foreign and local capital exhibit 140 to 270% greater odds of exporting, and 80 to 130% higher exports compared to comparable firms which do not have access to foreign technology and trademarks through ownership links or licenses. This result reflects the fact that the cost of exporting is lower for transnational firms, which have a good knowledge of foreign market conditions and often have the necessary sales organizations already in place in overseas markets.

Tariffs and other import barriers increase the cruzeiro price of import substitutes relative to exports, encouraging firms to produce for local rather than export markets. For each percentage point increase in the ratio of domestic to import prices, the volume of exports falls by an estimated three-quarters of a percentage point. For some firms, this anti-export bias is offset by export subsidies that increase the amount of cruzeiros received for each dollar of export revenue. In addition, export performance is improved when exporters have access to a supply of inputs at international prices through the drawback provision for duty-free imports.

Export subsidies are widely used in Brazil to stimulate exports of manufactures, but the analysis of this report shows clearly that the system of subsidies discriminates against small exporters. In general, the smaller the exporter, the smaller the rate of subsidy. This is true for aggregate manufacturing and

for individual industries throughout the manufacturing sector. Most surprisingly, a total of 523 exporters -- 15.6% of the sample -- received no fiscal subsidy at all in 1978. Unsubsidized exporters are found in a wide variety of industries, and tend to be much smaller than subsidized exporters. This suggests that the cost of bureaucratic transactions may well exceed the benefit of any subsidy to which a small exporter is entitled.

## 2. POLICY IMPLICATIONS

Many policy implications follow directly from the empirical findings summarized above. Others require some elaboration. Those discussed in this section are intended to be illustrative but not comprehensive.

An important finding of the present study is the confirmation of a very strong and independent relationship between firm size and the probability of exporting in Brazil. Other things equal, the smaller the firm, the less likely it is to export a portion of its output. Given fixed costs of entering export markets, such a relationship is inevitable. Nonetheless, the strength of the impact of size on the probability of exporting is strongly influenced by government policy. The estimated effect of firm size on the probability of exporting is not a purely technical parameter, but rather a number that reflects the effects of government policies; it can be altered by changes in those policies. Small firms tend to operate with a less skilled labor force and with less capital-intensive methods of production than do large firms, so the fact that the impact of capital intensity on the probability of exporting is negative means that policies to promote the entry of small firms into export markets can be particularly effective.

The system of export subsidies in effect in Brazil, or at least that in effect in 1978, discriminates against the small exporter, and this no doubt discourages small firms from exporting in the first instance. More importantly, however, the bureaucracy in general operates so as to increase markedly the fixed costs of exporting. To quote a recent World Bank report:

The general attitude of the administration (particularly of CACEX [the Foreign Trade Department of the Banco do Brasil]) toward exporting enterprises seems often to have been one of suspicion, instead of assistance and promotion. The volume of export documentation required is enormous, and CACEX operates a detailed export control system. This requires for both the exporting enterprises and CACEX large and costly bureaucracies, which may be an important reason for the concentration of exports in a comparatively limited number of large enterprises with experienced export administrations. (World Bank 1983, p. 31.)



The Brazilian government appears to be fully aware of the fact that bureaucratic controls inhibit the exports of small firms. Even the director of CACEX, Mr Carlos Viacava, has publicly criticized the "excessive centralization" [excessivo centralismo] of government which "hinders efforts of small and medium-sized firms to expand their exports." [...que impede uma maior agressividade da pequena e media empresa para aumentar suas exportacoes] (Jornal de Brasilia, 17 February, 1984, p. 1.) To date, however, little has been done to change this situation.

The formation of trading companies or export consortia is a potentially effective way to distribute the fixed costs of exporting among a number of firms. Such organizations are particularly useful for small firms when fixed costs include the cost of dealing with a centralized bureaucracy, but neither type of organization is common in Brazil. In a supposed effort to encourage exports by small firms, the Central Bank in April 1984 passed Resolution No. 906 which reduces the minimum capital required for the formation of export consortia composed solely of small firms from 114 000 ORTN (indexed government bonds), or approximately US \$ 912 000, to 11 000 ORTN, or approximately US \$ 88 000. Unfortunately, however, this measure will have no impact whatsoever on new entrants into export markets, or even new entrants into export consortia, for all participants in a consortium formed under Resolution 906 must previously be members of an established consortium which has been in existence either for two years with a minimum of two million dollars in exports or for three years with a minimum of one million dollars in exports.

A second empirical finding which is of great importance from the point of view of potential changes in economic policy is the fact that there is a very strong inverse relationship between firm size and export performance that is independent of other economic variables. This finding has two fundamental policy implications. First, any program to encourage the entry of small and medium-sized firms into export markets will have the added benefit of increasing the average export/sales ratios of Brazilian exporters. Secondly, policies which decrease industrial concentration in domestic markets will result in improved export performance because the average size of firms, as measured by domestic sales, will decrease. This positive impact of decreased concentration on exports is offset only partially by a negative effect for very large and very small firms.

The statistical analysis of this study demonstrates clearly that commercial policy has a significant and direct impact on export performance in Brazil. Import protection allows domestic prices and costs to exceed those of foreign producers and makes export markets appear unattractive to Brazilian producers. This bias against exports can be offset by export subsidies, drawback for import duties on imported inputs, and by real devaluation of the cruzeiro. Export subsidies as administered in Brazil appear to discriminate against the small firm, and duty drawback is most effective as an export stimulus for firms with little industrial value-added and a high dependence on imported inputs. Real

devaluation, in contrast, stimulates exports from all firms irrespective of size or dependence on imports. The exchange rate is thus potentially a very effective instrument of export promotion in Brazil. It has the added advantage of not provoking the imposition of countervailing duties in importing countries. In an inflationary economy such as that of Brazil, real devaluation requires increases in the cruzeiro price of dollars to equal or exceed increases in the general price level.

Access to foreign technology and trademarks is clearly beneficial to the performance of exporters in Brazil's manufacturing sector. The findings of this paper suggest, however, that it makes no difference on average whether this access is provided by licensing agreements or by the sale of equity to transnational enterprises. Subsidiaries of transnational enterprises and joint ventures of foreign and local capital do, however, face markedly lower fixed costs of exporting; for this reason, they are more likely to export in the first instance than are comparable firms that lack these direct links to foreign markets.

## II. THEORETICAL CONSIDERATIONS

This chapter discusses the main predictions of the theory of international trade and industrial economics concerning both inter-firm and inter-industry differences in the probability of exporting and in export performance. Where relevant, the empirical findings of earlier studies are also mentioned. For ease of exposition, in this chapter and throughout the report, export performance refers solely to the export/sales ratios of exporters, i.e. to firms who have already entered export markets. It will be shown that the determinants of export performance are somewhat different from the determinants of the probability of exporting in the first instance.

### 1. SCALE ECONOMIES

Given that there are fixed costs of entering export markets, it follows that the larger the firm, the greater the probability of exporting, for these fixed costs can be spread over a larger volume of sales. Fixed costs include the costs of dealing with government bureaucracies in the exporting and importing country, of obtaining market information and of setting up a sales organization abroad. Moreover, importers often have no interest in small or irregular shipments, so a minimum size may be necessary if any exports are to be supplied at all. (See Tyler 1976, pp. 254-260 and Rapp 1976.)

Once a firm incurs the fixed cost of entering foreign markets, one can expect a negative relationship between export performance and the size of firm, where size is measured in terms of domestic sales. If exporting is motivated by a desire to achieve economies of scale, then firms with large domestic sales are likely to export a smaller proportion of their output, for they can obtain the benefits of large-scale production without incurring the extra costs associated with exporting (Glejser et al. 1980). For the same reason, firms with a large number of establishments should export more than would a single-plant firm with a similar volume of domestic sales.

Auquier (1980, pp. 205-207) notes correctly that there is an alternative explanation for an inverse relationship between firm size and export performance: Such correlation could result from product differentiation and demand factors as well as scale economies per se. If small firms produce varieties (specialty goods) that do not have mass appeal, or if small firms in an

industry face more elastic domestic demand curves than their larger rivals, then it follows that among firms that export, the proportion of output exported will be larger for the small firms. In an empirical test employing data for individual firms the only way to distinguish this explanation from the scale economies hypothesis is that the latter predicts a positive partial correlation between the number of plants and export performance whereas the former would not predict, holding firm size constant, any correlation whatsoever between plant size and exports. Nevertheless, the two hypotheses are not mutually exclusive and it is possible for both simultaneously to account for greater export performance on the part of small firms.

Evidence for a negative relationship between firm size and export/sales ratios has been found for Belgium (Glejser et al. 1980), France (Auquier 1980), the United Kingdom (Utton 1982), Japan (Rapp 1976) and Brazil (Fajnzylber 1971, appendix 7, Silber 1978). Hirsch and Adar (1974) report a positive correlation between firm size and export performance for a sample of firms from Denmark, Holland and Israel, but the study has two defects: i) size was defined as total sales rather than domestic sales, and ii) it is not clear whether firms with no exports were excluded from the sample. In all of these studies, with the exception of Glejser et al., there has been insufficient control for variations in other relevant variables such as type of product, capital intensity, export subsidies and type of ownership.

## 2. CAPITAL INTENSITY

Standard (Heckscher-Ohlin) trade theory predicts a negative relationship between capital intensity, whether human or physical, and exports in a capital-poor, labor-rich country like Brazil. There does exist considerable aggregate evidence for Brazil in support of this hypothesis. Despite the distortions of subsidized credit, import protection and export subsidies, Brazil's imports embody, on average, more skills and physical capital than do Brazil's exports. This finding, which is based on direct and indirect requirements in production, is true for both total trade and for trade in manufactures (Tyler 1976, ch. 6, Carvalho and Haddad 1981, Rocca and Mendonca 1972, Hidalgo 1983). Tyler (1970) found, on the basis of direct requirements only, that exports of manufactures in 1965 were more capital-intensive than manufacturing production in general; but Carvalho and Haddad (1981, p. 53) show that the labor intensity of industrial exports increased markedly in the 1967-1974 period, so Tyler's conclusions may not be applicable to later years.

Conventional trade theory may be useful in predicting whether or not a firm will export in the first instance. Once the export decision has been made, however, trade theory may be of little help in explaining the proportion of output that is exported by a particular firm. An alternative hypothesis relating capital intensity to export performance can be derived from industrial economics. If scale economies are a decisive

factor in the allocation of output between foreign and domestic markets, one would expect this factor to be more important, ceteris paribus, the more capital-intensive the techniques of production employed by the firm. Investment in physical plant and equipment tends to be indivisible or "lumpy," hence a firm operating with capital-intensive techniques will tend to require a larger market to reduce average costs to a minimum. In other words, holding the size of the domestic market constant, physical capital intensity should have a positive effect on export performance. Skilled labor tends to be quite divisible compared to physical equipment, so no particular effect is predicted for human capital intensity.

### 3. ADVERTISING AND PRODUCT DIFFERENTIATION

For advertising, like capital intensity, there are two plausible hypotheses. The Dreze (1960) hypothesis predicts a negative relationship between advertising and exports because countries like Brazil which are minor participants in international trade are not "taste-makers," hence are expected to specialize in standardized manufactures which compete primarily on the basis of price. On the other hand, advertising intensity is associated with monopolistic competition, and monopolistic competition can be beneficial for exports when the domestic market is protected from import competition.

Consider a protected industry which is monopolistically competitive in the sense that there are differentiated products but freedom of entry into, as well as exit from, the industry. In international markets firms are likely to be "price-takers" which face extremely elastic demand. In the domestic market consumers regard any particular firm's product as a very imperfect substitute for competing goods produced by other firms, so demand is less than perfectly elastic. Since excess profits attract entry, in long-run equilibrium each firm in such an industry will produce, in the absence of exports, at a point where its average cost curve is tangent to the downward sloping demand curve that it faces. This results in the well-known "excess capacity theorem" of monopolistic competition in which average costs exceed those which would be experienced if output were expanded. The greater the advertising expenditures, the more differentiated the product, which in turn implies a less elastic domestic demand and greater "excess capacity." This excess capacity can be profitably utilized for export markets so long as the marginal revenue from export sales exceeds the marginal cost of production.

### 4. FOREIGN LICENSES

Licensees of foreign technology and trademarks might, due to restrictions imposed by overseas firms, be expected to show a lower propensity to export than would be the case in the absence of license agreements. On the other hand, access to foreign technology and internationally known brand names might give a

firm a competitive edge in foreign markets. The effect which dominates can be determined only by empirical analysis, not by economic theory.

## 5. FOREIGN OWNERSHIP

Foreign-owned firms, because of their international connections, are expected, *ceteris paribus*, to be more likely to export and to have a better export performance than locally owned firms. Transnational firms have a greater knowledge of foreign market conditions than do purely local firms, and have organizations already in place in overseas markets.

## 6. INDUSTRIAL CONCENTRATION

There exists a large body of theoretical literature, supported by weak empirical evidence, that postulates a positive correlation between market power and export performance. (See White 1974, Das 1982, Pagoulatos and Sorensen 1976 and Marvel 1980.) This reasoning, which is based largely on the possibility of profitable price discrimination (dumping) seems relevant for protected markets like those of Brazil. If so, one can expect, *ceteris paribus*, a positive relation between concentration and exports for firms with large domestic market shares. Auquier (1980, p.211) has proposed the alternative hypothesis that "concentration, by promoting more collusive behavior on the home market, should induce more small firms to export (because they find their competitive options on domestic sales constrained)." If, at the same time, large firms take advantage of the possibility of price discrimination, higher concentration should result in a greater export volume for both dominant firms and the "competitive fringe" of small firms. The two hypotheses may thus be complementary rather than competing explanations of the effect of market structure on exports.

Two studies have predicted an inverse relation between concentration and export performance. Fajnzylber (1971, p. 101) hypothesized that a negative effect could result in Brazil from "the profitability of domestic sales for firms which operate in highly concentrated industries. One can assume that the greater the profitability of domestic sales, the less the incentive for firms to enter the competitive international market." [...a taxa de rentabilidade que podem obter no mercado interno as empresas que operam em setores de elevado grau de concentracao. Pode-se presumir que enquanto for maior a rentabilidade interna, menor sera a motivacao das empresas para arriscar-se no competitivo mercado internacional.] Fajnzylber seems to have had a "satisficing" view of monopoly power in mind, but the data available to him (tables 20 and 24) were not consistent with the hypothesis. Glejser et al. (1980, pp. 508-509) predicted a negative effect for concentration in industries producing standardized commodities on the grounds that to export from from such industries "would involve increasing the demand elasticity and becoming price-takers by weakening the oligopolistic interdependence and facility of collusion." Their empirical

evidence for Belgium supports the hypothesis, but it does not seem to be applicable to the protected markets of Brazil.

## 7. COMMERCIAL POLICY

In markets with competing imports, export performance is a function of domestic prices relative to prices for export sales. Risk factors may impede a producer from exporting all of his output, even though it might be profitable to do so at a given point in time. So long as a producer is not completely specialized in the domestic or export markets, as is the case for all exporters in our sample, then increases in the domestic price relative to the export price will cause producers to reduce exports in order to sell in the more profitable domestic market. Over time, changes in both the exchange rate and commercial policy (export subsidies and import tariffs) are potentially important determinants of prices for exports and domestic sales, hence of export supply. At a point in time, the exchange rate is fixed, so inter-industry or inter-firm differences in export performance will depend solely on corresponding differences in commercial policy.

Import restrictions in many Brazilian industries have created markets in which domestic production does not compete with imports. As a result, a large number of intrinsically tradable goods have been transformed into what Tyler (1983b) has called "pseudo nontradables," but which might more accurately be described as "pseudo nonimportables." Domestic prices for these goods are determined solely by Brazilian demand and supply, or by oligopolistic collusion, or by the cost conditions of monopolistically competitive firms. Unless the markets are internally competitive one would not necessarily expect a negative relationship between export performance and the ratio of domestic to export prices. In concentrated industries, high prices may indicate high profits rather than high costs. In monopolistically competitive industries, firms with decreasing average costs may be able to export incremental production at prices well below those prevailing in the protected domestic market.

A large number of time-series analyses of the export supply of manufactures are now available for Brazil. All ignore changes in tariff policy, and most add changes in export subsidies to the real exchange rate variable. All researchers, without exception, have found exports to be very responsive to changes in the real, subsidy inclusive, exchange rate. Braga and Markwald (1983, p. 723), after surveying sixteen of these studies, conclude that "there exists a consensus among economists today that unity is a 'reasonable' value for the price-elasticity of the export supply of manufactures." [existe hoje um certo consenso, na profissao, que tende a achar "razoavel" um valor unitario para a elasticidade-preco da exportacao de manufacturados.]

A priori, one might expect aggregate export supply to be equally responsive to changes in the exchange rate and to changes in the rate of export subsidy. Both instruments affect in a similar manner the amount of local currency received by the exporter for each dollar of export sales. They differ in that the exchange rate affects all exporters equally in the absence of differential export taxes or multiple exchange rates, whereas export subsidies are most often product or firm-specific. Pinto (1983) separated real exchange rate changes from changes in export subsidies; using 1954-1974 annual data, he found virtually no difference between the two elasticities. Tyler (1976), with quarterly data for 1963-1972, somewhat surprisingly found the subsidy elasticity to be nearly twice as great as the exchange rate elasticity. He attributed this to greater producer confidence in government support of exports when this support is manifested with subsidies, and predicted an eventual convergence over time of the two elasticities.

With the exception of the present report, there have been no studies of the export response to commercial policy at the level of the firm, and only one study at the industry level. Tyler (1983a) in a pooled cross-section and time-series regression model found the inter-industry variation in export growth to be related negatively to changes in nominal tariffs and positively to changes in export subsidies. Only the former variable was statistically significant, perhaps as a result of aggregation and the large inter-firm variation in rates of subsidy within each industry. (See chapter III of this report.)

In the regression analysis of chapter V, a measure of the degree of vertical integration (value added/output) of each firm is included as an explanatory variable for export performance. This is intended to act as a proxy for the importance of the "drawback" provision for duty-free importation of inputs used in the production of exports. Information on use of the drawback system is not available for individual firms, but in 1978, the year of our sample, over 40% of manufactured exports contained at least some inputs imported with the drawback scheme. The dollar value of these duty-free imports amounted to 27% of the value of the corresponding exports. (See Musalem 1983.) The drawback privilege is undoubtedly valuable to firms that make use of it for, despite the limited availability of data, Musalem was able to find evidence of a high elasticity of substitution between imported inputs and domestically produced inputs. The availability of inputs at international prices should be most useful to the exporting firm which purchases a substantial portion of its inputs from other firms in the economy, i.e. to the firm with a low ratio of value-added to output. For this reason a negative relationship is expected, ceteris paribus, between vertical integration and export performance.

Exporters with varying degrees of vertical integration can also be affected differentially by indirect taxes, but Brazilian taxes appear to be neutral in this respect. Producers in Brazil pay a tax on industrial products known as IPI. Although the IPI



rate varies from product to product, it is effectively a value-added tax. Firms receive credits for IPI that the government has collected on inputs purchased from other firms in the economy. If a product is sold in the domestic economy, the firm pays the IPI rate for that good, less the IPI tax credits for purchased intermediate goods. As is well known, this system is neutral with respect to tax burden of firms with differing degrees of vertical integration. If a product is exported, the firm is exempted from the IPI but retains the IPI tax credits on any purchased inputs. The tax system is thus neutral as well with respect to exporters which differ in their degree of vertical integration. An exporter which purchases no inputs from the rest of the economy (100% vertically integrated) pays no IPI at all whereas an exporter which depends on outside suppliers receives a tax credit for IPI paid on purchased inputs. These border tax adjustments are not export subsidies, but rather a method of excluding the full value of exports from indirect taxation.

Tyler (1976, pp. 204-209) agrees that retention of IPI tax credits by the exporter does not constitute an export subsidy "for society as a whole," but argues that it does constitute a subsidy for the exporter, a subsidy which is paid by the suppliers of intermediate inputs:

Greater IPI tax benefits will be accrued by products with more stages of production and lower degrees of industrial verticalization. Thus, a producer adding very little industrial value added can stand to benefit substantially from the previous IPI tax credit mechanism when he exports. In fact it is this kind of firm that stands to gain the most. A large, more vertically integrated firm that exports does not enjoy commensurate fiscal benefits via the tax credit mechanism for IPI paid on previous stages of production. (p. 209)

This is an interesting possibility, but there seems to be a logical error in the argument. The "producer adding very little value added" receives a rebate for the IPI tax that was included in the price of purchased inputs. The "more vertically integrated firm" receives less rebate because no tax was paid on inputs produced within the firm. Nonetheless, if the exporters themselves behave as if IPI tax credits were subsidies, this would be another reason to expect a negative relationship between vertical integration and export performance.

## 8. PLANT LOCATION

Plant location can also have an independent effect on export performance, particularly in such a diverse country as Brazil, and it would be interesting to test this hypothesis. Unfortunately, the necessary data for such a test were not available. The data available for the present study does contain information on the location of the head office of each firm, but this need bear no relation to the location of a firm's production facilities.

### III. DESCRIPTIVE AND NONPARAMETRIC STATISTICS

#### 1. THE DATA BASE

A vast micro data base has been assembled to test the hypotheses discussed in the preceding chapter. The full set of data consists of 15 041 firms, of which 3 562 registered exports in the fiscal year 1978. To facilitate the statistical analysis, 107 firms which recorded virtually no domestic sales were deleted from the sample, as were 2 282 firms (101 exporters) which showed negative value-added or failed to report the number of employees. Sixteen industries producing "non-tradables" such as rock, bricks and mineral water were also deleted, reducing the sample size to a total of 12 435, of which 3 345 export to foreign markets.

The main data source consists of corporate income tax returns filed in 1979. These refer to the fiscal year 1978, which varies by firm and need not coincide with the calendar year. To improve inter-firm comparability of the information, the data for firms with a fiscal year ending before December 1978 were adjusted upwards according to variations in the industrial wholesale price index. Since income tax returns do not contain employment information, these data were taken from the average levels of employment reported on the industrial product tax (IPI) forms in the calendar year 1978. Individual firms are not, of course, identified, and to insure confidentiality four-digit industries with fewer than six firms were not included in the data base.

Each firm has been allocated to the industry which accounts for the largest proportion of its total sales. There is no way of knowing the extent to which a firm produces products outside its main industry, or the extent to which the industry classification by total sales truly reflects the distribution of sales in export markets.

As shown in table 1, the vast majority of the firms in our sample are under national private ownership. Foreign ownership is a characteristic of 841 firms, where ownership is defined quite broadly as more than ten percent of total equity. An additional 245 firms have licensing agreements with overseas firms. Only 21 firms in the sample are publicly owned or "mixed" enterprises, a consequence of the deletion of highly concentrated industries from the data base.

As can be seen in table 2, foreign-owned firms account for 33% of the domestic sales and nearly 39% of the exports of firms in our sample. The participation of transnational firms is particularly high in the machinery, electrical equipment, transport equipment, rubber, pharmaceutical and cosmetics subsectors. In contrast, there is little foreign direct investment in the wood, furniture, clothing, footwear or printing subsectors. In all but seven of the 21 subsectors, transnational participation in exports exceeds participation in domestic sales. Transnationals tend to account for a larger share of value-added than of employment in each subsector. This is understandable because foreign-owned firms tend to be larger than their locally owned counterparts, and large firms are known to use quite capital- and skill-intensive techniques of production compared to small firms. There is also some tendency for the transnationals' share of export subsidies to exceed their share of exports, but this may also be a result of their larger size.

Table 1  
Distribution of the Sample by Subsector

<u>Subsector</u>	<u>Number of Firms</u>				
	<u>Total</u>	<u>Export</u>	<u>Foreign License</u>	<u>Foreign Owner</u>	<u>Public Firm</u>
TOTAL	12 435	3 345	245	841	21
Non-metallic minerals	391	102	10	26	---
Basic iron and steel	256	108	12	21	4
Basic non-ferrous	166	39	2	16	---
Metal products	1 002	260	14	64	---
Machinery	1 047	475	53	169	---
Electrical equipment	523	232	20	96	---
Transport equipment	371	184	22	50	1
Wood	528	122	4	6	---
Furniture	481	84	6	5	---
Pulp and paper	806	85	2	23	---
Rubber products	365	54	2	11	---
Leather	594	129	2	6	---
Chemicals	581	197	19	92	2
Pharmaceutical, cosmetics	739	86	9	67	2
Plastics	418	84	9	19	---
Textiles	859	377	26	56	1
Clothing	639	104	3	8	---
Footwear	272	136	1	3	---
Food and tobacco	1 715	532	13	53	4
Printing	300	17	11	7	6
Other manufactures	382	138	5	43	1

Source: 1978 data base.

Table 2

Participation of Foreign-Owned Firms in Total Employment,  
Value-Added, Domestic Sales, Exports, and Export Subsidies

	(percentage)					
	Employ- ment	Value- added	Domestic Sales	Export Sales	Export Credit	Subsidies Income Tax Exemption
TOTAL MANUFACTURING	26.1	35.9	33.0	38.8	47.5	33.5
Non-metallic minerals	22.4	29.2	28.4	32.3	41.1	40.4
Basic iron and steel	26.4	37.1	34.9	18.7	21.3	17.8
Basic non-ferrous	18.2	24.1	22.4	38.2	51.1	23.7
Metal products	19.1	30.8	25.4	43.7	34.8	37.6
Machinery	34.8	47.1	43.5	59.5	52.1	44.8
Electrical equipment	54.7	66.5	62.4	80.0	81.4	58.6
Transport equipment	53.7	60.0	69.0	67.2	75.2	48.2
Wood	5.9	5.3	3.3	14.8	18.1	9.0
Furniture	4.9	6.3	5.3	3.1	3.4	4.5
Pulp and paper	14.6	21.4	19.1	22.7	23.2	32.2
Rubber products	45.1	67.8	70.7	83.0	84.4	88.3
Leather and goods	9.6	13.9	11.9	21.1	17.2	4.9
Chemicals	32.0	25.1	20.3	9.2	24.3	18.4
Pharm., cosmetics	46.9	59.0	54.3	57.9	48.9	57.8
Plastics	11.9	17.8	17.9	20.0	25.9	12.2
Textiles	19.5	27.2	27.4	36.6	36.2	45.3
Clothing	3.1	5.6	5.1	6.9	10.2	0.8
Footwear	2.9	2.7	4.0	0.9	1.7	0.0
Food and tobacco	12.6	20.6	20.4	30.1	32.5	28.2
Printing	4.7	5.6	4.9	0.1	0.9	1.7
Other manufactures	27.1	39.9	34.0	24.7	36.5	47.1

Source: 1978 data base.

Note: A foreign-owned firm is defined as one in which non-residents control more than ten percent of the equity.

## 2. FIRM SIZE AND EXPORTS

Table 3 shows the distribution of the 3345 exporters by size and by subsector. Nearly half of the exporters in the sample reported adjusted total sales in excess of 100 million cruzeiros (five and a half million dollars) in 1978. The typical exporter in the manufacturing sector is thus a large firm, large at least by Brazilian standards.

Table 4 reports the percentage of firms in the total sample represented by exporters, again by size class and by subsector. The percentage of firms which export increases steadily from less than one percent in the smallest size class to more than sixty percent for firms with total sales of more than 100 million cruzeiros. This tendency is present in each of the 21

Table 3  
Distribution of Exporters by Size and Subsector  
(number of firms)

	Size Class							
	I	II	III	IV	V	VI	VII	VIII
TOTAL	9	15	40	63	244	565	778	1631
Non-metallic minerals	0	0	1	1	8	16	19	57
Basic iron and steel	0	0	1	0	3	16	18	70
Basic non-ferrous metals	0	0	0	0	2	2	11	24
Metal products	1	1	5	3	14	37	79	120
Machinery	1	1	4	11	41	105	118	194
Electrical equipment	0	1	1	1	13	35	60	121
Transport equipment	0	1	1	1	13	30	30	108
Wood	0	2	2	2	12	28	34	42
Furniture	2	0	2	1	2	21	31	25
Pulp and paper	1	0	0	1	9	11	16	47
Rubber products	0	0	1	3	6	11	10	23
Leather and leather goods	1	1	6	9	14	31	35	32
Chemicals	1	3	2	2	10	21	46	112
Pharmaceutical, cosmetics	0	1	3	3	7	11	13	48
Plastics	0	0	3	3	8	11	19	40
Textiles	0	0	1	6	11	49	92	218
Clothing	0	4	1	4	12	27	25	31
Footwear	0	0	1	5	17	49	34	30
Food, beverages, tobacco	2	0	3	4	21	24	53	225
Printing	0	0	0	0	2	0	2	13
Other manufactures	0	0	2	3	19	30	33	51

Source: 1978 data base.

Note: The size classes are defined as follows:

- I Less than 2 million cruzeiros in sales.
- II 2 - 4 million cruzeiros in sales.
- III 4 - 8 million cruzeiros in sales.
- IV 8 - 12 million cruzeiros in sales.
- V 12 - 25 million cruzeiros in sales.
- VI 25 - 50 million cruzeiros in sales.
- VII 50 - 100 million cruzeiros in sales.
- VIII More than 100 million cruzeiros in sales.

During 1978 the average exchange rate was 18 cruzeiros per U.S. dollar.

subsectors. It would appear, then, that increased size increases the probability that a firm will export. Size in itself is, however, no guarantee that a firm will export, and firms of quite modest size do export to foreign markets. Within each industry, the total sales of the smallest exporter is but a small percentage -- usually less than one percent -- of the sales of

Table 4

Percentage of Firms Which Export by Size and Subsector

	Size Class							
	I	II	III	IV	V	VI	VII	VIII
TOTAL	0.6	2.1	4.2	7.4	14.9	25.9	39.8	61.9
Non-metallic minerals	0	0	4.0	14.3	19.0	23.2	31.7	48.7
Basic iron and steel	0	0	16.7	0	15.0	32.0	32.7	67.3
Basic non-ferrous	0	0	0	0	6.9	6.7	36.7	54.5
Metal products	0.9	3.4	7.7	4.0	11.0	17.8	40.7	61.9
Machinery	2.0	4.0	6.2	15.3	28.3	41.5	57.6	84.0
Electrical equipment	0	6.3	5.9	5.0	21.0	28.9	55.6	74.2
Transport equipment	0	20.0	7.7	8.3	38.2	38.0	42.9	76.6
Wood	0	4.8	4.0	3.9	14.0	28.6	52.3	71.2
Furniture	2.7	0	5.9	2.8	2.5	21.0	35.2	61.0
Pulp and paper	0.7	0	0	1.4	6.9	12.0	25.8	49.5
Rubber products	0	0	2.9	6.8	13.0	30.6	29.4	74.2
Leather, leather goods	0.5	1.3	6.9	21.4	20.6	56.4	92.1	94.1
Chemicals	12.5	23.1	10.5	8.3	15.4	16.9	40.0	52.6
Pharm., cosmetics	0	1.0	2.7	5.3	6.5	17.2	27.1	53.3
Plastics	0	0	11.1	9.7	10.5	11.6	23.5	54.8
Textiles	0	0	5.0	13.3	12.4	26.8	48.4	74.9
Clothing	0	8.0	2.0	6.2	10.6	20.9	27.8	47.7
Footwear	0	0	8.3	25.0	36.2	64.5	69.4	81.1
Food, tobacco	0.8	0	2.2	4.3	12.9	12.5	20.5	44.3
Printing	0	0	0	0	4.7	0	4.3	35.1
Other manufactures	0	0	10.0	12.5	31.1	39.5	48.5	75.0

Source: 1978 data base.

Note: The size classes are defined as follows:

- I Less than 2 million cruzeiros in sales.
- II 2 - 4 million cruzeiros in sales.
- III 4 - 8 million cruzeiros in sales.
- IV 8 - 12 million cruzeiros in sales.
- V 12 - 25 million cruzeiros in sales.
- VI 25 - 50 million cruzeiros in sales.
- VII 50 - 100 million cruzeiros in sales.
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During 1978 the average exchange rate was 18 cruzeiros per U.S. dollar.

the largest non-exporter. Factors other than size obviously affect the decision to enter export markets, and these factors are analysed in chapter IV.

Two measures of central tendency -- the median and the mean -- are reported in table 5 for the export/sales ratios of exporters in each manufacturing subsector. For the sample as a whole, the median ratio is only four percent whereas the mean ratio is fifteen percent. This suggests a highly skewed distribution, with a large number of exporters registering very low export-sales ratios. A logarithmic transformation of the data is thus appropriate for analytical techniques, such as ordinary least squares regression, that assume a normal distribution.

Table 6 reports three correlation coefficients for exporters in the entire manufacturing sector and in each subsector. Rank correlation has been used because it does not require any assumption regarding the distribution of the underlying data. The first correlation reported, that between exports and domestic

Table 5  
Export/Sales Ratios (percentages)

	Number of_firms	median	mean	Standard deviation
TOTAL	3345	3.97	15.25	24.16
Non-metallic minerals	102	1.79	12.33	25.07
Basic iron and steel	108	7.49	17.16	21.30
Basic non-ferrous metals	39	2.18	12.67	21.26
Metal products	260	1.97	6.43	12.64
Machinery	475	4.77	10.64	15.71
Electrical equipment	232	2.50	7.56	13.20
Transport equipment	184	2.92	10.09	17.58
Wood	122	20.15	26.87	25.91
Furniture	84	1.31	5.44	11.75
Pulp and paper	85	0.96	7.44	17.75
Rubber products	54	1.56	5.87	15.49
Leather and leather goods	129	15.27	23.63	24.59
Chemicals	197	2.86	18.30	28.77
Pharmaceutical and cosmetics	86	1.70	3.82	6.59
Plastics	84	0.97	2.69	7.60
Textiles	377	5.25	14.83	22.16
Clothing	104	2.06	11.44	22.84
Footwear	136	48.24	45.21	35.79
Food, beverages, tobacco	332	14.55	30.15	32.88
Printing	17	0.58	1.72	2.74
Other manufactures	138	4.54	15.98	26.61

Source: 1978 data base.

sales, tends to be positive, which shows that firms which rank high in export receipts tend also to rank high in sales to the Brazilian market. But most coefficients are well below unity, which suggests that the relationship is far from perfect. The second coefficient reports the correlation between export/sales ratios and total sales. This statistic tends to be small and not significantly different from zero. When the correlation is measured between domestic sales and the export ratio, there is a negative relationship in 19 subsectors, and the negative coefficient is statistically significant in ten subsectors. Large firms in terms of domestic sales thus tend to export a smaller proportion of their total output; but the transport equipment subsector represents a significant exception to this general pattern.

Table 6

Spearman Rank Correlation Coefficients for Exporters:  
Exports and Domestic Sales

	Exports and domestic_sales	X/S and total_sales	X/S and domestic_sales
TOTAL	.295**	-.022	-.232**
Non-metallic minerals	.311**	-.111	-.189
Basic iron and steel	.462**	.009	-.191*
Basic non-ferrous metals	.267	-.031	-.161
Metal products	.484**	.035	-.061
Machinery	.501**	.118*	-.018
Electrical equipment	.522**	.048	-.016
Transport equipment	.623**	.281**	.171*
Wood	.123	-.070	-.440**
Furniture	.251*	-.177	-.233*
Pulp and paper	.511**	-.076	-.143
Rubber products	.508**	.010	-.081
Leather, leather goods	.364**	.138	-.186*
Chemicals	.014	-.350**	-.524**
Pharmaceutical, cosmetics	.601**	-.127	-.157
Plastics	.601**	-.097	-.131
Textiles	.272**	.065	-.174**
Clothing	.215*	-.031	-.219*
Footwear	-.167	-.007	-.671**
Food, beverages, tobacco	.152**	-.048	-.461**
Printing	.618**	.071	.071
Other manufactures	.271**	.008	-.200*

Source: 1978 data base.

\* Coefficient is statistically significant at the .05 level in a two-tailed test.

\*\* Coefficient is statistically significant at the .01 level in a two-tailed test.



In sum, the descriptive statistics reported here provide considerable support for the hypothesized importance of scale economies: Because of the high fixed cost of exporting, larger firms are more likely to export than are small firms. However, among the firms that do export, firms with small domestic market sales are likely to have a higher ratio of exports to sales, for they have the most to gain from scale economies (cost reductions) through exports. Nevertheless, the subsector level is rather aggregate, and we have not yet controlled for variations in variables other than size which affect the probability of exporting and subsequent export performance.

### 3. FIRM SIZE AND EXPORT SUBSIDIES

Such clear evidence of a negative association between export ratios and domestic sales is somewhat surprising, for the system of export subsidies in effect in 1978 discriminated against the small firm. As reported in table 7, there is a highly significant and positive correlation between export volume and the rate of subsidy through both the export credit (S1) and the income tax exemption (S2). Overall, the smaller the exporter, the smaller the export subsidy as a percentage of exports. This is generally true within each of the 21 subsectors as well, the only notable exceptions being basic non-ferrous metals and furniture. When the data are disaggregated to 139 industries, statistically significant, positive coefficients between export volume and the sum of S1 plus S2 are evident in 33 industries. (See appendix B.) This is more than five times the number that would be expected by chance at the level of confidence employed. Moreover, not one of the statistically significant coefficients carries a negative sign.

Our data base does not contain any information on subsidized credit received in conjunction with exports, but this financial incentive, though important, is not likely to have offset the bias against the small firm. On the contrary, it is quite likely that large firms obtain a disproportionate amount of subsidized credit.

Most interestingly, 760 exporters in the sample received no export credit in 1978, and 1 229 received no income tax reduction from their export activities. A total of 523 exporters -- 15.6% of the sample -- received no fiscal incentive at all. With the exception of the chemical subsector, unsubsidized exporters tend to be much smaller, on average, than subsidized exporters. (See table 8.) Moreover, unsubsidized exporters can be found throughout the manufacturing sector: in 106 of the 139 industries, at least one firm exported without the benefit of fiscal subsidies.

It should be emphasized that the large variation in rates of export subsidy within manufacturing industries may well reflect an equally large variation in the types of products that are exported. Each firm has been allocated to the industry which

accounts for the largest proportion of its total sales. The exports of a firm may be quite distinct from its overall sales, particularly in the case of large, multi-plant firms.

Table 7

Spearman Rank Correlation Coefficients for Exporters: Export Volume and Rate of Fiscal Subsidy

	<u>Rank Correlation between Exports and</u>		
	<u>Total</u>	<u>Export</u>	<u>Income Tax</u>
	<u>Subsidy(S)</u>	<u>Credit(S1)</u>	<u>Exemption(S2)</u>
TOTAL	.202**	.195**	.176**
Non-metallic minerals	.320**	.249*	.294**
Basic iron and steel	.302**	.229*	.248**
Basic non-ferrous metals	-.132	-.176	.071
Metal products	.314**	.312**	.214**
Machinery	.228**	.239**	.110*
Electrical equipment	.232**	.207**	.149*
Transport equipment	.338**	.323**	.223**
Wood	.178*	.050	.304**
Furniture	.125	.143	.050
Pulp and paper	.332**	.421**	-.012
Rubber products	.309*	.243	.397**
Leather and leather goods	.343**	.361**	.221**
Chemicals	.163*	.149*	.191**
Pharmaceutical and cosmetics	.263*	.236*	.302**
Plastics	.352**	.301**	.332**
Textiles	.186**	.149**	.177**
Clothing	.272**	.227*	.419**
Footwear	.538**	.377**	.314**
Food, beverages, tobacco	.117*	.085	.229**
Printing	.481*	.573*	.114
Other manufactures	.208*	.162	.233**

Source: 1978 data base.

\* Coefficient is statistically significant at the .05 level in a two-tailed test.

\*\* Coefficient is statistically significant at the .01 level in a two-tailed test.

Note: Subsidy rate (S, S1 and S2) is defined as the ratio of subsidies to subsidy-inclusive export revenue.

Table 8

Average Size of All Exporters and Exporters with no Subsidies  
(million cruzeiros)

	Number of Firms		Average Exports		Average Sales	
	TOTAL	NOSUB	TOTAL	NOSUB	TOTAL	NOSUB
TOTAL MANUFACTURING	3345	523	51.0	26.7	383.6	433.5
Non-metallic minerals	102	24	16.0	5.5	273.6	62.6
Basic iron and steel	108	7	89.4	2.8	878.4	59.1
Basic non-ferrous	39	5	43.6	35.1	475.3	259.4
Metal products	260	42	12.6	14.5	207.4	130.5
Machinery	475	54	27.3	5.1	213.8	71.5
Electrical equipment	232	24	38.9	2.4	418.7	216.0
Transport equipment	184	22	154.1	2.7	901.0	95.8
Wood	122	15	30.9	10.1	132.6	66.4
Furniture	84	17	5.4	0.7	102.2	50.6
Pulp and paper	85	20	27.3	2.0	331.5	230.7
Rubber products	54	16	27.5	1.3	525.8	65.4
Leather and goods	129	14	22.2	1.1	83.5	32.3
Chemicals	197	39	55.5	125.7	1087.4	3735.9
Pharm., cosmetics	86	25	12.5	3.8	507.4	175.5
Plastics	84	13	4.8	0.5	228.4	52.5
Textiles	377	32	34.3	4.9	255.4	95.2
Clothing	104	18	8.5	1.3	114.3	97.1
Footwear	136	17	36.0	0.2	81.7	61.1
Food and tobacco	332	98	175.1	72.9	614.0	415.8
Printing	17	4	8.9	0.3	427.1	54.5
Other manufactures	138	17	26.8	3.1	174.0	79.4

Source: 1978 data base.

Subsidization of exports via income tax exemptions is related to the rate of profit, hence indirectly to capital intensity. It is thus understandable that this subsidy discriminates against small firms, which tend to use labor-intensive techniques of production. It is not clear why the export credit (credito premio) should also discriminate against small exporters. Since the export credit in effect in 1978 varied widely by product, rates must have been lower for those products exported predominantly by small firms. In addition, bureaucratic obstacles may have made it unattractive for a small exporter to incur the cost of collecting a subsidy to which it was entitled.

## IV. LOGIT ANALYSIS OF THE PROBABILITY OF EXPORTING

### 1. THE LOGIT MODEL

In this chapter a single-equation, multivariate model is used to measure the effect of economic variables on the probability that a firm will be an exporter. The equation to be estimated is

$$Y_i = P_i + u_i$$

where  $P_i = 1/(1+e^{-Z_i})$ ;

$$Z_i = b_0 + b_1 \ln S_i + b_2 \ln K_i + b_3 \text{ADV}_i + b_4 \text{STATE}_i + b_5 \text{LIC}_i + b_6 \text{FOR}_i$$

and the disturbance  $u_i$  is an independently distributed random variable with zero mean.

$Y_i$  is a dichotomous variable which takes the value of 1 if firm  $i$  exports and 0 if it does not. This type of binary choice model is referred to in the literature as logit analysis. (See Pindyck and Rubinfeld 1976, ch. 8 or Cox 1970.) The model restricts the estimated probabilities (the  $P_i$ 's) to the zero-to-one interval and assumes that a change in an independent variable will have its greatest impact on the probability of exporting when  $P$  would otherwise be equal to 1/2. At very low or very high probabilities, large changes in independent variables result in only small changes in the estimated probability.

Estimation of the logit model presents two related problems. First, it is not appropriate to use ordinary least squares to estimate any equation with a dichotomous dependent variable, for the error term is heteroscedastic, i.e. the variance of  $u_i$  is not the same for all observations. Since the  $Y_i$  can assume only two different values, 0 or 1, observations for which the  $P_i$  are close to 0 or 1 will have small variances whereas those close to 1/2 will have larger variances. It is possible to show that  $P_i(1-P_i)$  is a consistent estimate of the variance of the error term, so weighted least squares can be used to produce asymptotically efficient and unbiased estimates of the parameters of the model. (Kmenta 1971, pp. 425-27 and 461-62.) Secondly, the model is intrinsically nonlinear, so it is necessary to iteratively reweight the least squares results, where the weights are the reciprocals of the variances calculated from the previous iteration. In practice this means that somewhat more computer

time is required than would otherwise be the case. (SAS Institute 1982, pp. 36-37.)

The logit equation can also be expressed in the following way:

$$\ln\{Y_i/(1-Y_i)\}=b_0 + b_1 \ln S_i + b_2 \ln K_i + b_3 \text{ADV}_i + b_4 \text{STATE}_i + b_5 \text{LIC}_i + b_6 \text{FOR}_i$$

where the dependent variable is the logarithm of the odds that a firm will export. This equation cannot, of course, be estimated directly, for the logarithms of zero and infinity are undefined. Therefore the first equation is the one that was actually estimated.

The independent variable  $\ln S$  refers to the size of the firm as measured by the natural logarithm of the cruzeiro value of adjusted sales. The coefficient of  $\ln S$  is expected to be positive, for larger firms are more likely to export than are small firms given high fixed costs of exporting.

Capital intensity ( $K$ ) is defined as cruzeiro value-added per employee. Value-added per employee is highly correlated with the capital intensity of different industries (Lary 1968) and presumably different firms as well. In addition, it is possible to divide this measure of capital intensity into human capital intensity ( $HK$ ) and physical capital intensity ( $PHK$ ). The former is measured as the average annual wage whereas the latter is defined as non-wage value-added per employee. These two variables could not be calculated for 21 firms, including two exporters, which failed to report their 1978 wage bill. Measured non-wage value-added was negative for 183 firms, so their physical capital intensity ( $PHK$ ) was set equal to one cruzeiro. Value-added was estimated as total sales revenue plus change in inventories less purchases of raw materials, advertising, electricity, fuel and goods to be resold. The value-added of firms whose fiscal year differed from the calendar year was adjusted by the wholesale price index in order to make the statistics more comparable between firms.

In accordance with the Heckscher-Ohlin theorem, a negative coefficient is thus expected for capital intensity, whether human or physical. Nonetheless it should be emphasized that our measure of capital intensity takes no account of indirect labor requirements. It is entirely conceivable that a firm may use capital-intensive methods of production, yet utilize large amounts of unskilled labor in the form of inputs purchased from other firms in the economy.

The advertising variable ( $ADV$ ) is defined as the ratio of advertising expenditures to domestic sales. Dreze (1960) would predict a negative coefficient for this variable because countries which have little weight in world trade are expected in export markets to specialize in standardized goods which compete on the basis of price rather than advertising. As explained in chapter II, monopolistic competition in a protected domestic

market can conceivably reduce the importance of the "Dreze hypothesis" or even produce a positive coefficient.

STATE is a dummy variable which takes the value of unity if the government holds equity in the firm, and the value of zero otherwise. Eight of the 21 public enterprises in the sample are exporters. No particular sign is expected a priori for the coefficient of this variable.

LIC is a dummy variable which is equal to one if a firm in which residents own ninety percent or more of the equity has a licensing agreement with an overseas firm, and zero otherwise. More than half of these 245 firms registered exports in 1978. The coefficient of this variable can be negative, if overseas firms prevent licensees from competing in export markets, or positive, if access to foreign technology and trademarks gives licensees a competitive edge in exports.

FOR takes a value of one if non-resident owners hold more than ten percent of the equity of a firm, and zero if foreign ownership is ten percent or less. This variable is thus broadly defined to include joint ventures of national and foreign firms as well as foreign-controlled firms. Nearly three-quarters of the 841 firms in which foreigners held more than ten percent of the equity recorded exports in 1978. A positive coefficient is expected for this variable.

The same logit model was estimated for each manufacturing subsector, with only two changes. First, the STATE dummy was deleted due to an insufficient number of public enterprises in the sample. Secondly, the dummy variables LIC and FOR were combined into a variable labelled LICFOR which takes the value of unity if a firm has foreign licensing agreements or foreign direct investment amounting to more than ten percent of its equity, and zero otherwise.

## 2. EMPIRICAL RESULTS

Table 9 reports the mean and standard deviation of the explanatory variables for the sample as a whole as well as for the subsets of exporters and nonexporters. Exporters are clearly larger than nonexporters, utilize more skill- and capital-intensive techniques of production and exhibit a higher ratio of advertising to domestic sales. From the disaggregate data reported in appendix table C-1, it can be seen that this is generally true in each subsector as well. The only exceptions are rubber products, where exporters have low advertising ratios, and footwear, where exporters' output is slightly less capital-intensive than that of nonexporters. Nonetheless, it would not be correct to conclude that each of these variables necessarily has a positive impact on the probability of exporting, for there are significant positive correlations between the explanatory variables themselves. (See table 10.) Firms that export may be relatively capital-intensive not by virtue of the fact that they sell part of their output to foreign markets, but rather because

they are large. To determine the independent effect of capital intensity on export performance, holding constant other relevant variables such as size, a multivariate approach is needed. Precisely such an approach is provided by the logit regression model.

Tables 11 and 12 report parameters for 27 equations which were estimated by iteratively reweighted least squares, the weights being the reciprocals of  $P_i(1-P_i)$ . In equations 01 and 04 the intercept was held constant over all firms, whereas in the other four equations of table 11 it was allowed to vary by subsector.

a) Firm Size

The coefficient of the logarithm of sales ( $\ln S$ ) is positive as expected and highly significant. Its magnitude ranges from 0.8 to 0.9 in regressions employing the full sample of firms, which indicates that a ten percent increase in the size of a firm, as measured by total sales, is associated with an eight to nine percent increase in the odds of exporting  $\{P/(1-P)\}$ . In the subsector regressions reported in table 12 the coefficient is significant in every case at the .01 level and its magnitude ranges from a low of 0.47 (chemicals) to a high of 1.67 (footwear).

Table 9

Mean and Standard Deviation of Variables in Logit Regression

Variable	Description	Mean	Standard Deviation
lnS	ln(total sales)	16.984	1.940
	nonexporters	16.418	1.808
	exporters	18.521	1.370
lnK	ln(value-added per employee)	12.154	0.872
	nonexporters	12.077	0.909
	exporters	12.365	0.720
ADV	advertising/domestic sales	0.007	0.024
	nonexporters	0.006	0.010
	exporters	0.010	0.033
lnHK	ln(wage bill per employee)	10.959	0.760
	nonexporters	10.868	0.781
	exporters	11.207	0.635
lnPHK	ln(non-wage value-added/employee)	11.560	1.736
	nonexporters	11.448	1.883
	exporters	11.864	1.201

Table 10

## Simple Correlation between Variables in Logit Regression

	lnS	lnK	ADV	lnHK	lnPHK
lnS	1.000	0.463	0.066	0.497	0.340
lnK	0.463	1.000	0.051	0.696	0.734
ADV	0.066	0.051	1.000	0.081	-0.006
lnHK	0.497	0.696	0.081	1.000	0.309
lnPHK	0.340	0.734	-0.006	0.309	1.000

Note: All coefficients except that for the correlation between ADV and lnPHK (-0.006) are statistically significant at the .01 level.

b) Capital Intensity

The variable for total capital intensity (K) is highly significant and has the negative coefficient suggested by standard trade theory, but the elasticity increases markedly in absolute size from -0.35 to -0.91 when subsector dummies are included in the regression. This appears to be due to observations in the footwear subsector which are outliers with respect to this variable and others as well. In regression equation 03, which excludes the 272 footwear firms but includes 20 dummy variables, the estimated elasticity of capital intensity is only -0.34. In 19 of the 21 subsector regressions, the coefficient of capital intensity is negative, significantly so at the .05 level in a two-tailed test in nine equations. Pulp and paper is the only subsector to show a significantly positive coefficient for capital intensity.

When human capital intensity (HK) and physical capital intensity (PHK) enter the equation, both have the expected negative coefficients, but the coefficient of lnHK is much higher than that of lnPHK. This suggests that variations in skill intensity, as measured by average wages, have a much greater impact on the probability of exporting than do variations in physical plant and equipment.

c) Advertising Intensity

The advertising variable (ADV) carries a significantly positive coefficient in all of the equations reported in table 11. This implies that Brazilian firms producing highly advertised, hence highly differentiated, goods are more likely to export than are firms producing standardized commodities. Such a



finding is opposite that predicted by the Dreze hypothesis, but it is consistent with the existence of "excess capacity" due to monopolistic competition in the protected Brazilian market.

To test whether the positive coefficient for ADV might be a product of errors in the data, 141 observations were deleted in which the advertising/domestic sales ratio was very high (8% or higher). Regression equations O1 and O2 were then re-estimated with the restricted sample. The coefficient for advertising actually increased from 5.246 to 14.043 in equation O1 and from 7.299 to 22.960 in equation O2 with little effect on the size or significance of other parameters of the model. The results reported in table 11 may thus underestimate the magnitude, though not the statistical significance, of the impact of advertising on the probability of exporting.

In the subsector regressions listed in table 12, ADV has a positive coefficient in 19 equations and a significantly positive coefficient in nine equations. In view of the fact that our expectation of a positive coefficient is based on the excess capacity theorem of the theory of monopolistic competition, it may seem strange that the highest coefficients (97.2 and 85.8) occur in basic iron and steel and in basic non-ferrous metals, subsectors with very low advertising ratios. In interpreting these subsector results it is important to recall that the data refer to firms, not plants or establishments, and each firm has been allocated to the industry which accounts for the largest proportion of its total sales. A relatively high advertising ratio for a firm in the iron and steel subsector, for example, may well be indicative of diversification, with considerable production and exports from plants operating in monopolistically competitive industries.

Equally noteworthy is the fact that the coefficient of ADV in the pharmaceutical and cosmetics subsector -- everyone's example of monopolistic competition -- is quite low (2.1) and not statistically different from zero. Three possible explanations of this result come to mind. First, advertising ratios in this subsector are quite high, so the ADV variable may be a poor indicator of inter-firm variations in "excess capacity" within the subsector. Secondly, industries in this subsector have relatively high prices, and presumably high costs, compared to foreign producers. (See appendix table D-1 of this report.) Unless sales expansion can reduce average costs to a level below export prices plus subsidies, there is no incentive to export regardless of the existence of "excess capacity." Finally, international brand names are very important for pharmaceutical products, soap and cosmetics, so export markets are likely to be as monopolistically competitive as the domestic market. In this case the assumption of highly elastic demand for exports would not be warranted and there would be less incentive to enter export markets.

Table 11

## Logit Analysis of the Probability of Exporting

Variable	Regression Coefficients					
	01	02	03 a/	04	05	06 a/
Constant	-12.559** (0.451)	b/	b/	-13.463** (0.472)	b/	b/
lnS	0.896** (0.021)	0.787** (0.021)	0.970** (0.071)	0.881** (0.021)	0.803** (0.021)	0.965** (0.071)
lnK	-0.350** (0.033)	-0.913** (0.033)	-0.339** (0.090)			
lnHK				-0.193** (0.040)	-0.941** (0.037)	-0.263* (0.111)
lnPHK				-0.085** (0.017)	-0.107** (0.017)	-0.069 (0.046)
ADV	5.246** (1.096)	7.299** (1.187)	8.841** (2.996)	5.008** (1.083)	8.095** (1.230)	8.921** (3.036)
STATE	-1.393* (0.564)	-1.028 (0.632)	-0.355 (1.718)	-1.396* (0.573)	-0.839 (0.657)	-0.237 (1.754)
LIC	0.580** (0.155)	0.618** (0.159)	0.302 (0.378)	0.577** (0.154)	0.695** (0.160)	0.317 (0.378)
FOR	0.941** (0.091)	1.208** (0.093)	0.874** (0.227)	0.933** (0.092)	1.301** (0.094)	0.913** (0.229)
# firms	12 435	12 435	12 163	12 414	12 414	12 142

Note: The numbers in parentheses are the asymptotic standard errors of the estimated coefficients. A single asterisk (\*) indicates that a coefficient is significantly different from zero at the .05 level of confidence and a double asterisk (\*\*) indicates significance at the .01 level.

a/ Excludes footwear.

b/ The constant term in this regression was allowed to vary by subsector. The estimated coefficients of the 21 dummy terms are reported in appendix table C-2.

Table 12

## Logit Analysis by Subsector of the Probability of Exporting

Subsector	Regression Coefficients				
	Constant	lnS	lnK	ADV	LICFOR
07 Non-metallic minerals	-8.823** (2.414)	0.825** (0.121)	-0.588* (0.227)	24.769* (9.771)	0.253 (0.427)
08 Basic iron and steel	-12.790** (3.171)	0.861** (0.138)	-0.298 (0.251)	97.242** (33.610)	0.614 (0.493)
09 Basic nonfer. metals	-19.586** (5.016)	1.438** (0.275)	-0.653 (0.367)	85.768** (31.877)	0.580 (0.672)
10 Metal products	-11.988** (2.034)	1.044** (0.090)	-0.633** (0.157)	29.660** (8.909)	1.396** (0.312)
11 Machinery	-13.650** (1.999)	1.162** (0.092)	-0.581** (0.137)	25.647** (6.165)	0.721** (0.218)
12 Electrical equipment	-12.457** (2.616)	1.029** (0.115)	-0.526** (0.182)	16.777** (5.342)	0.697* (0.280)
13 Transport equipment	-10.106** (2.768)	0.735** (0.111)	-0.272 (0.207)	6.950 (10.379)	0.668 (0.396)
14 Wood	-18.443** (2.858)	1.288** (0.138)	-0.408* (0.197)	13.675 (7.147)	0.952 (0.862)
15 Furniture	-18.517** (4.070)	1.114** (0.163)	-0.197 (0.341)	7.560 (9.836)	0.410 (0.715)
16 Pulp and paper	-28.402** (3.250)	1.012** (0.113)	0.704** (0.220)	38.564 (22.517)	0.753 (0.544)
17 Rubber	-18.247** (4.021)	1.230** (0.175)	-0.337 (0.285)	-46.528 (34.540)	0.013 (0.819)
18 Leather	-27.980** (3.693)	1.931** (0.192)	-0.435 (0.288)	50.256 (26.652)	-1.283 (0.938)
19 Chemicals	-6.860** (1.580)	0.473** (0.075)	-0.207* (0.105)	8.427 (4.817)	0.871** (0.243)
20 Pharmaceut., cosmetics	-15.459** (3.048)	0.898** (0.110)	-0.179 (0.256)	2.144 (2.519)	0.776* (0.356)
21 Plastics	-17.724** (3.412)	0.844** (0.137)	0.091 (0.252)	14.339 (9.612)	1.963** (0.507)
22 Textiles	-19.328** (2.047)	1.202** (0.098)	-0.219 (0.115)	39.629** (14.530)	0.247 (0.320)
23 Clothing	-12.240** (2.659)	0.844** (0.116)	-0.347 (0.188)	33.255** (10.742)	0.097 (0.693)
24 Footwear	6.271 (4.720)	1.671** (0.228)	-3.006** (0.521)	-3.742 (11.085)	-3.686** (1.294)
25 Food, tobacco	-14.697** (1.094)	0.857** (0.056)	-0.174** (0.066)	0.002 (2.294)	0.177 (0.318)
26 Printing	-18.648** (6.508)	1.279** (0.282)	-0.616 (0.479)	-5.701 (20.553)	2.967** (0.742)
27 Other manuf.	-9.856** (2.849)	0.986** (0.131)	-0.651** (0.190)	16.937** (5.917)	0.688 (0.410)

Note: The statistics in parentheses are the asymptotic standard errors of the coefficients. (\*) indicates significance at the .05 level of confidence and (\*\*) at the .01 level.

d) State Ownership, Foreign Ownership and Licenses

The coefficient of the dummy variable STATE is negative, which indicates, other things equal, that a public enterprise is less likely to export than is a firm under private ownership. Nonetheless, the coefficient is statistically significant at the 0.05 level only when the constant term is constrained to be the same for all subsectors.

In contrast, the coefficients of LIC and FOR are significantly positive, and the latter is nearly twice as large as the former. The licensing dummy, for some unknown reason, loses statistical significance when the footwear subsector is deleted from the sample. It appears then that one can conclude with a high degree of confidence that foreign direct investment in a firm increases the odds that the firm will be an exporter, but such a positive effect from foreign licensing agreements is less certain. In the subsector regressions reported in table 4, the LICFOR dummy shows a positive coefficient in all but two subsectors -- leather and footwear -- and in these two subsectors there is a particularly low incidence of foreign licenses and foreign ownership. In only seven subsectors, however, is a positive LICFOR coefficient significant at the .05 level of confidence.

Some experimentation was done that was not successful and for this reason is not reported here. The Herfindahl index of concentration was entered into the logit regression under the assumption that small firms are induced to export from highly concentrated industries. In no case was the coefficient significantly different from zero, in contrast to the result predicted by Auquier (1980, p. 211). An attempt was also made to enter interaction terms of subsector dummies with  $\ln S$ , i.e. to allow the size coefficient to vary by subsector. This specification proved to be very costly in terms of computer time, so the attempt was abandoned when convergence failed to occur within a reasonable number of iterations.

e) Illustration of the Use of the Logit Parameters

The estimated parameters of the logit equations can easily be used to calculate probabilities. Assume, for example, that one wishes to predict the probability of exporting for a firm with 1978 sales of 100 million cruzeiros ( $\ln S = 18.421$ ), value-added per employee of 180 thousand cruzeiros ( $\ln K = 12.101$ ), and no advertising, state ownership, foreign licenses or foreign owners. From equation 01, the natural logarithm of the odds of exporting is  $-12.559 + 0.896(18.421) - 0.350(12.101)$  or  $-0.289$ . Taking antilogarithms and solving for  $P_i$ , the probability that such a firm will export is found to be .43. If the same firm is under foreign ownership, the calculated logarithm of the odds increases by 0.941 to 0.652 and the probability of exporting increases to .66.

It is also possible to see how the probability of exporting for each category of firm changes as the size of firm increases, holding all other variables constant. Table 13 reports such an

exercise utilizing equation 01 of table 11. If equation 02 had been used for these calculations, the effect of size would have been somewhat larger and if equation 03 had been used it would have been larger. Table 14 reports a similar exercise for changes in capital intensity and advertising, holding size and the three dummy terms constant. It should be noted that the 10 to 14 capital intensity range corresponds to a range of 22 thousand to 1.2 million cruzeiros (approximately 1 200 to 66 800 dollars) in value-added per employee.

Table 13

Illustration of the Relationship between Size, Ownership and the Probability that a Firm will Export

Total Sales (million cruzeiros)	Probability of Exporting			
	Public Enterprise	Private Enterprise	Foreign License	Foreign Owner
4	.01	.04	.07	.10
8	.02	.09	.12	.17
12	.03	.10	.17	.23
25	.05	.18	.28	.36
50	.09	.29	.42	.51
100	.16	.43	.58	.66
200	.26	.59	.72	.78
400	.40	.73	.83	.87

Source: Calculated from equation 01 of table 11 with variables lnK and ADV set equal to their means (12.154 and 0.007 respectively).

Table 14

Illustration of the Relationship between Capital Intensity,  
Advertising and the Probability that a Firm will Export

Advertising Intensity_a/	Capital Intensity b/				
	10	11	12	13	14
0	.61	.52	.44	.35	.28
.01	.62	.54	.45	.37	.29
.02	.63	.55	.46	.38	.30
.04	.66	.58	.49	.40	.32
.10	.73	.65	.57	.48	.39

Source: Calculated from equation 01 of table 11 with firm size set equal to 100 million cruzeiros and the dummy variables STATE, LIC and FOR set equal to zero.

a/ Ratio of advertising expenditures to domestic sales.

b/ The natural logarithm of cruzeiros of value-added per employee.

## V. REGRESSION ANALYSIS OF EXPORT PERFORMANCE

Chapter IV analyzed factors which affect a firm's decision to enter export markets. In this chapter attention is focused on a second question: Once the export decision has been made, what determines the allocation of output between foreign and domestic markets? Data for 3 345 exporters are used to test the hypotheses discussed in chapter II.

### 1. THE ORDINARY LEAST SQUARES REGRESSION MODEL

The basic model chosen for a simultaneous test of these hypotheses draws heavily on Glejser et al. (1980):

$$\begin{aligned} \ln(X_{ij}/DS_{ij}) = & b_j D_j + b_k D_j \ln(DS_{ij}) + b_{279} \ln(EST_{ij}) + b_{280} \ln(K_{ij}) \\ & + b_{281} ADV_{ij} + b_{282} T_j + b_{283} S1D_{ij} + b_{284} S1_{ij} \\ & + b_{285} S2D_{ij} + b_{286} S2_{ij} + b_{287} V_j + b_{288} H_j \\ & + b_{289} STATE_{ij} + b_{290} LIC_{ij} + b_{291} FOR_{ij} + u_{ij} \end{aligned}$$

$$i = 1, 2, \dots, n_j \quad n_j > 2$$

$$j = 1, 2, \dots, 139$$

$$k = 140, 141, \dots, 278$$

$$b_k < 0 \quad b_{279} > 0 \quad b_{280} = ? \quad b_{281} = ? \quad b_{282} < 0$$

$$b_{283} > 0 \quad b_{284} > 0 \quad b_{285} > 0 \quad b_{286} > 0$$

$$b_{287} < 0 \quad b_{288} > 0 \quad b_{289} = ? \quad b_{290} = ? \quad b_{291} > 0$$

where

the subscripts  $i$  and  $j$  refer to the  $i$ th firm and the  $j$ th industry, respectively;

$\ln(X_{ij}/DS_{ij})$ , the dependent variable, is the natural logarithm of the ratio of exports to domestic sales, so can take any positive or negative value. The cruzeiro value of both exports and sales for those firms whose fiscal year differed from the calendar year was adjusted by the wholesale price index for manufactures so as to

make the inter-firm statistics more comparable. Export subsidies are included as a part of the export and total sales revenue.

$D_j$  is a dummy variable corresponding to one of the 139 industries to which a firm belongs;

$D_j \ln(DS_{ij})$  is the natural logarithm of sales (in cruzeiros) multiplied by the industry dummy so that  $b_j$ , the size elasticity, takes a different value in each industry. In another specification of this model, this variable is replaced by  $\ln(DS_{ij})$ , constraining the size elasticity to be the same for all industries.

$EST_{ij}$  is the number of establishments owned by a particular firm;

$K_{ij}$  is the value-added (in adjusted cruzeiros) per employee, a commonly used proxy for capital intensity. In another version of the model, this variable is replaced by  $HK_{ij}$  and  $PHK_{ij}$ , which is wages per employee and non-wage value-added per employee, respectively. These two variables are proxies for human and physical capital intensities. (See Lary 1968.) They could not be measured for two firms which failed to report their 1978 wage bill. Measured non-wage value-added was negative for 17 of the remaining 3 343 firms, so their physical capital intensity was set equal to one cruzeiro so that its logarithm could be defined. Value-added was estimated as total sales revenue plus value of changes in stock less purchases of raw materials, advertising, electricity, fuel and goods to be resold.

$ADV_{ij}$  is a firm's expenditures on advertising expressed as a proportion of domestic sales;

$T_j$  is the implicit tariff of an industry, measured as the excess price of domestic over import prices;

$S1D_{ij}$  is a dummy variable which takes the value of one if an exporter receives an export tax credit (credito premio) and the value of zero otherwise;

$S1_{ij}$  is the export tax credit of a firm expressed as a proportion of total export revenue, including export subsidies;

$S2D_{ij}$  is a dummy variable which takes the value of one if a firm pays reduced corporate income tax by virtue of its export activity, and the value of zero otherwise;

$S2_{ij}$  is the export credit equivalent of the reduction in taxable income expressed as a proportion of the firm's total export revenue. Export credits are taxable as income at the standard rate of 30%, so the export credit



equivalent of the reduction in taxable income due to export activity is  $0.3/0.7 (=0.43)$  times the reduction in taxable income.

$V_{ij}$  is the ratio of value-added to total output, intended as a measure of the degree of vertical integration of the firm;

$H_j$  is the Herfindahl index of concentration of domestic sales in a particular industry, defined as the sum of the squares of market shares of the individual firms;

$STATE_{ij}$  is a dummy variable which takes the value of unity if the government holds equity in the firm, and the value of zero otherwise;

$LIC_{ij}$  is a dummy variable equal to unity if a nationally owned firm has a licensing agreement with an overseas firm, and equal to zero otherwise;

$FOR_{ij}$  takes the value of one if non-resident owners hold more than ten percent of the equity of the firm and zero if foreign ownership amounts to ten percent or less of the equity;

$u_{ij}$  is an independent error term with zero mean and constant variance. Since the variance of the dependent variable is a decreasing function of the size of the firm, the assumption of constant variance (homoscedasticity) was not expected to be realistic. Most surprisingly, analysis of the residuals of several regression equations revealed no evidence of heteroscedasticity, so no correction of the ordinary least squares results was required.

## 2. EMPIRICAL RESULTS

Table 15 lists the mean and standard deviation of the explanatory variables which enter the regression equations, and table 16 reports the simple correlation matrix for these variables. The main regression results are shown in table 17, which contains estimated coefficients for six specifications of the basic model. Equation 01 has a constant term, but excludes the industry dummies ( $D_j$ ), which do enter equation 02. The 139 industry dummies are also entered along with dummy-domestic sales interaction terms in equation 03. The estimated coefficients for the industry dummies and interaction terms can be found in appendices B, C and D. Equations 04 through 06 are identical to the first three equations except that human and physical capital replace the capital intensity variable.

In general, the regression results are most satisfactory from the point of view of goodness of fit. In equation 01 all of the estimated coefficients are significantly different from zero at the .01 level of confidence in a two-tailed test, and in

equation 04 all but one coefficient is significant at this level of confidence. The industry terms add considerably to the explanatory power of the equation, for the coefficient of determination ( $R^2$ ) increases from .33 to .79 with the addition of industry dummies, and again to .81 when the coefficient of domestic sales is allowed to vary by industry. The full model thus "explains" more than 80% of the variation of the dependent variable.

Rather than discuss each specification of the model in turn, it seems preferable to present the results by variable, as they relate to the hypotheses discussed in chapter II.

Table 15

Mean and Standard Deviation of Variables in Regression

<u>Variable and Description</u>	<u>Mean</u>	<u>Standard Deviation</u>
$\ln(X_{ij}/DS_{ij})$ $\ln(\text{ratio of exports/domestic sales})$	-3.087	(2.539)
$\ln DS_{ij}$ $\ln(\text{domestic sales})$	18.234	(1.593)
$\ln EST_{ij}$ $\ln(\text{number of establishments})$	0.512	(0.683)
$\ln K_{ij}$ $\ln(\text{value-added per employee})$	12.365	(0.720)
$\ln HK_{ij}$ $\ln(\text{wage bill per employee})$	11.207	(0.635)
$\ln PHK_{ij}$ $\ln(\text{non-wage value-added/employee})$	11.864	(1.201)
$ADV_{ij}$ advertising/domestic sales	0.010	(0.033)
$T_j$ implicit tariff	0.180	(0.325)
$S1_{ij}$ export credit/exports	0.131	(0.126)
$S2_{ij}$ profit tax subsidy equivalent/exports	0.022	(0.029)
$V_{ij}$ value-added/output	0.555	(0.161)
$H_j$ Herfindahl index of concentration	0.069	(0.091)
		----- <u>Sum</u> -----
STATE-owned enterprises		8
LICensing agreements with foreign firms		148
FDReign participation in equity		610

a) Scale Economies

When the coefficient of the domestic sales variable is constrained to be identical for all 139 industries, its sign is significantly negative as hypothesized. (See equations 01, 02, 04 and 05 of table 17.) The coefficient of the establishment variable is also highly significant and has the positive sign predicted by the scale economies hypothesis. Most interestingly, the absolute size of the coefficient of  $\ln EST$  is considerably smaller than that of  $\ln DS$ . This suggests that a doubling of the number of plants per firm has less impact on export ratios than does a 50% reduction in domestic sales. In short, there is strong evidence of the importance of economies of scale at the plant level, but the results also lend some support to the considerations of product differentiation and demand factors stressed by Auquier (1980).

Table 16

Correlation Matrix

	$\ln DS$	$\ln K$	$\ln HK$	$\ln PHK$	ADV	T	S1	S2	V	H
$\ln(X/DS)$	-.363	-.004	-.145	.001	.123	-.059	.025	.108	-.104	.032
$\ln DS$	1.000	.305	.366	.230	-.128	-.047	.033	.039	-.092	.132
$\ln K$	.305	1.000	.757	.753	.017	.075	-.063	.145	-.002	.113
$\ln HK$	.366	.757	1.000	.398	.043	.128	-.043	-.049	.060	.063
$\ln PHK$	.230	.753	.398	1.000	-.030	.031	-.035	.176	.034	.060
ADV	-.128	.017	.043	-.030	1.000	.067	-.011	-.002	.016	.077
T	-.047	.075	.128	.031	.067	1.000	.007	.052	.211	.018
S1	.033	-.063	-.043	-.035	-.011	.007	1.000	.082	.115	-.011
S2	.039	.145	-.049	.176	-.002	.052	.082	1.000	.274	.024
V	-.092	-.002	.060	.034	.016	.211	.115	.274	1.000	-.085
H	.132	.113	.063	.060	.077	.018	-.011	.024	-.085	1.000

Note: Coefficients with an absolute value of .034 or greater are statistically significant at the .05 level and coefficients with an absolute value of .044 or greater are significant at the .01 level.

Equation 03 is a rigorous test of the scale economies hypothesis, for in this specification both the intercept and the domestic sales coefficient are allowed to vary by industry. As can be seen in appendix D, the sales elasticities are negative in 121 of the 139 industries, significantly so at the .01 level in 50 industries. In contrast, none of the positive coefficients are significantly different from zero at the .05 level of confidence. Estimated elasticities of less than -1 indicate that increasing domestic sales is associated not only with a decline in the export-sales ratio, but also with an absolute decline in export volume. It is thus noteworthy that 40 of the 139 sales elasticities in equation 03 are less than -1, eight significantly so at the .05 level of confidence. The specification of equation 06 produces almost identical results.

b) Capital Intensity

The coefficient of capital intensity is highly significant, and its positive sign is opposite that which would be predicted for Brazil by standard trade theory. Moreover, its significance is attributable solely to variations in physical capital intensity, for the coefficient of the human capital variable is small and not significantly different from zero in equations 04 through 06. This finding is consistent with the hypothesis that the influence of economies of scale overwhelms the role of factor proportions emphasized in the conventional theory of international trade. A firm with a large investment in plant and equipment requires a larger volume of exports to reduce average costs to a minimum than does a firm with the same volume of domestic sales but less capital-intensive production techniques.

It is interesting to note that the simple correlation between capital intensity and export ratios is quite different from the partial correlation implicit in the regression equations. As can be seen in the first line of table 16, the simple correlation between the logarithm of  $X/DS$  and that of  $K$  or  $PHK$  is very low and not significantly different from zero. In contrast, the correlation between the logarithm of the wage rate ( $\ln HK$ ) and the logarithm of the export ratio is negative and highly significant. The multiple regression results indicate that this negative correlation, though statistically significant, is spurious and that skill levels as measured by the average wage have no independent effect on export ratios. Wage rates are positively correlated with domestic sales; firms with a high volume of domestic sales export proportionately less not because their wages are high but rather because they can achieve economies of scale in the domestic market with less need to enter competitive international markets. Similarly, the correlation between domestic sales and physical capital intensity obscures the positive effect that the latter has on export ratios.

c) Advertising Intensity

The coefficient of advertising is highly significant and, like the capital intensity variable, its sign is opposite that which would be predicted by trade theorists (Dreze 1960). Firms producing highly advertised, hence highly differentiated products

export a larger proportion of their output than do firms producing standardized manufactures. This finding is consistent with the hypothesis that firms in monopolistic competition will seek export markets because of the existence of "excess capacity" in the sense that long-run marginal costs of production are well below long-run average costs.

The advertising variable is defined as the ratio of advertising expenditures to domestic sales. Since the domestic sales term also enters the denominator of the dependent variable, the possibility exists that the coefficient for ADV is biased upwards as a result of errors in the measurement of domestic sales. To test this hypothesis, fifty observations were deleted in which the advertising/domestic sales ratio was very high (8% or more). Regression equations 01 through 03 were then re-estimated with the restricted sample of firms. In equation 01 the coefficient of ADV fell to -0.7, and was not significantly different from zero, while other coefficients were affected very little. In equations 02 and 03, however, the coefficient increased from 5.4 to 10.6 and from 8.7 to 12.2 respectively, retaining its high level of statistical significance. For the full regression model, the reported results for the advertising variable are thus quite robust.

d) Implicit Tariff Protection

In equations 01 and 04, the coefficient of the tariff variable is negative as expected and is significant at the .01 level of confidence. For each percentage point increase in the ratio of domestic to import prices, the volume of exports falls by three-quarters of a percentage point. It appears that high domestic prices by and large do reflect high production costs or serve as an incentive to supply the domestic market at the expense of exports. Protectionist commercial policies are thus a serious impediment to the export of manufactures in Brazil.

The variable  $T_j$  can also be interpreted as the cross-sectional equivalent of a real exchange rate. Over time, an aggregate index of the real value of the cruzeiro is simply the ratio of domestic prices to international prices, divided by the nominal exchange rate (cruzeiros per unit of foreign currency). At a point in time, the nominal exchange rate is the same for all firms, but industries differ in the ratio of domestic to international prices. The higher this ratio, the greater the "overvaluation" of the cruzeiro in that industry, and the less competitive will firms be in export markets. Most interestingly, our estimated elasticity of 0.75 is only slightly lower than long-run supply elasticities calculated with time series data. (See Braga and Markwald 1983.)

Although the size of the coefficient of  $T_j$  is quite plausible, two caveats should be noted regarding the underlying data. First, the tariff data are rather aggregate, for only 77 separate tariff rates were available for the 139 industries covered in this study. (See appendix table D-1.) Secondly, calculations of the implicit tariff are based on direct price

comparisons made in late 1980 and early 1981, two to three years after the relevant time period for the remainder of the explanatory variables. Data for legal tariffs are available, but these were not used because Tyler (1983b) has shown that there is widespread tariff redundancy in Brazil, and virtually no correlation whatsoever between legal and implicit tariffs.

Due to severe multicollinearity, it was not possible to estimate the regression equations which include the implicit tariff variable along with the 139 industry dummy terms. Therefore, in those equations the coefficient of  $T_j$  is constrained to take the value obtained in regressions which exclude the industry dummies.

e) Export Subsidies

The Brazilian government uses both fiscal and financial incentives as export subsidies to offset, at least in part, the anti-export bias of the system of protection. At the level of the firm, it has been possible to obtain information for only two types of fiscal incentives: S1, the export tax credit (credito premio) and S2, the export credit equivalent of the reduction in corporate income tax attributable to exports. S1 is by far the most important of the two subsidies, averaging 13.1% for the firms in our sample compared to only 2.2% for S2. The simple correlation between S1 and S2 is significant, but a relatively low .082. S1 is negatively correlated with both human and physical capital intensity, whereas S2, which is based on profits, hence indirectly on capital intensity, shows a high positive correlation with physical capital intensity. (See table 16.)

Financial incentives are omitted entirely from the regression analysis. No data are available by firm, but Musalem (1981) has estimated that the subsidy element of export financing amounted to 10.5% of total exports of manufactures in 1978. It is also impossible to obtain data by firm on the use of the drawback provision for imported inputs, but the vertical integration variable ( $V_{ij}$ ) is intended to act as a proxy for this fiscal incentive.

Both S1 and S2 enter the regression equation in two distinct ways. A dummy variable first captures the effect of the presence of any positive subsidy on export ratios. The subsidy rate itself is then entered simultaneously as a measure of the impact of increased subsidies on export performance at the margin. This specification provides an unconstrained estimate of the marginal effect of changes in the rate of subsidy on export performance.

The coefficient of S2 is significant in all equations and has the expected positive sign. In the full model (equation 03 or 06), its size implies that a one percentage point increase in the rate of subsidization through income tax reductions produces a three percent increase in export volume. This elasticity is much higher than that of the implicit tariff variable, but it

Table 17

## Ordinary Least Squares Analysis of Export Performance

Variable	Regression Coefficients					
	01	02	03	04	05	06
Constant	8.254** (0.755)	a/	a/	11.365** (0.756)	a/	a/
$\ln DS_{ij}$	-0.924** (0.029)	-0.823** (0.029)	a/	-0.893** (0.029)	-0.816** (0.029)	a/
$\ln EST_{ij}$	0.561** (0.059)	0.473** (0.057)	0.399** (0.059)	0.520** (0.060)	0.461** (0.057)	0.386** (0.059)
$\ln K_{ij}$	0.420** (0.055)	0.318** (0.057)	0.284** (0.057)			
$\ln HK_{ij}$				-0.076 (0.070)	0.024 (0.070)	0.003 (0.071)
$\ln PHK_{ij}$				0.204** (0.034)	0.146** (0.032)	0.133** (0.033)
$ADV_{ij}$	4.142** (1.116)	5.417** (1.060)	8.658** (1.410)	4.689** (1.123)	5.737** (1.065)	9.040** (1.415)
$T_j$	-0.780** (0.115)	-0.780 b/	-0.780 b/	-0.721** (0.116)	-0.721 b/	-0.721 b/
$S1D_{ij}$	2.054** (0.113)	1.804** (0.107)	1.702** (0.106)	2.068** (0.114)	1.813** (0.107)	1.707** (0.106)
$S1_{ij}$	-2.769** (0.348)	-2.057** (0.337)	-2.086** (0.333)	-2.898** (0.349)	-2.090** (0.338)	-2.115** (0.333)
$S2D_{ij}$	0.477** (0.096)	0.450** (0.090)	0.446** (0.088)	0.429** (0.097)	0.432** (0.090)	0.430** (0.088)
$S2_{ij}$	4.221** (1.592)	3.301* (1.473)	2.876* (1.460)	4.595** (1.603)	3.686* (1.477)	3.173* (1.466)
$V_{ij}$	-3.117** (0.244)	-1.304** (0.269)	-1.104** (0.271)	-3.214** (0.246)	-1.375** (0.271)	-1.176** (0.273)
$H_j$	1.167** (0.408)	0.512 (0.986)	0.229 (1.029)	1.278** (0.409)	0.492 (0.988)	0.160 (1.031)

Table 17 (continued)

Variable	Regression Coefficients					
	01	02	03	04	05	06
STATE <sub>ij</sub>	2.495** (0.748)	2.157** (0.718)	1.360 (0.742)	2.756** (0.752)	2.351** (0.721)	1.540* (0.745)
LIC <sub>ij</sub>	0.803** (0.181)	0.865** (0.167)	0.732** (0.167)	0.891** (0.182)	0.903** (0.167)	0.766** (0.168)
FOR <sub>ij</sub>	0.601** (0.105)	0.792** (0.098)	0.651** (0.099)	0.731** (0.106)	0.845** (0.099)	0.701** (0.100)
R <sup>2</sup>	.331	.791	.813	.328	.791	.813

Note: The numbers in parentheses are the standard errors of the coefficients. (\*) indicates significance at the .05 level and (\*\*) at the .01 level.

a/ Coefficient varies by industry. See appendix tables D-2, D-3 and D-4.

b/ An a priori restriction for the coefficient of this variable was necessary because of multicollinearity.

should be noted that it is not significantly higher in a statistical sense.

The coefficient of S1, in contrast, is significantly negative. The net effect of the export tax credit (S1D + S1) is positive, but the marginal effect on exports of increases in the subsidy appears to be negative. Higher rates of subsidy are thus associated with reduced export volume. This unexpected finding is the product of a defect in the underlying data: S1 includes not only subsidies for exports of the current year, but also an unknown amount of accumulated subsidies for exports of previous years.

Export subsidies in the form of tax credits were originally given by state governments as well as the federal government. Because of budgetary problems, many states found themselves unable to honor their commitments to exporters, so in 1977 the federal government allowed firms to utilize half of their accumulated state credits in payment of federal IPI taxes. In 1978 this percentage was increased to 100% and in 1979 the federal government took full responsibility for all fiscal incentives to exports. Export tax credits are taxable as income in the year that they are actually used. Since the income tax data for all firms in our sample cover fiscal years ending in 1978, the use of accumulated tax credits introduces a serious distortion in the S1 variable. Export revenue is defined as inclusive of subsidies, so a firm which utilized accumulated



export credits in 1978 without actually exporting in that year appears to have a subsidy rate of 100%. Firms with a small volume of exports relative to accumulated export credits can also show quite high apparent rates of subsidy. In general, for all firms utilizing accumulated export credits, the S1 variable is biased upwards, which biases downwards the estimate of the coefficient of S1.

In an attempt to improve the estimate of the effect of the export credit on export supply, 44 firms for which S1 was 40% or higher were deleted from the sample. The results are shown in equations 07 through 09 of table 1B. With the removal of these outliers, the coefficient of S1 becomes positive and is significant at the .01 level in the full model. Since the coefficient is still biased downwards because of the inclusion of an unknown amount of accumulated export credits, one can safely conclude that export subsidies given in the form of tax credits are at least as efficacious as subsidies given in the form of income tax reductions.

These errors in the measurement of export subsidies also affect the measurement of exports, hence export ratios. For this reason the regression equations were re-estimated utilizing data only for the 760 firms which received no subsidies whatsoever in the form of export credits. As shown in chapter II, it is the smallest exporters which tend to receive no export credits, so this is hardly a random sample of firms; nonetheless, equation 10 in table 1B compares quite favorably with equation 01 or 07. With the addition of industry dummies, additional observations were deleted because many industries contain only one or two firms with no export credits.

In the full model with 699 firms (equation 12), the coefficient of determination is quite high (.904), but only the advertising variable is significantly different from zero. This is due to severe multicollinearity among the explanatory variables. Neither the coefficient of S2D nor that of S2, for example, are statistically significant, but in a joint test the two variables are significant at the .01 level of confidence ( $F=5.38$ ). For this type of regression model an extremely large number of observations seem to be required in order to obtain precise estimates of the parameters. Glejser et al. had a sample of only 970 firms to estimate a similar model; the "small" size of the sample may account for the multicollinearity problems that they encountered.

f) Vertical Integration

The value-added/output variable has the expected negative sign and is highly significant in all specifications of the regression model. The more vertically integrated the firm, the less the volume of exports. This finding is consistent with the hypothesis that the drawback privilege of duty-free importation of inputs is most valuable for an exporter that relies heavily on outside suppliers for component parts and raw materials. In the full model (equation 03 or 06), each additional percentage point

Table 18

## The Determinants of Export Performance in Restricted Samples

Variable	Regression Coefficients					
	---export credit < 40%---			---no export credit---		
	07	08	09	10	11	12
Constant	7.925** (0.762)	a/	a/	4.399** (1.523)	a/	a/
lnDS <sub>ij</sub>	-0.931** (0.029)	-0.813** (0.029)	a/	-0.983** (0.063)	-0.973** (0.062)	a/
lnEST <sub>ij</sub>	0.582** (0.059)	0.477** (0.057)	0.404** (0.058)	0.375** (0.146)	0.364** (0.142)	0.274 (0.155)
lnK <sub>ij</sub>	0.460** (0.056)	0.343** (0.057)	0.303** (0.057)	0.854** (0.102)	.316** (0.114)	0.193 (0.121)
ADV <sub>ij</sub>	3.938** (1.113)	5.146** (1.050)	8.159** (1.400)	10.056** (2.228)	9.777** (2.114)	10.202** (2.529)
T <sub>j</sub>	-0.794** (0.115)	-0.794 b/	-0.794 b/	-1.171** (0.246)	-1.171 b/	-1.171 b/
S1D <sub>ij</sub>	1.618** (0.131)	1.211** (0.128)	1.154** (0.127)			
S1 <sub>ij</sub>	0.258 (0.576)	2.159** (0.609)	1.813** (0.605)			
S2D <sub>ij</sub>	0.446** (0.097)	0.408** (0.089)	0.402** (0.088)	0.736** (0.235)	0.721** (0.223)	0.428 (0.233)
S2 <sub>ij</sub>	3.994* (1.589)	3.138* (1.461)	2.823* (1.448)	-0.847 (5.672)	0.975 (5.312)	4.738 (5.875)
V <sub>ij</sub>	-3.173** (0.246)	-1.295** (0.270)	-1.073** (0.272)	-3.710** (0.458)	-0.718 (0.554)	-0.208 (0.598)
H <sub>j</sub>	1.203** (0.411)	0.629 (0.979)	0.406 (1.022)	0.144 (0.864)	-3.139 (2.770)	-2.700 (2.714)
STATE <sub>ij</sub>	2.470** (0.745)	2.165** (0.711)	1.432* (0.733)	3.333** (1.282)	3.325** (1.177)	0.508 (1.484)
LIC <sub>ij</sub>	0.805** (0.182)	0.880** (0.167)	0.742** (0.167)	1.880 (0.565)	0.722 (0.554)	0.449 (0.584)
FOR <sub>ij</sub>	0.596** (0.105)	0.778** (0.098)	0.635** (0.099)	0.053 (0.295)	0.591* (0.281)	0.278 (0.297)
R <sup>2</sup>	.328	.792	.814	.352	.882	.904
# firms	3 301	3 301	3 301	760	743	699

Table 18 (notes)

Note: The numbers in parentheses are the standard errors of the coefficients. (\*) indicates significance at the .05 level and (\*\*) at the .01 level.

- a/ Coefficient varies by industry. See appendix tables D-5, D-6 and D-7.
- b/ An a priori restriction for the coefficient of this variable was necessary because of multicollinearity.

of production that is incorporated within the firm is associated with a one percent fall in exports.

Firms which produce final consumer goods tend to advertise more, and to be less integrated vertically than firms which produce capital or intermediate goods. Since the coefficient for advertising is positive, whereas that for vertical integration is negative, it appears that Brazilian producers demonstrate a strong competitive advantage in consumer goods.

g) Industrial Concentration

The coefficient of the Herfindahl (H) index has the expected positive sign, but is statistically significant only when industry dummies are excluded from the regression equation. As was the case with the tariff variable, this may well be the result of collinearity, with the dummy terms picking up some of the effect of market concentration. The coefficient of 1.167 in equation 01 implies that, holding other variables constant, exports increase by nearly 1.2 percent for each increase of .01 points in the H index. Does a coefficient of this magnitude indicate that concentration is beneficial for export performance? The answer is not necessarily, for other things are not constant, and there is also a very strong inverse relationship between firm size and export performance.

Suppose, for example, there to be an industry that contains ten identical single-plant firms, so that the H index is equal to  $10(1/10)^2$ , or 0.10. Now let the number of firms be reduced to nine, with no change in the size of the domestic market or, the equality of market shares. The H index increases to  $9(1/9)^2$ , or approximately 0.11, so we would expect an increase of 1.2% in exports. But the domestic sales of at least one firm must increase, and this will have a negative effect on exports of the industry. If the domestic sales of the firm which leaves the industry are distributed equally among the remaining nine firms, the domestic sales of each will increase by approximately 11% and exports on this account will fall by more than nine percent, much more than the increase attributable to increased concentration.

One might well argue that the concentration variable is not properly specified in the equations of table 17. Most of the literature on this topic implies that a positive relationship is

expected between industry concentration and export performance only in the case of large firms with considerable monopoly power in the domestic market. In addition, Auquier (1980) has hypothesized that the competitive fringe should also export more, the more concentrated the market, because their domestic options are preempted by larger rivals.

These two hypotheses can be tested jointly by adding two interaction terms to the regression model: DS25<sub>ij</sub>H<sub>j</sub> and DS500<sub>ij</sub>H<sub>j</sub>. The first variable is equal to the value of the H index for the jth industry only if the ith firm of that industry reported domestic sales of 25 million cruzeiros or less; otherwise the variable is equal to zero. This sales criteria applies to 576 firms in our sample. The second interaction term takes the value of the H index of the industry corresponding to a particular firm only if the firm recorded domestic sales in excess of 500 million cruzeiros, which was the case of only 379 firms in our sample. These two variables thus measure the deviation of small and large firms from the coefficient of H estimated with data from the entire sample of 3 345 firms.

Adding the interaction terms to equation 01 produces the following result:

$$\begin{aligned} \ln(X/DS_{ij}) = & 8.344^{**} - 0.912^{**} \ln(DS_{ij}) + 0.509^{**} \ln(EST_{ij}) \\ & (0.800) \quad (0.032) \quad (0.060) \\ & + 0.399^{**} \ln(K_{ij}) + 3.931^{**} ADV_{ij} - 0.752^{**} T_j + 2.063^{**} S1D_{ij} \\ & (0.055) \quad (1.113) \quad (0.115) \quad (0.113) \\ & - 2.772^{**} S1_{ij} + 0.483^{**} S2D_{ij} + 3.948^{*} S2_{ij} - 3.081^{**} V_{ij} \\ & (0.347) \quad (0.096) \quad (1.589) \quad (0.243) \\ & - 0.496 H_j + 1.927^{*} STATE_{ij} + 0.756^{**} LIC_{ij} + 0.576^{**} FOR_{ij} \\ & (0.508) \quad (0.759) \quad (0.180) \quad (0.104) \\ & + 3.439^{**} DS25_{ij} H_j + 3.694^{**} DS500_{ij} H_j \quad R^2 = .337 \\ & (0.946) \quad (0.826) \end{aligned}$$

It should be noted that the coefficient of H<sub>j</sub> becomes negative, but is not significantly different from zero, whereas the coefficient for the interaction between size and concentration exceeds 3.0 and is highly significant.

Introducing the size-concentration interaction terms into the full regression model (equation 03) yields a similar result:

$$\begin{aligned} \ln(X/DS_{ij}) = & a_j D_j + b_k D_j \ln(DS_{ij}) + 0.366^{**} \ln(EST_{ij}) \\ & \quad (0.059) \\ & + 0.279^{**} \ln(K_{ij}) + 8.598^{**} ADV_{ij} - 0.752 T_j + 1.696^{**} S1D_{ij} \\ & (0.057) \quad (1.406) \quad (0.106) \\ & - 2.045^{**} S1_{ij} + 0.448^{**} S2D_{ij} + 2.843^{*} S2_{ij} - 1.116^{**} V_{ij} \\ & (0.332) \quad (0.088) \quad (1.455) \quad (0.271) \end{aligned}$$

$$\begin{aligned}
& - 0.907 H_j + 1.371 \text{ STATE}_{ij} + 0.697^{**} \text{ LIC}_{ij} + 0.638^{**} \text{ FOR}_{ij} \\
& \quad (1.054) \quad (0.741) \quad (0.167) \quad (0.099) \\
& + 3.884^{**} \text{ DS25}_{ij} H_j + 3.385^{**} \text{ DS500}_{ij} H_j \quad R^2 = .815 \\
& \quad (1.259) \quad (1.225)
\end{aligned}$$

The industry dummies ( $a_j$ ) and 139 domestic sales elasticities ( $b_k$ ) were calculated but  $j$  are not shown for reasons of space.

In sum, the results lend considerable support to the proposition that concentration induces greater export performance on the part of both large firms and the competitive fringe, while for the vast majority of firms market concentration in itself bears no relationship to exports. In addition, it should be noted that concentration can have a large effect on export performance through its effect on the size distribution of firms in an industry. This negative effect, though indirect, overwhelms the direct effects if increased concentration at the firm level is associated with increased concentration of production at the plant level as well.

#### h) State Ownership

No particular sign was hypothesized for the STATE dummy. It is included in the regression first because of interest in the behavior of public compared to private enterprise and secondly because public ownership may well have an independent effect on export performance. As can be seen in table 17, the coefficient of this variable is quite large, and is most often statistically significant. Ex post, it is tempting to interpret this as evidence that public enterprises have more information and a wider export horizon than private enterprises, or that they are able to sell abroad at a loss with the full knowledge that this will be covered by the state or by increased prices for domestic sales. Nonetheless, since only eight exporters in our sample are under public ownership, it is very possible that this result may not be generally applicable to public enterprises operating in Brazil's manufacturing sector.

#### i) Foreign Licenses

The positive and highly significant coefficient of the foreign license dummy is consistent with the thesis that in Brazil license agreements with overseas firms are a prerequisite for, rather than an obstacle to, export success. The estimated coefficient varies from 0.7 to 0.9 depending on the specifications of the other variables, which implies that exports of resident-owned firms with licenses are two to two-and-a-half times greater than exports of similar firms operating without licensed technology or trademarks.

#### j) Foreign Ownership

The coefficient of the foreign ownership dummy is similarly positive and highly significant. It is interesting to note that its magnitude differs little from that of the dummy for license agreements. It would thus appear to make no difference in terms

of export performance whether foreign firms transfer their technology and trademarks through licensing arrangements or through direct investment in Brazilian companies.

## APPENDICES

### A. INDUSTRIAL CONCENTRATION

The complete data base for this report consists of 15,041 firms, which represent nearly 6% of the total number of active manufacturing firms in 1978. Exporting firms total 3,562, or roughly two-thirds of the total number of exporters in the manufacturing sector. Those firms which registered virtually no domestic sales were deleted, reducing the sample by 107 to 14,934 firms. Each firm has been allocated to the industry which accounts for the largest proportion of its sales.

It should be emphasized that this is not a stratified sample, for small firms are under-represented. Individual firms are not, of course, identified, and to insure confidentiality four-digit industries with fewer than six firms were not included in the data base. For 179 industries, data are included for all firms with reported 1978 sales in excess of two million cruzeiros or exports greater than one million cruzeiros, i.e. approximately 100 and 50 thousand dollars, respectively.

Table A-1 shows the distribution by industry of the entire sample and the 3,455 exporters. This table reveals the extraordinary diversity of Brazilian exports: all but nine of the 179 four-digit industries registered exports in 1978.

The data have been used to calculate indices of market concentration for each of the 179 industries. This repeats the earlier work of Braga and Mascolo (1982) with two important modifications. First, many firms have a fiscal year which does not coincide with the calendar year. The cruzeiro values of sales for these firms have been inflated by the industrial wholesale price index in order to make the statistics more comparable. Secondly, exports have been deleted from total sales in order to calculate indices of concentration in the domestic market. It has not been possible to take competing imports into account, but these are of minor importance in most industries.

Table A-2 reports the Herfindahl indices of concentration for domestic sales, exports and total sales in each industry. This index is defined as the sum of the squares of market shares, so takes a value between one (a single seller) and zero. As is to be expected, export sales tend to be much more concentrated than domestic sales; in only 13 industries is the index for export sales smaller than that for domestic sales. Most surprisingly, however, in 73 industries total sales are actually less concentrated than domestic sales. This is strong evidence that the largest exporters are not, in general, the largest sellers in the domestic market.

Table A-1

## Distribution of Firms in the Complete Data Base by Industry

<u>Code</u>	<u>Number of Firms</u>	<u>Total Exporters</u>	<u>Description</u>
	14 934	3 455	----TOTAL-----
			NON-METALLIC MINERALS
1010	36	8	Stone, marble, granite
1011	23		Crushed rock
1020	24		Limestone
1030	86	1	Brick
1040	100	40	Ceramics
1050	47	5	Cement
1060	117	11	Cement products
1070	55	21	Glass
1080	42	8	Processed non-metallic minerals
1099	41	9	Other non-metallic minerals
			BASIC IRON AND STEEL
1101	30	27	Pig iron
1102	6	3	Primary iron and steel
1103	12	9	Primary iron alloys
1104	45	23	Steel plate, including alloys
1105	33	13	Iron and steel pipe and tubes
1106	88	23	Forged steel
1107	27	8	Steel wire
1109	17	3	Plated steel
			BASIC NON-FERROUS METALS
1111	48	12	Primary non-ferrous metals
1112	13	3	Primary non-ferrous alloys
1113	18	6	Non-ferrous metal plates
1114	7	1	Pipe and tubes of non-ferrous metals
1115	59	8	Forgings of non-ferrous metals
1116	6	1	Non-ferrous metal wire
1117	7	1	Plated non-ferrous metals
1118	10	5	Solder and anodes
1119	7	2	Precious metals
			METAL PRODUCTS
1120	18	8	Metallurgy of powders
1130	81	14	Metallic structures
1140	112	27	Products made of metal bars
1150	101	17	Metal stampings
1160	169	22	Tanks and boilers
1170	80	42	Cutlery, arms, hand tools, etc.
1180	31	1	Metal-working, galvanizing
1199	447	129	Other metal products n.e.s.



<u>Code</u>	<u>Number_of_Firms</u>		<u>Description</u>
		<u>Total Exporters</u>	
			MACHINERY
1210	22	8	Non-electrical industrial motors
1220	189	78	Heating and plumbing equipment
1231	154	75	Machine tools
1232	118	23	Parts and accessories for ind. machinery
1240	140	66	Agricultural machinery
1251	186	93	Elevators and other commercial machinery
1253	6	4	Office machinery, including electrical
1254	20	9	Domestic appliances
1260	10	2	Clocks and watches
1270	26	16	Tractors and earth-moving equipment
1280	21	2	Machinery and equipment repair
1299	219	103	Other machinery and equipment n.e.c.
			ELECTRICAL EQUIPMENT
1310	63	35	Electrical generating equipment
1320	105	40	Electrical material
1330	6	2	Lighting
1340	36	20	Electrical material for motor vehicles
1351	48	17	Electrical equipment for domestic use
1352	113	60	Electrical equip for commerce and ind.
1353	6	2	Electrical equip. for technical uses
1370	81	26	Electronic equipment
1380	87	32	Communications equipment
1390	10	1	Electrical equipment repair
			TRANSPORT EQUIPMENT
1411	29	9	Shipbuilding
1413	11	1	Ship repair
1421	8	7	Railway vehicles
1432	17	15	Automobiles
1433	248	122	Automobile parts, except rubber, elec.
1434	19	3	Rebuilding of automobile engines
1440	61	19	Automobile bodies, except chassis
1450	22	10	Bicycles and motorcycles
1472	10	1	Aircraft repair
1480	14	4	Other vehicles
1490	12	1	Automotive upholstery
			WOOD
1510	301	68	Lumber
1520	89	8	Wood structures
1530	65	33	Plywood and particleboard
1550	103	18	Other wood articles, except furniture
			FURNITURE
1610	343	57	Wood furniture
1620	71	16	Metal furniture
1630	37	5	Mattresses
1699	41	6	Other furniture n.e.c. except plastic

<u>Code</u>	<u>Number_of_Firms</u>		<u>Description</u>
	<u>Total</u>	<u>Exporters</u>	
			<b>PULP AND PAPER</b>
1710	34	4	Pulp
1720	217	44	Paper and cardboard
1730	335	28	Paper articles
1740	259	9	Cardboard articles
1790	9	1	Articles of pressed fibers
			<b>RUBBER</b>
1810	28		Natural rubber
1821	33	8	Tires and tubes
1823	294	1	Tire re-treading
1830	40	7	Rubber hose and sheets
1840	22	4	Foam rubber, except mattresses
1899	268	37	Other rubber articles except clothing or footwear
			<b>LEATHER</b>
1910	278	93	Leather tanning
1911	7	3	Leather finishing
1930	97	11	Luggage
1999	250	25	Other leather goods except clothing or footwear
			<b>CHEMICALS</b>
2000	91	36	Organic and inorganic chemicals n.e.c.
2011	20	3	Petroleum fuels and oils
2012	26	10	Basic petrochemicals
2017	11	3	Grease, other petroleum derivatives
2020	27	8	Synthetic fibers
2031	8	4	Explosives
2040	63	40	Essential oils
2050	13	5	Concentrated flavors and aromas
2060	51	15	Insecticides, disinfectants, cleansers
2070	103	28	Paint and varnish
2080	62	4	Fertilizers
2099	169	44	Other chemical products n.e.c.
			<b>PHARMACEUTICAL</b>
2110	408	58	Pharmaceutical products
			<b>PERFUMES AND SOAPS</b>
2210	155	13	Perfumes
2220	180	13	Soap and detergents
2230	58	2	Candles
			<b>PLASTICS</b>
2310	21	6	Plastic sheets
2320	73	20	Plastic articles for industrial use
2330	43	10	Plastic articles for domestic use, except luggage, shoes or clothing
2340	14	4	Plastic furniture
2350	127	15	Plastic packaging

Code	Number_of_Firms		Description
	Total	Exporters	
2360	19	9	Plastic pipe and fittings
2399	127	21	Other plastic articles n.e.c.
TEXTILES			
2410	148	34	Textile fibers
2420	484	232	Knits and woven fabrics
2430	141	47	Stretch knits, elastic
2440	35	14	Pleating, embroidery, ribbons
2450	23	12	Special textiles
2460	44	10	Finished cloth and yarn
2499	49	30	Other textile products n.e.c.
CLOTHING AND FOOTWEAR			
2510	568	78	Clothing
2520	9	3	Hats
2530	275	136	Footwear
2540	55	18	Clothing accessories
2599	38	6	Other fabric articles n.e.c.
PROCESSED FOOD			
2601	431	15	Coffee and grain processing plants
2602	64	5	Flour mills
2603	180	1	Coffee roasting and grinding
2604	7	7	Instant coffee and tea
2605	30	4	Maize products, except oils
2606	16	1	Cassava products
2609	78	37	Other grain mill products
2610	67	23	Preserved fruits and vegetables
2620	207	44	Meatpacking plants
2621	73	9	Meat products from meatpacking plants
2622	25		Sausage and meat products not produced in meatpacking plants
2629	8		Meat products n.e.c.
2630	43	24	Fish and fish products
2640	122	9	Dairy products, except ice cream
2651	171	45	Sugar
2652	12	4	Refined sugar
2660	54	23	Chocolates and candies
2670	129		Bakeries
2680	101	8	Macaroni, spaghetti and noodles
2691	72	51	Vegetable oils and lard
2692	11	3	Ice cream
2693	11	1	Salt
2694	9		Baking powder and yeast
2698	51	3	Prepared animal feeds
2699	66	21	Other food products, n.e.c.

<u>Code</u>	<u>Number_of_Firms</u>		<u>Description</u>
	<u>Total</u>	<u>Exporters</u>	
			BEVERAGES
2710	147	6	Wine
2720	365	15	Distilled liquor
2730	28	3	Beer and malt beverages
2741	225	7	Non-alcoholic beverages
2742	38		Mineral water
2750	24	1	Alcohol distillation
			TOBACCO
2810	34	8	Tobacco
2820	8	5	Cigarettes
2830	7	2	Cigars
2899	22	9	Other tobacco products
			PRINTING AND PUBLISHING
2910	167	19	Newspapers, magazines and books
2920	187	8	Commercial printing
2999	85	1	Other printing n.e.c.
			OTHER MANUFACTURES
3000	27	10	Technical and scientific instruments
3011	7	1	Artificial limbs, wheelchairs
3012	36	17	Surgical and dental supplies
3021	8	2	Photographic equipment
3023	29	9	Optical instruments
3031	15	9	Lapidary work
3032	32	5	Jewelry
3033	17	4	Costume jewelry
3041	6	4	Musical instruments
3042	15	4	Phonograph records
3050	20	5	Brooms and brushes
3060	20		Moving pictures
3070	21	6	Toys
3080	11	6	Sporting and athletic goods
3099	176	56	Other manufactured goods n.e.c.

Source: 1978 data base.

n.e.c. = not elsewhere classified.

Table A-2

## Concentration Indices for Brazilian Industries, 1978.

Industry	Herfindahl Indices		
	Domestic Sales	Exports	Total Sales
NON-METALLIC MINERALS			
1010	.0653	.3086	.0601
1011	.1844	...	.1844
1020	.1759	...	.1759
1030	.1661	1.0000	.1660
1040	.0254	.0981	.0253
1050	.0555	.7932	.0550
1060	.1082	.2518	.1065
1070	.1209	.2158	.1190
1080	.0648	.2621	.0664
1099	.1672	.7821	.1952
BASIC IRON AND STEEL			
1101	.0991	.2280	.1176
1102	.6660	.5132	.6158
1103	.1143	.1742	.1107
1104	.1479	.1936	.1480
1105	.2157	.1939	.2050
1106	.0695	.4390	.0732
1107	.1842	.4174	.1882
1109	.2359	.5439	.2365
BASIC NON-FERROUS METALS			
1111	.1283	.2347	.1230
1112	.2478	.9761	.2338
1113	.2621	.5198	.2609
1114	.3155	1.0000	.3154
1115	.1175	.3951	.1190
1116	.6378	1.0000	.6382
1117	.3075	1.0000	.3076
1118	.2248	.4292	.2400
1119	.2111	.9485	.2135
METAL PRODUCTS			
1120	.1136	.2243	.1123
1130	.0889	.5422	.1018
1140	.0465	.2310	.0473
1150	.0573	.1623	.0571
1160	.0788	.1181	.0764
1170	.0481	.0789	.0465
1180	.0712	1.0000	.0712
1199	.0110	.0300	.0110

<u>Industry</u>	<u>Herfindahl Indices</u>		
	<u>Domestic Sales</u>	<u>Exports</u>	<u>Total Sales</u>
<b>MACHINERY</b>			
1210	.2492	.3703	.2523
1220	.0170	.1420	.0167
1231	.0303	.1048	.0313
1232	.0358	.3711	.0375
1240	.0900	.2676	.1026
1251	.0269	.0887	.0264
1253	.4391	.4134	.4336
1254	.1729	.2714	.1679
1260	.2058	.9870	.2122
1270	.1246	.2500	.1332
1280	.3225	.7219	.3214
1299	.0202	.0871	.0222
<b>ELECTRICAL EQUIPMENT</b>			
1310	.1382	.1118	.1291
1320	.0281	.0995	.0279
1330	.4266	.7787	.4358
1340	.2450	.5798	.2556
1351	.1689	.7010	.1752
1352	.1230	.3312	.1358
1353	.2940	.8373	.3023
1370	.0906	.2870	.0897
1380	.0870	.2387	.0837
1390	.3377	1.0000	.3371
<b>TRANSPORT EQUIPMENT</b>			
1411	.1761	.3146	.1700
1413	.3450	1.0000	.3607
1421	.2393	.4209	.2465
1432	.1971	.1677	.1888
1433	.0212	.0728	.0219
1434	.0890	.7065	.0900
1440	.0536	.3993	.0615
1450	.1527	.4821	.1563
1472	.2472	1.0000	.2265
1480	.2405	.5640	.2268
1490	.2649	1.0000	.2647
<b>WOOD</b>			
1510	.0112	.0412	.0122
1520	.0322	.4797	.0335
1530	.1017	.1851	.1078
1550	.0243	.1065	.0242
<b>FURNITURE</b>			
1610	.0079	.1634	.0082
1620	.0401	.1445	.0400
1630	.1299	.3541	.1309
1699	.1024	.9094	.1278

Industry	Herfindahl Indices		
	Domestic Sales	Exports	Total Sales
PULP AND PAPER			
1710	.5113	.5175	.3521
1720	.0260	.1888	.0279
1730	.0374	.6219	.0373
1740	.0188	.4354	.0188
1790	.1965	1.0000	.1962
RUBBER			
1810	.1054	...	.1054
1821	.3044	.3945	.3081
1823	.0101	1.0000	.0100
1830	.1055	.1965	.1053
1840	.1231	.3613	.1230
1899	.0249	.2989	.0246
LEATHER			
1910	.0224	.0525	.0245
1911	.3825	.4018	.3729
1930	.0678	.2176	.0640
1999	.0397	.1542	.0437
CHEMICALS			
2000	.0705	.1592	.0661
2011	.9469	.9953	.9485
2012	.1092	.2026	.1079
2017	.6404	.6631	.6398
2020	.1317	.4340	.1326
2031	.2528	.3649	.2557
2040	.0473	.1680	.0700
2050	.3409	.3238	.2837
2060	.0724	.1895	.0723
2070	.0532	.4663	.0528
2080	.0655	.4015	.0655
2099	.0555	.1434	.0535
PHARMACEUTICAL			
2110	.0359	.0871	.0362
PERFUMES AND SOAPS			
2210	.0885	.2585	.0885
2220	.2390	.3740	.2368
2230	.0626	.9940	.0638
PLASTICS			
2310	.2077	.3807	.2094
2320	.0430	.3996	.0430
2330	.1102	.2539	.1106
2340	.1441	.3770	.1447
2350	.0253	.5242	.0252
2360	.1972	.5551	.1992
2399	.0360	.0920	.0360

Industry	Herfindahl Indices		
	Domestic Sales	Exports	Total Sales
TEXTILES			
2410	.0158	.3118	.0172
2420	.0237	.0205	.0210
2430	.0401	.1400	.0422
2440	.0895	.5318	.0964
2450	.1770	.8174	.2481
2460	.0804	.2942	.0871
2499	.1062	.3060	.1134
CLOTHING			
2510	.0102	.0905	.0101
2520	.2457	.5128	.2433
2540	.0416	.2331	.0377
2599	.0535	.5223	.0546
FOOTWEAR			
2530	.0138	.0267	.0119
PROCESSED FOOD			
2601	.0069	.4153	.0082
2602	.0418	.9179	.0433
2603	.0185	1.0000	.0183
2604	.2238	.2097	.2009
2605	.5129	.3634	.4971
2606	.1045	1.0000	.1042
2609	.2872	.2112	.2289
2610	.1667	.1788	.1650
2620	.0152	.1066	.0161
2621	.0678	.2698	.0757
2622	.0145	...	.0145
2629	.2002	...	.2002
2630	.0655	.1607	.0580
2640	.1413	.7779	.1292
2651	.0115	.0658	.0108
2652	.2794	.5512	.2536
2660	.0614	.2886	.0643
2670	.0761	...	.0761
2680	.0404	.7484	.0404
2691	.0644	.0746	.0561
2692	.8191	.7244	.8033
2693	.1662	1.0000	.1590
2694	.2039	...	.2039
2698	.1032	.6242	.1031
2699	.0453	.3145	.0895
BEVERAGES			
2710	.0404	.3155	.0404
2720	.0398	.1238	.0397
2730	.1577	.5133	.1586
2741	.0498	.4643	.0516
2742	.1570	...	.1570
2750	.1812	1.0000	.2064



Industry	Herfindahl Indices		
	Domestic Sales	Exports	Total Sales
TOBACCO			
2810	.1891	.3094	.2514
2820	.5837	.8051	.5987
2830	.6200	.5159	.5917
2899	.1475	.2193	.1623
PRINTING			
2910	.0491	.3148	.0494
2920	.0218	.9276	.0228
2999	.0359	1.0000	.0360
OTHER MANUFACTURES			
3000	.1106	.3524	.1106
3011	.8402	1.0000	.8465
3012	.0816	.2610	.0857
3021	.8550	.9766	.8683
3023	.0689	.4601	.0752
3031	.3964	.2093	.1686
3032	.1521	.3590	.1533
3033	.1962	.7329	.1895
3041	.2614	.4350	.2670
3042	.2523	.8865	.2670
3050	.2261	.3942	.2293
3060	.1715	...	.1715
3070	.3906	.7516	.4042
3080	.1469	.3334	.1460
3099	.0226	.4567	.0385

Source: 1978 data base.

## B. STATISTICAL APPENDIX TO CHAPTER III

Table B-1

### Definition of Subsectors

<u>Subsector</u>	<u>Industry Codes</u>
Non-metallic minerals	10
Basic iron and steel	110
Basic non-ferrous	111
Metal products	112-119
Machinery	12
Electrical equipment	13
Transport equipment	14
Wood	15
Furniture	16
Pulp and paper	17
Rubber products	18
Leather	19
Chemicals	20
Pharmaceutical, soaps, cosmetics	21-22
Plastics	23
Textiles	24
Clothing	251-252, 254-259
Footwear	253
Food and tobacco	26-28
Printing	29
Other manufactures	30

Table B-2

Spearman Rank Correlation Coefficients between Volume of Exports  
and Rate of Fiscal Subsidy, by Industry

Industry	Number of Firms	Rank Correlation between Exports and		
		Total Subsidy(S)	Export Credit(S1)	Income Tax Exemption(S2)
TOTAL	3 345	.202	.195	.176
NON-METALLIC MINERALS				
1010	8	NS	NS	NS
1040	40	.481	.358	.330
1050	5	NS	NS	NS
1060	11	NS	NS	NS
1070	21	.579	.472	.541
1080	8	NS	NS	NS
1099	9	NS	NS	NS
BASIC IRON AND STEEL				
1101	27	NS	NS	NS
1102	3	NS	NS	NS
1103	9	NS	NS	NS
1104	23	NS	NS	NS
1105	13	NS	NS	NS
1106	23	.591	.615	NS
1107	7	NS	NS	NS
1109	3	NS	NS	NS
BASIC NON-FERROUS METALS				
1111	12	NS	NS	NS
1112	3	NS	NS	NS
1113	6	NS	NS	NS
1114-1117	11	NS	NS	NS
1118-1119	7	NS	NS	NS
METAL PRODUCTS				
1120	8	NS	NS	NS
1130	14	NS	NS	NS
1140	27	NS	NS	NS
1150	17	.536	.521	.504
1160	22	NS	NS	NS
1170	42	.542	.549	.528
1180, 1199	130	.182	NS	.185
MACHINERY				
1210	8	.738	NS	NS
1220	77	.304	NS	.376
1231	74	NS	NS	NS
1232	23	.460	.432	.510
1240	66	.405	.411	NS
1251	93	NS	NS	NS

Industry	Number of Firms	Rank Correlation between Exports and		
		Total Subsidy(S)	Export Credit(S1)	Income Tax Exemption(S2)
1253	4	NS	NS	NS
1254, 1260	11	.615	.597	.861
1270	16	NS	NS	NS
1280, 1299	103	.195	.251	NS
ELECTRICAL EQUIPMENT				
1310	35	NS	.335	NS
1320, 1330	41	NS	NS	NS
1340	20	NS	NS	NS
1351	17	NS	NS	NS
1352-1353	62	.294	NS	NS
1370	25	.433	NS	.425
1380	32	NS	NS	NS
TRANSPORT EQUIPMENT				
1411	9	NS	NS	NS
1421	7	NS	NS	NS
1432	15	NS	.618	NS
1433	122	.452	.326	.445
1434	3	NS	NS	NS
1440	19	NS	NS	NS
1450	9	NS	NS	NS
WOOD				
1510	65	.406	NS	.482
1520	7	NS	NS	NS
1530	33	NS	NS	NS
1550	17	NS	NS	NS
FURNITURE				
1610	57	NS	NS	NS
1620	16	NS	NS	.634
1630	5	NS	NS	NS
1699	6	NS	.880	NS
PULP AND PAPER				
1710	4	NS	NS	NS
1720	44	.312	.397	NS
1730	27	.382	.491	NS
1740, 1790	10	NS	NS	NS
RUBBER PRODUCTS				
1821	8	NS	NS	NS
1830	7	NS	NS	NS
1840	4	NS	NS	NS
1899	35	.349	NS	.346
LEATHER				
1910-1911	94	.381	.455	NS
1930	11	NS	NS	NS
1999	24	.617	.489	.489

Industry	Number of Firms	Rank Correlation between Exports and		
		Total Subsidy(S)	Export Credit(S1)	Income Tax Exemption(S2)
<b>CHEMICALS</b>				
2000	36	NS	NS	NS
2011	3	NS	NS	NS
2012	10	NS	NS	NS
2017	3	NS	NS	NS
2020	8	NS	NS	NS
2031	4	NS	NS	NS
2040	39	NS	NS	.373
2050	5	NS	NS	NS
2060	15	NS	NS	.600
2070	28	.453	NS	.620
2080	3	NS	NS	NS
2099	43	.344	NS	.405
<b>PHARMACEUTICAL, COSMETICS AND SOAPS</b>				
2110	58	.386	.379	.349
2210	13	NS	NS	NS
2220, 2230	15	NS	NS	NS
<b>PLASTICS</b>				
2310	6	NS	NS	NS
2320	20	NS	NS	NS
2330	10	.784	NS	.725
2340	4	NS	NS	NS
2350	14	NS	NS	NS
2360	9	NS	NS	NS
2399	21	NS	NS	NS
<b>TEXTILES</b>				
2410	32	NS	NS	.403
2420	232	.228	.165	.199
2430	47	NS	NS	NS
2440	14	NS	NS	NS
2450	12	NS	NS	NS
2460	10	NS	NS	NS
2499	30	NS	NS	NS
<b>CLOTHING</b>				
2510, 2520	80	NS	NS	.380
2540	18	.543	.491	.702
2599	6	NS	NS	NS
<b>FOOTWEAR</b>				
2530	136	.538	.377	.314
<b>FOOD</b>				
2601	8	NS	NS	NS
2602	4	NS	.949	NS
2603, 2604	8	.833	NS	.810
2605, 2606	5	NS	NS	NS
2609	35	NS	NS	NS

<u>Industry</u>	<u>Number of Firms</u>	<u>Rank Correlation between Exports and</u>		
		<u>Total Subsidy(S)</u>	<u>Export Credit(S1)</u>	<u>Income Tax Exemption(S2)</u>
2610	22	.562	.532	NS
2620	32	.401	.401	NS
2621	9	NS	NS	NS
2630	19	NS	NS	NS
2640	9	NS	NS	NS
2651, 2652	36	NS	NS	NS
2660	23	.486	.482	.477
2680	6	NS	NS	NS
2691	51	NS	NS	.411
2692	3	NS	NS	NS
2698	3	NS	NS	NS
2699	19	NS	NS	.602
BEVERAGES				
2710	6	NS	NS	NS
2720	15	NS	NS	NS
2730	3	NS	NS	NS
2741	6	NS	NS	NS
TOBACCO				
2810, 2820, 2830, 2899	10	NS	NS	NS
PRINTING				
2910	8	NS	NS	NS
2920, 2999	9	NS	.785	NS
OTHER MANUFACTURES				
3000	10	NS	NS	NS
3011-3012	18	NS	.524	NS
3021, 3023	11	NS	NS	NS
3031	9	NS	NS	NS
3032	5	NS	NS	NS
3033	4	NS	NS	NS
3041	4	NS	NS	NS
3042	4	NS	NS	1.000
3050	5	NS	NS	NS
3070	6	NS	NS	NS
3080	6	.943	.812	NS
3099	56	NS	NS	.366

Note: NS = not significantly different from zero at the five per cent level of confidence in a two-tailed test.

S1 = ratio of export credit (credito premio) to subsidy-inclusive export revenue.

S2 = ratio of subsidy equivalent of the income tax reduction to subsidy-inclusive export revenue.

S = S1 + S2.

Source: 1978 data base.

C. STATISTICAL APPENDIX TO CHAPTER IV

Table C-1

Mean Values by Subsector of Variables in Logit Regression

	lnS	lnK	ADV	lnHK	lnPHK
TOTAL	16.984	12.154	0.007	10.959	11.560
nonexporters	16.418	12.077	0.006	10.868	11.448
exporters	18.521	12.365	0.010	11.207	11.864
Non-metallic minerals	17.288	12.070	0.006	10.936	11.471
nonexporters	16.812	12.018	0.005	10.875	11.374
exporters	18.638	12.216	0.010	11.111	11.744
Basic iron and steel	18.258	12.287	0.004	11.218	11.440
nonexporters	17.565	12.185	0.002	11.170	11.113
exporters	19.208	12.426	0.007	11.282	11.885
Basic non-ferrous	17.546	12.351	0.004	11.146	11.849
nonexporters	17.067	12.287	0.003	11.065	11.763
exporters	19.108	12.562	0.005	11.408	12.129
Metal products	17.061	12.170	0.005	11.067	11.581
nonexporters	16.575	12.125	0.004	10.997	11.508
exporters	18.448	12.297	0.008	11.267	11.787
Machinery	17.414	12.516	0.009	11.451	11.840
nonexporters	16.677	12.474	0.007	11.357	11.713
exporters	18.303	12.566	0.011	11.564	11.992
Electrical equipment	17.814	12.389	0.009	11.270	11.782
nonexporters	17.068	12.356	0.008	11.190	11.699
exporters	18.749	12.431	0.011	11.370	11.886
Transport equipment	18.056	12.265	0.006	11.261	11.627
nonexporters	17.181	12.187	0.005	11.182	11.535
exporters	18.946	12.343	0.007	11.342	11.721
Wood	16.439	11.864	0.003	10.590	11.327
nonexporters	15.967	11.804	0.002	10.555	11.232
exporters	18.008	12.065	0.006	10.708	11.640
Furniture	16.505	11.843	0.007	10.741	11.319
nonexporters	16.195	11.794	0.006	10.703	11.250
exporters	17.970	12.074	0.011	10.919	11.644
Pulp and paper	16.229	11.873	0.003	10.749	11.220
nonexporters	15.941	11.807	0.002	10.683	11.131
exporters	18.678	12.436	0.005	11.306	11.971
Rubber products	15.807	12.016	0.005	10.798	11.379
nonexporters	15.381	11.971	0.005	10.727	11.302
exporters	18.260	12.275	0.004	11.209	11.815

	InS	InK	ADV	InHK	InPHK
Leather	15.483	11.683	0.004	10.478	10.478
nonexporters	14.874	11.595	0.002	10.402	10.402
exporters	17.678	11.999	0.013	10.753	10.753
Chemicals	18.071	12.951	0.007	11.510	12.474
nonexporters	17.690	12.909	0.006	11.467	12.406
exporters	18.815	13.033	0.008	11.593	12.607
Pharmaceutical, cosmetics	16.034	12.182	0.021	10.851	11.601
nonexporters	15.678	12.119	0.019	10.758	11.519
exporters	18.741	12.660	0.033	11.552	12.223
Plastics	17.245	12.144	0.005	10.985	11.534
nonexporters	16.949	12.079	0.004	10.936	11.445
exporters	18.418	12.402	0.008	11.179	11.891
Textiles	17.829	12.129	0.003	10.897	11.609
nonexporters	17.179	12.077	0.002	10.843	11.490
exporters	18.661	12.196	0.004	10.965	11.761
Clothing	16.598	11.895	0.006	10.713	11.312
nonexporters	16.348	11.881	0.004	10.684	11.291
exporters	17.881	11.970	0.011	10.860	11.420
Footwear	17.020	11.594	0.007	10.637	10.994
nonexporters	16.255	11.646	0.004	10.626	11.013
exporters	17.785	11.542	0.010	10.649	10.974
Food and tobacco	17.103	12.175	0.009	10.827	11.554
nonexporters	16.622	12.082	0.008	10.751	11.416
exporters	19.103	12.560	0.014	11.145	12.128
Printing	16.488	12.185	0.004	11.146	11.617
nonexporters	16.336	12.162	0.004	11.120	11.589
exporters	19.013	12.580	0.010	11.582	12.069
Other manufactures	16.911	12.380	0.012	11.084	11.889
nonexporters	16.229	12.360	0.009	11.033	11.871
exporters	18.118	12.414	0.018	11.175	11.921

Source: 1978 data base.



Table C-2

Estimated Regression Coefficients of the Subsector  
Dummy Variables

Subsector	Regression Model			
	02	03	05	06
Non-metallic minerals	-4.167 (0.306)	-14.500 (1.472)	-3.953 (0.304)	-14.841 (1.538)
Basic iron and steel	-3.690 (0.315)	-14.006 (1.465)	-3.404 (0.314)	-14.346 (1.538)
Basic non-ferrous	-4.227 (0.347)	-14.462 (1.523)	-4.019 (0.346)	-14.840 (1.593)
Metal products	-3.843 (0.287)	-14.062 (1.425)	-3.577 (0.285)	-14.406 (1.499)
Machinery	-2.825 (0.287)	-13.122 (1.405)	-2.487 (0.287)	-13.450 (1.488)
Electrical equipment	-3.328 (0.296)	-13.629 (1.424)	-3.067 (0.294)	-13.962 (1.498)
Transport equipment	-3.248 (0.302)	-13.480 (1.428)	-2.893 (0.302)	-13.784 (1.507)
Wood	-3.690 (0.292)	-13.607 (1.406)	-3.626 (0.288)	-13.983 (1.464)
Furniture	-4.207 (0.299)	-14.215 (1.428)	-4.013 (0.297)	-14.562 (1.493)
Pulp and paper	-4.777 (0.299)	-14.783 (1.462)	-4.496 (0.297)	-15.097 (1.535)
Rubber products	-3.935 (0.318)	-13.883 (1.456)	-3.722 (0.316)	-14.224 (1.526)
Leather	-3.229 (0.285)	-12.814 (1.363)	-3.092 (0.282)	-13.176 (1.427)
Chemicals	-3.624 (0.310)	-14.400 (1.490)	-3.597 (0.304)	-14.797 (1.551)
Pharmaceutical, cosmetics	-4.668 (0.309)	-15.117 (1.508)	-4.529 (0.304)	-15.477 (1.575)
Plastics	-4.294 (0.306)	-14.549 (1.460)	-4.091 (0.304)	-14.888 (1.526)
Textiles	-3.412 (0.286)	-13.586 (1.413)	-3.280 (0.282)	-13.959 (1.476)
Clothing	-4.347 (0.293)	-14.406 (1.426)	-4.153 (0.290)	-14.743 (1.492)
Footwear	-2.928 (0.298)		-2.609 (0.297)	
Food and tobacco	-4.480 (0.286)	-14.935 (1.471)	-4.438 (0.281)	-15.330 (1.531)
Printing	-5.433 (0.384)	-15.535 (1.628)	-5.101 (0.383)	-15.867 (1.699)
Other manufactures	-3.070 (0.303)	-13.307 (1.426)	-2.936 (0.299)	-13.688 (1.491)

Note: The statistics in parentheses are the asymptotic standard errors of the coefficients. All coefficients are significantly different from zero at the .01 level of confidence.

A. STATISTICAL APPENDIX TO CHAPTER V

Table D-1

Concentration Indices, Implicit Tariff Protection and Industry Dummies (variables H, T and D1-D139)

<u>Industry</u>	<u>Number of Exporters</u>	<u>Herfindahl Index</u>	<u>Implicit Tariff (%)</u>	<u>Industry Dummy</u>
NON-METALLIC MINERALS				
1010	8	.0653	-15.5	D1
1040	40	.0254	-27.5	D2
1050	5	.0555	-34.1	D3
1060	11	.1082	-34.1	D4
1070	21	.1209	19.5	D5
1080	8	.0648	-27.5	D6
1099	9	.1672	-27.5	D7
BASIC IRON AND STEEL				
1101	27	.0991	-32.9	D8
1102	3	.6660	-8.9	D9
1103	9	.1143	-8.9	D10
1104	23	.1479	-9.9	D11
1105	13	.2157	-22.2	D12
1106	23	.0695	31.3	D13
1107	7	.1842	-16.4	D14
1109	3	.2359	15.7	D15
BASIC NON-FERROUS METALS				
1111	12	.1283	-16.5	D16
1112	3	.2478	-16.5	D17
1113	6	.2621	-16.5	D18
1114	1	.3155	-16.5	D19
1115	8	.1175	-16.5	D19
1116	1	.6378	-16.5	D19
1117	1	.3075	-16.5	D19
1118	5	.2248	-16.5	D20
1119	2	.2111	-16.5	D20
METAL PRODUCTS				
1120	8	.1136	-16.5	D21
1130	14	.0889	15.7	D22
1140	27	.0465	15.7	D23
1150	17	.0573	15.7	D24
1160	22	.0788	15.7	D25
1170	42	.0481	15.7	D26
1180	1	.0712	15.7	D27
1199	129	.0110	15.7	D27

<u>Industry</u>	<u>Number of Exporters</u>	<u>Herfindahl Index</u>	<u>Implicit Tariff (%)</u>	<u>Industry Dummy</u>
<b>MACHINERY</b>				
1210	8	.2492	17.1	D28
1220	77	.0170	29.5	D29
1231	74	.0303	65.1	D30
1232	23	.0358	65.1	D31
1240	66	.0900	-18.3	D32
1251	93	.0269	29.5	D33
1253	4	.4391	-18.3	D34
1254	9	.1729	-5.8	D35
1260	2	.2058	-5.8	D35
1270	16	.1246	-47.8	D36
1280	2	.3225	29.5	D37
1299	101	.0202	29.5	D37
<b>ELECTRICAL EQUIPMENT</b>				
1310	35	.1382	-11.3	D38
1320	39	.0281	52.9	D39
1330	2	.4266	52.9	D39
1340	20	.2450	52.9	D40
1351	17	.1689	34.7	D41
1352	60	.1230	34.7	D42
1353	2	.2940	34.7	D42
1370	25	.0906	96.4	D43
1380	32	.0870	63.2	D44
<b>TRANSPORT EQUIPMENT</b>				
1411	9	.1761	19.6	D45
1421	7	.2393	-6.4	D46
1432	15	.1971	-6.4	D47
1433	122	.0212	-23.2	D48
1434	3	.0890	-15.5	D49
1440	19	.0536	-15.5	D50
1450	9	.1527	-15.5	D51
<b>WOOD</b>				
1510	65	.0112	33.6	D52
1520	7	.0322	-8.9	D53
1530	33	.1017	33.6	D54
1550	17	.0243	-23.1	D55
<b>FURNITURE</b>				
1610	57	.0079	20.0	D56
1620	16	.0401	20.0	D57
1630	5	.1299	20.0	D58
1699	6	.1024	20.0	D59
<b>PULP AND PAPER</b>				
1710	4	.5113	-37.7	D60
1720	44	.0260	-9.0	D61
1730	27	.0374	-32.4	D62
1740	9	.0188	-32.4	D63
1790	1	.1965	-32.4	D63

<u>Industry</u>	<u>Number of Exporters</u>	<u>Herfindahl Index</u>	<u>Implicit Tariff (%)</u>	<u>Industry Dummy</u>
RUBBER PRODUCTS				
1821	8	.3044	-20.9	D64
1830	7	.1055	-28.2	D65
1840	4	.1231	-28.2	D66
1899	35	.0249	-28.2	D67
LEATHER				
1910	92	.0224	10.0	D68
1911	2	.3825	10.0	D68
1930	11	.0678	10.0	D69
1999	24	.0397	10.0	D70
CHEMICALS				
2000	36	.0705	55.1	D71
2011	3	.9469	0.0	D72
2012	10	.1092	24.9	D73
2017	3	.6404	11.9	D74
2020	8	.1317	63.6	D75
2031	4	.2528	84.4	D76
2040	39	.0473	-46.5	D77
2050	5	.3409	84.4	D78
2060	15	.0724	84.4	D79
2070	28	.0532	42.1	D80
2080	3	.0655	17.8	D81
2099	43	.0555	84.4	D82
PHARMACEUTICAL, COSMETICS AND SOAPS				
2110	58	.0359	79.0	D83
2210	13	.0885	28.5	D84
2220	13	.2390	28.5	D85
2230	2	.0626	28.5	D85
PLASTICS				
2310	6	.2077	14.3	D86
2320	20	.0430	14.3	D87
2330	10	.1102	14.3	D88
2340	4	.1441	14.3	D89
2350	14	.0253	14.3	D90
2360	9	.1972	14.3	D91
2399	21	.0360	14.3	D92
TEXTILES				
2410	32	.0158	-5.0	D93
2420	232	.0237	12.9	D94
2430	47	.0401	26.0	D95
2440	14	.0895	26.0	D96
2450	12	.1770	30.0	D97
2460	10	.0804	35.0	D98
2499	30	.1062	26.0	D99

<u>Industry</u>	<u>Number of Exporters</u>	<u>Herfindahl Index</u>	<u>Implicit Tariff (%)</u>	<u>Industry Dummy</u>
<b>CLOTHING</b>				
2510	77	.0102	23.1	D100
2520	3	.2457	23.1	D100
2540	18	.0416	23.1	D102
2599	6	.0535	23.1	D103
<b>FOOTWEAR</b>				
2530	136	.0138	27.5	D101
<b>FOOD</b>				
2601	8	.0069	-38.6	D104
2602	4	.0418	-28.3	D105
2603	1	.0185	-41.7	D106
2604	7	.2238	-41.7	D106
2605	4	.5129	21.4	D107
2606	1	.1045	21.4	D107
2609	35	.2872	21.4	D108
2610	22	.1667	24.3	D109
2620	32	.0152	-25.4	D110
2621	9	.0678	55.1	D111
2630	19	.0655	-2.4	D112
2640	9	.1413	64.2	D113
2651	33	.0115	3.1	D114
2652	3	.2794	3.1	D114
2660	23	.0614	-45.8	D115
2680	6	.0404	-45.8	D116
2691	51	.0644	3.1	D117
2692	3	.8191	92.7	D118
2698	3	.1032	-33.5	D119
2699	19	.0453	-21.8	D120
<b>BEVERAGES</b>				
2710	6	.0404	-9.9	D121
2720	15	.0398	-9.9	D122
2730	3	.1577	-9.9	D123
2741	6	.0498	-9.9	D124
<b>TOBACCO</b>				
2810	1	.1891	-3.6	D125
2820	5	.5837	-3.6	D125
2830	2	.6200	-3.6	D125
2899	2	.1475	-3.6	D125
<b>PRINTING</b>				
2910	8	.0491	18.1	D126
2920	8	.0218	18.1	D127
2999	1	.0359	18.1	D127

<u>Industry</u>	<u>Number of Exporters</u>	<u>Herfindahl Index</u>	<u>Implicit Tariff (%)</u>	<u>Industry Dummy</u>
OTHER MANUFACTURES				
3000	10	.1106	73.9	D128
3011	1	.8402	73.9	D129
3012	17	.0816	73.9	D129
3021	2	.8550	73.9	D130
3023	9	.0689	73.9	D130
3031	9	.3964	73.9	D131
3032	5	.1521	73.9	D132
3033	4	.1962	73.9	D133
3041	4	.2614	73.9	D134
3042	4	.2523	73.9	D135
3050	5	.2261	73.9	D136
3070	6	.3906	73.9	D137
3080	6	.1469	73.9	D138
3099	56	.0226	73.9	D139

Source: 1978 data base and W.G. Tyler, "Politica comercial e industrial no Brasil: uma analise sob a otica de protecao efetiva para vendas no mercado domestico, 1980/81," IPEA/INPES, mimeo, July 1981.

Table D-2

Estimated Regression Coefficients of the Industry Dummy Terms  
in Equations O2 and O5

Variable	Equation O2		Equation O5	
	coefficient	standard error	coefficient	standard error
D1	7.219**	1.023	9.055**	1.040
D2	6.354**	0.835	8.134**	0.859
D3	6.629**	1.174	8.531**	1.180
D4	6.424**	0.959	8.231**	0.971
D5	6.344**	0.894	8.145**	0.920
D6	6.989**	1.032	8.888**	1.054
D7	5.834**	1.016	7.676**	1.038
D8	8.486**	0.849	10.329**	0.859
D9	7.425**	1.507	9.198**	1.536
D10	8.872**	1.027	10.733**	1.037
D11	7.146**	0.923	8.982**	0.944
D12	6.922**	0.980	8.776**	1.002
D13	6.312**	0.873	8.099**	0.905
D14	5.975**	1.102	7.842**	1.120
D15	6.237**	1.371	8.108**	1.391
D16	7.673**	0.979	9.541**	0.989
D17	6.876**	1.357	8.741**	1.370
D18	4.253**	1.127	6.094**	1.152
D19	4.563**	0.986	6.380**	1.015
D20	6.722**	1.078	8.560**	1.095
D21	6.452**	1.032	8.272**	1.054
D22	6.823**	0.948	8.656**	0.966
D23	6.255**	0.869	8.069**	0.892
D24	5.813**	0.898	7.579**	0.922
D25	7.243**	0.886	9.063**	0.910
D26	7.289**	0.832	9.071**	0.858
D27	5.808**	0.802	7.619**	0.827
D28	6.575**	1.069	8.415**	1.094
D29	6.655**	0.822	8.494**	0.849
D30	7.265**	0.827	9.115**	0.859
D31	6.354**	0.881	8.145**	0.908
D32	6.335**	0.821	8.156**	0.845
D33	6.752**	0.811	8.577**	0.845
D34	7.628**	1.319	9.549**	1.346
D35	7.446**	0.981	9.237**	0.995
D36	7.244**	0.938	9.118**	0.959
D37	6.627**	0.815	8.466**	0.845
D38	7.171**	0.862	9.018**	0.890
D39	6.081**	0.845	7.876**	0.869
D40	6.196**	0.911	7.957**	0.942
D41	6.407**	0.922	8.168**	0.943
D42	6.331**	0.830	8.141**	0.859
D43	6.894**	0.878	8.741**	0.900
D44	6.594**	0.862	8.376**	0.886
D45	9.476**	1.048	11.352**	1.056
D46	7.824**	1.110	9.643**	1.133
D47	9.175**	0.958	11.207**	0.991

Variable	Equation 02		Equation 05	
	coefficient	standard error	coefficient	standard error
D48	5.937**	0.803	7.750**	0.830
D49	6.399**	1.351	8.302**	1.369
D50	6.385**	0.896	8.207**	0.923
D51	6.021**	1.012	7.829**	1.029
D52	8.149**	0.799	9.951**	0.803
D53	5.797**	1.039	7.552**	1.052
D54	7.628**	0.839	9.380**	0.855
D55	6.840**	0.882	8.619**	0.897
D56	5.875**	0.806	7.637**	0.824
D57	5.355**	0.917	7.158**	0.936
D58	5.593**	1.150	7.397**	1.158
D59	6.655**	1.087	8.398**	1.100
D60	8.215**	1.328	10.072**	1.352
D61	6.053**	0.836	7.865**	0.856
D62	5.127**	0.862	6.972**	0.884
D63	5.642**	1.002	7.556**	1.011
D64	6.365**	1.080	8.221**	1.100
D65	5.711**	1.057	7.526**	1.079
D66	4.187**	1.220	6.014**	1.232
D67	5.722**	0.839	7.541**	0.865
D68	7.186**	0.783	8.987**	0.794
D69	6.649**	0.948	8.337**	0.966
D70	6.884**	0.837	8.623**	0.860
D71	6.693**	0.868	8.617**	0.885
D72	6.395**	1.694	8.426**	1.719
D73	5.814**	1.043	7.764**	1.058
D74	5.682**	1.486	7.611**	1.493
D75	6.079**	1.069	7.940**	1.085
D76	8.530**	1.249	10.328**	1.263
D77	8.627**	0.834	10.540**	0.826
D78	7.685**	1.212	9.575**	1.235
D79	5.384**	0.944	7.220**	0.957
D80	5.135**	0.879	6.973**	0.894
D81	7.420**	1.370	9.366**	1.378
D82	6.119**	0.853	7.948**	0.874
D83	6.169**	0.844	7.973**	0.869
D84	5.510**	0.950	7.311**	0.968
D85	6.219**	0.934	8.001**	0.945
D86	6.288**	1.130	8.129**	1.153
D87	5.600**	0.886	7.472**	0.909
D88	5.336**	0.994	7.129**	1.002
D89	5.519**	1.220	7.288**	1.238
D90	5.102**	0.934	6.922**	0.949
D91	4.624**	1.029	6.457**	1.049
D92	5.695**	0.883	7.483**	0.898
D93	7.428**	0.846	9.256**	0.853
D94	7.407**	0.789	9.196**	0.805
D95	6.755**	0.818	8.509**	0.837
D96	5.668**	0.920	7.417**	0.939
D97	6.834**	0.973	8.638**	0.990
D98	7.823**	0.978	9.587**	0.993
D99	6.929**	0.864	8.624**	0.885



Variable	Equation 02		Equation 05	
	coefficient	standard error	coefficient	standard error
D100	6.185**	0.796	7.957**	0.816
D101	8.169**	0.749	9.879**	0.777
D102	6.811**	0.873	8.571**	0.891
D103	6.899**	1.084	8.672**	1.095
D104	8.487**	1.052	10.445**	1.058
D105	5.494**	1.219	7.303**	1.231
D106	10.996**	1.060	12.967**	1.070
D107	7.798**	1.222	9.618**	1.227
D108	8.876**	0.864	10.654**	0.871
D109	6.972**	0.873	8.720**	0.885
D110	8.168**	0.857	10.001**	0.871
D111	9.173**	1.004	10.910**	1.014
D112	8.470**	0.875	10.219**	0.891
D113	7.604**	1.019	9.343**	1.032
D114	9.948**	0.895	11.914**	0.908
D115	6.720**	0.867	8.503**	0.885
D116	4.498**	1.090	6.278**	1.106
D117	9.540**	0.852	11.416**	0.845
D118	5.500**	1.551	7.209**	1.573
D119	3.845**	1.346	5.722**	1.365
D120	8.506**	0.883	10.335**	0.890
D121	5.235**	1.089	7.063**	1.081
D122	5.291**	0.929	7.146**	0.935
D123	5.990**	1.365	7.811**	1.381
D124	6.400**	1.090	8.222**	1.105
D125	8.046**	1.082	10.087**	1.110
D126	5.630**	1.051	7.470**	1.077
D127	5.157**	1.010	6.978**	1.029
D128	6.415**	0.979	8.160**	1.005
D129	6.842**	0.910	8.705**	0.937
D130	6.562**	0.980	8.325**	0.999
D131	8.362**	1.083	10.285**	1.078
D132	6.795**	1.181	8.623**	1.194
D133	6.280**	1.234	8.057**	1.261
D134	7.522**	1.253	9.286**	1.272
D135	6.713**	1.295	8.639**	1.308
D136	6.961**	1.160	8.688**	1.177
D137	6.397**	1.159	8.129**	1.177
D138	7.181**	1.088	8.905**	1.106
D139	7.116**	0.814	8.885**	0.833

Note: All coefficients are statistically significant at the .01 level.

Table D-3

Estimated Regression Coefficients of the Industry Dummy Terms  
in Equations 03 and 06

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
D1	37.079**	10.072	39.318**	10.072
D2	10.415*	5.036	11.690*	5.050
D3	32.244	58.746	30.304	58.798
D4	22.040**	3.996	23.709**	3.996
D5	3.533	4.930	5.379	4.936
D6	15.366	8.169	17.374*	8.185
D7	3.827	6.071	5.431	6.077
D8	-0.436	6.945	0.367	6.955
D9	-3.423	8.676	-1.886	8.692
D10	-0.865	7.173	0.649	7.177
D11	-10.361	5.514	-8.620	5.534
D12	-10.734	8.464	-8.964	8.474
D13	-6.365	5.456	-4.683	5.467
D14	-17.317	14.022	-15.010	14.033
D15	17.453	17.914	19.253	17.929
D16	13.578	7.305	15.183*	7.323
D17	28.793**	7.113	30.785**	7.127
D18	24.531*	11.653	25.834*	11.674
D19	1.115	9.461	3.119	9.477
D20	4.592	14.039	5.877	14.050
D21	17.547	13.509	18.666	13.519
D22	-4.657	5.043	-3.640	5.054
D23	3.372	5.516	5.133	5.523
D24	5.916	6.299	7.061	6.308
D25	15.700**	4.651	17.571**	4.651
D26	0.928	4.296	2.884	4.320
D27	3.327	2.701	4.901	2.724
D28	4.540	11.381	6.046	11.404
D29	9.962*	3.971	12.019**	3.975
D30	2.226	3.896	4.802	3.923
D31	-1.528	7.638	-0.431	7.648
D32	-4.313	3.186	-2.836	3.199
D33	1.263	2.711	2.898	2.735
D34	3.508	10.852	4.171	10.864
D35	-2.297	6.227	-0.394	6.223
D36	-5.211	6.054	-3.223	6.067
D37	3.208	2.904	4.976	2.918
D38	-1.518	4.556	0.144	4.564
D39	2.429	5.816	4.181	5.839
D40	3.934	4.996	5.441	5.001
D41	-5.249	5.566	-3.964	5.582
D42	1.077	3.197	3.112	3.215
D43	10.807**	4.170	14.533**	4.295
D44	-6.409	4.270	-4.759	4.289
D45	9.715	6.387	11.378	6.394
D46	-12.616	9.261	-10.790	9.273
D47	-5.428	3.811	-2.679	3.850

Variable	Equation 03		Equation 06	
	coefficient	standard_error	coefficient	standard_error
D48	-2.591	2.368	-0.875	2.367
D49	-39.677	76.748	-38.696	76.847
D50	10.662	6.549	12.412	6.554
D51	-12.476	7.775	-10.763	7.786
D52	6.059*	3.053	8.618**	3.068
D53	-21.941	25.162	-20.806	25.186
D54	15.406**	4.197	16.577**	4.196
D55	9.642	9.515	11.557	9.519
D56	12.069**	3.273	13.542**	3.281
D57	10.987	10.962	12.383	10.964
D58	2.884	14.630	4.851	14.635
D59	-18.281	14.589	-16.502	14.603
D60	28.144	15.121	29.465	15.144
D61	9.692**	3.634	11.079**	3.641
D62	2.442	3.248	4.326	3.244
D63	5.478	12.121	9.234	12.098
D64	-3.878	7.054	-2.385	7.067
D65	13.914	12.985	15.487	13.004
D66	18.779	16.978	19.872	16.998
D67	7.008	4.743	8.635	4.745
D68	7.765*	3.040	10.146**	3.052
D69	-5.940	5.261	-5.008	5.265
D70	1.786	4.215	3.251	4.225
D71	17.690**	2.925	19.705**	2.922
D72	-10.551	8.134	-8.456	8.177
D73	35.255**	12.075	35.960**	12.087
D74	12.809	8.823	13.605	8.845
D75	6.023	5.952	7.904	5.980
D76	11.008	19.254	12.002	19.270
D77	10.135**	2.594	11.842**	2.619
D78	23.461*	10.674	25.036*	10.677
D79	2.331	5.479	3.931	5.477
D80	0.679	5.974	2.406	5.979
D81	8.064	4.431	9.897*	4.448
D82	13.145**	4.027	14.660**	4.040
D83	-3.230	3.179	-1.837	3.186
D84	8.605	4.706	10.262*	4.725
D85	6.474	3.850	7.811*	3.848
D86	8.266	11.744	9.861	11.758
D87	-1.572	5.968	2.549	6.028
D88	-1.260	7.071	0.520	7.068
D89	-4.758	19.964	-3.462	19.985
D90	5.959	9.670	7.623	9.669
D91	-12.255	8.299	-10.268	8.310
D92	0.637	5.942	2.631	5.951
D93	19.326**	4.042	20.881**	4.032
D94	6.587**	1.955	8.460**	1.950
D95	9.123*	4.077	10.852**	4.086
D96	-12.675	11.268	-10.764	11.285
D97	-5.339	8.368	-2.998	8.364
D98	4.181	9.834	5.816	9.846
D99	-2.687	5.028	-1.088	5.036

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
D100	3.370	2.873	5.486	2.880
D101	15.461**	1.566	17.134**	1.599
D102	21.695**	5.051	23.558**	5.051
D103	-9.477	16.199	-7.154	16.215
D104	9.516	10.292	11.743	10.303
D105	-2.582	11.912	-1.405	11.925
D106	6.000	15.344	6.975	15.381
D107	9.124	8.517	10.136	8.526
D108	13.184**	2.325	14.771**	2.327
D109	13.083**	4.211	14.619**	4.214
D110	17.832**	4.605	19.608**	4.609
D111	5.511	6.867	7.014	6.877
D112	11.785*	5.593	13.678*	5.593
D113	18.862**	4.544	20.419**	4.559
D114	22.203**	4.942	24.713**	4.953
D115	1.304	6.412	2.857	6.414
D116	0.124	14.525	1.193	14.538
D117	7.412	4.224	8.913*	4.218
D118	29.406*	12.542	30.889*	12.553
D119	47.343	51.036	52.861	51.088
D120	13.907*	5.522	15.270**	5.531
D121	9.402	10.420	10.858	10.430
D122	18.305**	4.425	19.993**	4.434
D123	-7.587	69.520	-6.339	69.585
D124	5.953	7.750	7.062	7.762
D125	8.130*	3.867	9.355*	3.853
D126	-14.884	10.542	-13.587	10.550
D127	5.519	9.803	7.063	9.808
D128	-5.701	9.518	-3.766	9.529
D129	-11.997	7.960	-10.309	7.966
D130	-8.036	8.350	-6.946	8.373
D131	11.023	6.667	13.801*	6.659
D132	-32.176*	13.476	-30.522*	13.495
D133	34.627	19.311	37.668	19.344
D134	-3.587	30.805	-1.132	30.835
D135	-21.708	24.836	-19.922	24.868
D136	2.675	12.464	4.069	12.472
D137	-9.519	9.911	-7.899	9.920
D138	13.004	43.748	15.960	43.793
D139	12.380**	2.291	14.283**	2.299

Note: (\*) indicates significance at the .05 level of confidence and (\*\*) at the .01 level.

Table D-4

Estimated Regression Coefficients of the Industry-Domestic Sales  
Interaction Terms in Equations 03 and 06

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
NON-METALLIC MINERALS				
lnDS*D1	-2.548**	0.586	-2.565**	0.587
lnDS*D2	-1.019**	0.269	-0.986**	0.269
lnDS*D3	-2.111	3.014	-1.908	3.016
lnDS*D4	-1.657**	0.216	-1.643**	0.216
lnDS*D5	-0.649*	0.260	-0.644*	0.261
lnDS*D6	-1.270**	0.457	-1.270**	0.457
lnDS*D7	-0.686*	0.337	-0.665*	0.338
BASIC IRON AND STEEL				
lnDS*D8	-0.293	0.388	-0.228	0.389
lnDS*D9	-0.223	0.436	-0.202	0.436
lnDS*D10	-0.282	0.378	-0.257	0.378
lnDS*D11	0.061	0.268	0.072	0.268
lnDS*D12	0.132	0.442	0.143	0.443
lnDS*D13	-0.105	0.296	-0.093	0.297
lnDS*D14	0.365	0.697	0.350	0.698
lnDS*D15	-1.374	0.926	-1.364	0.927
BASIC NON-FERROUS METALS				
lnDS*D16	-1.094**	0.371	-1.074**	0.371
lnDS*D17	-2.028**	0.394	-2.029**	0.394
lnDS*D18	-1.839**	0.601	-1.804**	0.601
lnDS*D19	-0.607	0.518	-0.610	0.518
lnDS*D20	-0.675	0.752	-0.638	0.753
METAL PRODUCTS				
lnDS*D21	-1.411	0.744	-1.365	0.745
lnDS*D22	-0.183	0.270	-0.132	0.270
lnDS*D23	-0.644*	0.291	-0.635*	0.292
lnDS*D24	-0.807*	0.344	-0.766*	0.344
lnDS*D25	-1.267**	0.253	-1.263**	0.254
lnDS*D26	-0.454*	0.231	-0.457*	0.231
lnDS*D27	-0.664**	0.145	-0.644**	0.145
MACHINERY				
lnDS*D28	-0.687	0.605	-0.662	0.606
lnDS*D29	-0.978**	0.214	-0.983**	0.214
lnDS*D30	-0.517*	0.215	-0.551*	0.216
lnDS*D31	-0.360	0.424	-0.315	0.425
lnDS*D32	-0.211	0.173	-0.186	0.173
lnDS*D33	-0.492**	0.147	-0.475**	0.147
lnDS*D34	-0.580	0.546	-0.508	0.547
lnDS*D35	-0.298	0.315	-0.297	0.316
lnDS*D36	-0.159	0.305	-0.158	0.306
lnDS*D37	-0.609**	0.158	-0.598**	0.158

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
ELECTRICAL EQUIPMENT				
lnDS*D38	-0.330	0.242	-0.313	0.242
lnDS*D39	-0.604*	0.305	-0.595	0.305
lnDS*D40	-0.673*	0.268	-0.652*	0.268
lnDS*D41	-0.207	0.281	-0.176	0.282
lnDS*D42	-0.507**	0.172	-0.512**	0.172
lnDS*D43	-1.004**	0.218	-1.097**	0.222
lnDS*D44	-0.103	0.226	-0.089	0.226
TRANSPORT EQUIPMENT				
lnDS*D45	-0.809*	0.328	-0.791*	0.328
lnDS*D46	0.258	0.474	0.265	0.475
lnDS*D47	-0.087	0.181	-0.115	0.181
lnDS*D48	-0.339**	0.123	-0.327**	0.124
lnDS*D49	1.747	4.248	1.805	4.253
lnDS*D50	-1.023**	0.344	-1.013**	0.344
lnDS*D51	0.217	0.425	0.229	0.426
WOOD				
lnDS*D52	-0.675**	0.174	-0.713**	0.175
lnDS*D53	0.751	1.405	0.793	1.406
lnDS*D54	-1.222**	0.228	-1.183**	0.229
lnDS*D55	-0.956	0.539	-0.957	0.539
FURNITURE				
lnDS*D56	-1.150**	0.182	-1.127**	0.182
lnDS*D57	-1.109	0.599	-1.080	0.601
lnDS*D58	-0.646	0.796	-0.648	0.796
lnDS*D59	0.574	0.803	0.579	0.804
PULP AND PAPER				
lnDS*D60	-1.807*	0.768	-1.772*	0.769
lnDS*D61	-0.990**	0.190	-0.961**	0.191
lnDS*D62	-0.650**	0.174	-0.646**	0.174
lnDS*D63	-0.790	0.688	-0.889	0.688
RUBBER PRODUCTS				
lnDS*D64	-0.285	0.346	-0.260	0.347
lnDS*D65	-1.265	0.733	-1.245	0.734
lnDS*D66	-1.674	1.016	-1.624	1.017
lnDS*D67	-0.871**	0.262	-0.854**	0.262
lnDS*D68	-0.829**	0.172	-0.856**	0.172
lnDS*D69	-0.073	0.302	-0.022	0.303
lnDS*D70	-0.496*	0.249	-0.474	0.249

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
CHEMICALS				
lnDS*D71	-1.404**	0.157	-1.402**	0.157
lnDS*D72	0.011	0.373	0.017	0.374
lnDS*D73	-2.236**	0.592	-2.169**	0.593
lnDS*D74	-1.163*	0.475	-1.094*	0.474
lnDS*D75	-0.793**	0.294	-0.787**	0.295
lnDS*D76	-0.921	1.015	-0.871	1.017
lnDS*D77	-0.884**	0.148	-0.866**	0.148
lnDS*D78	-1.666**	0.593	-1.641**	0.594
lnDS*D79	-0.635*	0.294	-0.616*	0.295
lnDS*D80	-0.562	0.310	-0.550	0.310
lnDS*D81	-0.845**	0.230	-0.832**	0.230
lnDS*D82	-1.174**	0.215	-1.150**	0.216
PHARMACEUTICAL, COSMETICS AND SOAPS				
lnDS*D83	-0.305	0.166	-0.277	0.166
lnDS*D84	-0.975**	0.254	-0.961**	0.254
lnDS*D85	-0.810**	0.210	-0.779**	0.210
PLASTICS				
lnDS*D86	-0.893	0.588	-0.873	0.588
lnDS*D87	-0.405	0.326	-0.522	0.329
lnDS*D88	-0.437	0.386	-0.430	0.387
lnDS*D89	-0.234	1.096	-0.201	1.097
lnDS*D90	-0.843	0.518	-0.828	0.519
lnDS*D91	0.104	0.439	0.103	0.440
lnDS*D92	-0.520	0.327	-0.525	0.327
TEXTILES				
lnDS*D93	-1.465**	0.224	-1.444**	0.225
lnDS*D94	-0.753**	0.100	-0.751**	0.100
lnDS*D95	-0.931**	0.223	-0.923**	0.223
lnDS*D96	0.215	0.620	0.213	0.620
lnDS*D97	-0.131	0.453	-0.153	0.453
lnDS*D98	-0.599	0.531	-0.586	0.531
lnDS*D99	-0.288	0.264	-0.276	0.264
CLOTHING				
lnDS*D100	-0.644**	0.157	-0.657**	0.157
lnDS*D102	-1.689**	0.298	-1.689**	0.298
lnDS*D103	0.141	0.929	0.116	0.930
FOOTWEAR				
lnDS*D101	-1.238**	0.087	-1.229**	0.087

Variable	Equation 03		Equation 06	
	coefficient	standard error	coefficient	standard error
FOOD				
lnDS*D104	-0.856	0.569	-0.865	0.570
lnDS*D105	-0.381	0.612	-0.342	0.613
lnDS*D106	-0.513	0.880	-0.449	0.880
lnDS*D107	-0.859	0.457	-0.808	0.457
lnDS*D108	-1.046**	0.131	-1.028**	0.131
lnDS*D109	-1.138**	0.232	-1.119**	0.232
lnDS*D110	-1.292**	0.232	-1.283**	0.232
lnDS*D111	-0.613	0.340	-0.595	0.340
lnDS*D112	-0.986**	0.311	-0.988**	0.312
lnDS*D113	-1.382**	0.231	-1.366**	0.232
lnDS*D114	-1.452**	0.258	-1.475**	0.258
lnDS*D115	-0.509	0.344	-0.490	0.345
lnDS*D116	-0.574	0.766	-0.530	0.767
lnDS*D117	-0.684**	0.220	-0.659**	0.220
lnDS*D118	-2.018**	0.640	-1.998**	0.641
lnDS*D119	-2.957	2.540	-3.131	2.542
lnDS*D120	-1.102**	0.313	-1.069**	0.313
BEVERAGES				
lnDS*D121	-1.032	0.584	-1.005	0.584
lnDS*D122	-1.552**	0.251	-1.536**	0.251
lnDS*D123	-0.170	3.206	-0.136	3.209
lnDS*D124	-0.776	0.439	-0.729	0.439
TOBACCO				
lnDS*D125	-0.806**	0.205	-0.756**	0.207
PRINTING				
lnDS*D126	0.254	0.538	0.289	0.539
lnDS*D127	-0.819	0.527	-0.798	0.528
OTHER MANUFACTURES				
lnDS*D128	-0.128	0.524	-0.131	0.525
lnDS*D129	0.257	0.445	0.273	0.445
lnDS*D130	0.009	0.463	0.054	0.463
lnDS*D131	-0.963*	0.427	-1.013*	0.427
lnDS*D132	1.298	0.724	1.314	0.725
lnDS*D133	-2.432*	1.111	-2.498*	1.112
lnDS*D134	-0.194	1.678	-0.225	1.679
lnDS*D135	0.613	1.231	0.626	1.232
lnDS*D136	-0.559	0.691	-0.534	0.691
lnDS*D137	0.050	0.526	0.063	0.526
lnDS*D138	-1.126	2.457	-1.188	2.459
lnDS*D139	-1.098**	0.124	-1.099**	0.124

Note: (\*) indicates significance at the .05 level of confidence and (\*\*) at the .01 level.



Table D-5

Estimated Regression Coefficients of the Industry Dummy Terms  
in Equations 08 and 11

Variable	Equation 08		Equation 11	
	coefficient	standard error	coefficient	standard error
D1	6.779**	1.021	10.326**	1.871
D2	5.879**	0.836	8.184**	1.728
D3	6.212**	1.169		
D4	6.006**	0.958	10.628**	1.795
D5	5.881**	0.895	8.860**	1.789
D6	6.553**	1.029	11.166**	1.952
D7	5.865**	1.037	8.164**	1.952
D8	7.842**	0.851	11.537**	2.083
D9	6.639**	0.501		
D10	8.263**	1.026		
D11	6.472**	0.930		
D12	6.364**	0.980		
D13	5.810**	0.873	8.182**	1.771
D14	5.375**	1.099		
D15	5.669**	1.364		
D16	7.325**	0.977		
D17	6.352**	1.350	10.239**	2.111
D18	3.790**	1.123		
D19	4.049**	0.999		
D20	6.476**	1.111		
D21	5.935**	1.030		
D22	6.344**	0.948	9.722**	1.840
D23	5.693**	0.870	9.151**	1.784
D24	5.276**	0.898	7.886**	1.835
D25	6.552**	0.888	10.151**	1.832
D26	6.748**	0.833	9.331**	1.707
D27	5.381**	0.805	8.578**	1.636
D28	6.063**	1.067	10.194**	2.227
D29	6.200**	0.825	9.136**	1.750
D30	6.796**	0.830	9.800**	1.747
D31	5.785**	0.883	9.013**	2.006
D32	5.704**	0.826	8.016**	1.702
D33	6.230**	0.814	10.599**	1.682
D34	6.908**	1.315		
D35	6.783**	0.981	8.829**	2.169
D36	6.568**	0.939	7.507**	2.152
D37	6.152**	0.818	9.184**	1.649
D38	6.674**	0.864	9.667**	1.807
D39	5.577**	0.847	7.625**	1.818
D40	5.718**	0.912	8.920**	2.072
D41	5.889**	0.922	8.801**	2.018
D42	5.849**	0.833	9.245**	1.755
D43	6.259**	0.880	9.499**	1.916
D44	6.022**	0.863	10.138**	1.802
D45	8.988**	1.047	11.421**	2.159
D46	7.202**	1.108		
D47	8.406**	0.959		

Variable	Equation 08		Equation 11	
	coefficient	standard error	coefficient	standard error
D48	5.438**	0.806	7.764**	1.657
D49	5.886**	1.344	9.055**	2.009
D50	5.858**	0.896	11.235**	2.042
D51	5.384**	1.011	7.668**	2.149
D52	7.744**	0.801	10.346**	1.646
D53	5.280**	1.036		
D54	6.940**	0.842	10.761**	1.816
D55	6.363**	0.881	8.650**	2.014
D56	5.422**	0.808	8.969**	1.600
D57	4.854**	0.922	8.776**	1.928
D58	4.900**	1.147		
D59	6.168**	1.083	8.806**	1.941
D60	7.948**	1.322		
D61	5.452**	0.838	8.671**	1.698
D62	4.553**	0.864	7.554**	1.714
D63	4.947**	1.005	8.286**	2.097
D64	5.667**	1.080	9.890**	2.178
D65	5.103**	1.055	9.816**	1.952
D66	3.581**	1.215	7.508**	2.106
D67	5.210**	0.841	8.559**	1.673
D68	6.951**	0.784	9.063**	1.617
D69	6.097**	0.946		
D70	6.300**	0.839	8.157**	1.673
D71	6.296**	0.869	8.806**	2.191
D72	5.704**	1.688	12.736**	3.541
D73	5.388**	1.042		
D74	5.472**	1.659		
D75	5.434**	1.068	9.222**	2.137
D76	8.004**	1.244		
D77	8.219**	0.836	11.634**	1.703
D78	7.158**	1.209		
D79	4.970**	0.944	8.737**	1.764
D80	4.688**	0.880	8.140**	1.779
D81	6.995**	1.363	10.317**	2.165
D82	5.584**	0.857	8.018**	1.789
D83	5.848**	0.845	9.374**	1.699
D84	5.074**	0.949	8.188**	1.871
D85	5.927**	0.951	11.014**	1.901
D86	5.654**	1.127		
D87	5.133**	0.893	9.087**	1.757
D88	4.718**	0.993	8.266**	1.953
D89	5.311**	1.213		
D90	4.560**	0.934	8.134**	1.942
D91	4.095**	1.028	8.790**	2.164
D92	5.106**	0.885	9.096**	1.799
D93	6.809**	0.848	10.459**	1.751
D94	6.602**	0.795	9.027**	1.652
D95	5.978**	0.822	9.701**	1.656
D96	4.762**	0.936	8.816**	2.115
D97	5.848**	0.978		
D98	7.001**	0.979		
D99	6.140**	0.870	8.373**	1.930

Variable	Equation 08		Equation 11	
	coefficient	standard error	coefficient	standard error
D100	5.498**	0.802	8.458**	1.630
D101	7.840**	0.750	7.355**	1.614
D102	6.152**	0.880	8.255**	1.831
D103	6.258**	1.081	9.424**	1.909
D104	7.928**	1.051	11.375**	1.845
D105	4.945**	1.213	7.895**	2.043
D106	10.705**	1.058	14.655**	2.014
D107	7.694**	1.217		
D108	8.370**	0.870	12.474**	2.070
D109	6.418**	0.874	8.746**	1.864
D110	7.672**	0.857	11.070**	1.697
D111	8.618**	1.002	14.046**	2.003
D112	8.078**	0.875	11.442**	1.782
D113	7.266**	1.017	12.651**	1.952
D114	9.536**	0.896	12.708**	1.829
D115	6.555**	0.870	9.057**	1.724
D116	4.100**	1.086	7.113**	1.953
D117	9.272**	0.853	13.254**	1.705
D118	5.276**	1.542		
D119	3.331**	1.338	7.903**	2.163
D120	8.282**	0.888	11.233**	2.074
D121	4.846**	1.085	8.605**	1.950
D122	4.783**	0.929	8.409**	1.745
D123	5.447**	1.357		
D124	5.960**	1.086	7.231**	2.031
D125	7.517**	1.081	11.990**	2.307
D126	4.917**	1.050		
D127	4.599**	1.008	7.551**	1.830
D128	5.918**	0.978	8.962**	2.010
D129	6.212**	0.912	8.052**	1.991
D130	5.908**	0.980	10.432**	2.071
D131	8.039**	1.081		
D132	6.329**	1.176		
D133	5.741**	1.228		
D134	6.804**	1.249		
D135	6.225**	1.290	9.309**	2.379
D136	6.392**	1.156		
D137	5.751**	1.156		
D138	6.651**	1.085	10.313**	2.167
D139	6.691**	0.816	9.078**	1.704

Note: All coefficients are statistically significant at the .01 level of confidence.

Table D-6

Estimated Regression Coefficients of the Industry Dummy Terms  
in Equations 09 and 12

Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
D1	36.317**	9.961	34.037**	11.512
D2	9.820*	4.980	16.721	15.850
D3	35.157	58.090		
D4	22.081**	3.953	24.764**	6.233
D5	2.568	4.878	7.439	10.953
D6	14.338	8.079	22.046*	11.107
D7	2.121	6.014	20.380	10.807
D8	-0.884	6.868		
D9	-1.423	8.583		
D10	0.688	7.100		
D11	-10.560	5.737		
D12	-11.430	8.371		
D13	-5.848	5.397	2.641	10.878
D14	-17.795	13.866		
D15	16.361	17.714		
D16	13.758	7.224		
D17	28.445**	7.035	29.804**	7.121
D18	24.047*	11.523		
D19	-0.203	10.590		
D20	4.794	14.018		
D21	16.869	13.358		
D22	-4.591	4.987	-4.147	6.076
D23	3.928	5.456	68.237**	20.243
D24	4.887	6.230	12.512	11.335
D25	14.409**	4.604	15.530	14.697
D26	0.682	4.251	8.810	8.458
D27	2.635	2.691	-3.581	5.229
D28	5.083	11.254		
D29	9.539*	3.933	14.641	8.256
D30	1.190	3.865	23.815*	10.021
D31	-1.508	7.553	-29.933	22.891
D32	-4.299	3.212	1.661	7.935
D33	0.458	2.697	3.485	5.240
D34	2.406	10.731		
D35	-2.344	6.159		
D36	-4.892	5.989		
D37	2.442	2.876	10.138	7.487
D38	-2.400	4.508	17.903	33.357
D39	1.684	5.753	88.224*	38.142
D40	3.750	4.941	34.835	20.962
D41	-5.619	5.505	2.539	26.804
D42	2.190	3.286	13.621*	5.506
D43	10.087*	4.126	33.731**	12.626
D44	-7.002	4.225	-0.045	9.758
D45	9.573	6.316		
D46	-12.047	9.158		
D47	-5.443	3.770		

Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
D48	-2.891	2.349	6.819	7.466
D49	-37.938	75.887	-35.168	74.960
D50	11.407	6.478		
D51	-13.006	7.689		
D52	6.075*	3.022	6.660	7.574
D53	-28.267	24.893		
D54	15.067**	4.152	34.001**	10.013
D55	9.172	9.410		
D56	10.599**	3.282	8.236	4.345
D57	10.807	11.170	1.783	49.014
D58	2.426	14.467		
D59	-17.715	14.426	-20.018	50.687
D60	30.961*	14.955		
D61	9.454**	3.595	32.609**	6.553
D62	2.431	3.215	6.982	4.130
D63	-7.616	13.561		
D64	-4.074	6.977	16.075	121.027
D65	14.454	12.840	12.348	22.225
D66	19.470	16.788		
D67	6.570	4.691	5.300	7.442
D68	6.389*	3.013	17.786**	6.057
D69	-5.766	5.208		
D70	1.297	4.170	10.547	12.679
D71	16.867**	2.899		
D72	-10.515	8.044	-11.028	9.225
D73	36.512**	11.940		
D74	15.307	9.970		
D75	5.886	5.887		
D76	9.207	19.040		
D77	9.418**	2.569	15.837**	4.653
D78	22.136*	10.556		
D79	0.999	5.422	-7.584	6.895
D80	-0.571	5.911	4.355	12.543
D81	7.838	4.384		
D82	11.138**	4.291	17.858	11.382
D83	-3.369	3.145	0.861	5.935
D84	7.115	4.659	10.585	7.292
D85	7.056	3.988	4.315	5.222
D86	7.506	11.613		
D87	-1.285	5.925	2.268	7.424
D88	-1.620	6.994	-1.274	14.417
D89	-2.859	19.742		
D90	4.459	9.564	-53.602	48.408
D91	-12.723	8.208		
D92	0.829	5.877	-5.886	19.280
D93	18.844**	3.999	12.572	8.617
D94	5.938**	1.941	15.390*	6.525
D95	9.643*	4.033	10.926	6.833
D96	-21.887	12.225		
D97	-6.342	8.277		
D98	3.008	9.726		
D99	0.141	5.467	-0.658	44.632

Variable	Equation 09		Equation 12	
	coefficient	standard_error	coefficient	standard_error
D100	2.959	2.979	-0.212	5.872
D101	15.275**	1.553	3.040	7.262
D102	22.200**	5.275	-9.761	35.868
D103	-6.806	16.023	-12.161	24.089
D104	9.096	10.178	8.354	10.623
D105	-1.182	11.780		
D106	7.215	15.173	18.695	20.058
D107	7.966	8.423		
D108	12.226**	2.315	-10.287	17.474
D109	12.156**	4.167	41.478**	12.832
D110	17.678**	4.556	20.424**	6.077
D111	5.379	6.791	20.567**	7.946
D112	11.804*	5.532	-5.994	18.080
D113	18.535**	4.495	20.899**	5.402
D114	22.319**	4.890	22.822**	6.353
D115	-1.969	6.418	-7.127	10.886
D116	0.452	14.362	5.232	17.792
D117	5.454	4.186	-8.182	9.118
D118	27.114*	12.406		
D119	47.166	50.466		
D120	10.748*	5.483		
D121	10.870	10.305	9.276	12.726
D122	17.677**	4.378	9.021	6.166
D123	-16.296	68.749		
D124	3.941	7.668		
D125	7.136	3.827	11.926*	4.734
D126	-14.292	10.426		
D127	6.125	9.694	32.128	16.748
D128	-5.051	9.413	-24.531	21.036
D129	-13.178	7.873	34.729	72.978
D130	-7.759	8.259		
D131	9.711	6.598		
D132	-33.718*	13.327		
D133	39.077*	19.104		
D134	-4.188	30.459		
D135	-23.749	24.560		
D136	0.574	12.328		
D137	-9.609	9.802		
D138	11.675	43.257		
D139	12.555**	2.286	-9.711	13.131

Note: (\*) indicates significance at the .05 level of confidence and (\*\*) at the .01 level.

Table D-7

Estimated Regression Coefficients of the Industry-Domestic Sales  
Interaction Terms in Equations 09 and 12

Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
NON-METALLIC MINERALS				
lnDS*D1	-2.515**	0.579	-2.302**	0.668
lnDS*D2	-0.999**	0.266	-1.385	0.882
lnDS*D3	-2.269	2.981		
lnDS*D4	-1.669**	0.213	-1.777**	0.373
lnDS*D5	-0.609*	0.257	-0.829	0.594
lnDS*D6	-1.223**	0.452	-1.546*	0.666
lnDS*D7	-0.574	0.335	-1.631*	0.636
BASIC IRON AND STEEL				
lnDS*D8	-0.290	0.384		
lnDS*D9	-0.353	0.431		
lnDS*D10	-0.382	0.374		
lnDS*D11	0.048	0.277		
lnDS*D12	0.153	0.437		
lnDS*D13	-0.147	0.293	-0.581	0.622
lnDS*D14	0.372	0.689		
lnDS*D15	-1.334	0.915		
BASIC NON-FERROUS METALS				
lnDS*D16	-1.108**	0.366		
lnDS*D17	-2.024**	0.389	-1.989**	0.384
lnDS*D18	-1.825**	0.594		
lnDS*D19	-0.552	0.575		
lnDS*D20	-0.686	0.749		
METAL PRODUCTS				
lnDS*D21	-1.388	0.736		
lnDS*D22	-0.198	0.267	-0.119	0.342
lnDS*D23	-0.690*	0.288	-4.223**	1.138
lnDS*D24	-0.766*	0.340	-1.159	0.621
lnDS*D25	-1.219**	0.251	-1.197	0.818
lnDS*D26	-0.456*	0.228	-0.877	0.475
lnDS*D27	-0.635**	0.145	-0.216	0.285
MACHINERY				
lnDS*D28	-0.730	0.598		
lnDS*D29	-0.966**	0.211	-1.193**	0.439
lnDS*D30	-0.470*	0.214	-1.688**	0.551
lnDS*D31	-0.378	0.420	1.287	1.281
lnDS*D32	-0.233	0.175	-0.532	0.451
lnDS*D33	-0.462**	0.146	-0.490	0.288
lnDS*D34	-0.547	0.540		
lnDS*D35	-0.315	0.312		
lnDS*D36	-0.196	0.302		
lnDS*D37	-0.578**	0.156	-0.950*	0.428

Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
ELECTRICAL EQUIPMENT.				
lnDS*D38	-0.295	0.239	-1.364	1.870
lnDS*D39	-0.577	0.302	-5.134*	2.009
lnDS*D40	-0.676*	0.265	-2.404*	1.205
lnDS*D41	-0.201	0.278	-0.584	1.371
lnDS*D42	-0.582**	0.177	-1.150**	0.302
lnDS*D43	-0.985**	0.216	-2.131**	0.635
lnDS*D44	-0.088	0.223	-0.338	0.529
TRANSPORT EQUIPMENT				
lnDS*D45	-0.814*	0.324		
lnDS*D46	0.210	0.469		
lnDS*D47	-0.109	0.179		
lnDS*D48	-0.335**	0.122	-0.851*	0.409
lnDS*D49	1.637	4.201	1.553	4.151
lnDS*D50	-1.077**	0.340		
lnDS*D51	0.225	0.420		
WOOD				
lnDS*D52	-0.686**	0.172	-0.678	0.441
lnDS*D53	1.090	1.389		
lnDS*D54	-1.227**	0.226	-2.208**	0.555
lnDS*D55	-0.942	0.533		
FURNITURE				
lnDS*D56	-1.079**	0.183	-0.857**	0.244
lnDS*D57	-1.114	0.612	-0.502	2.787
lnDS*D58	-0.644	0.787		
lnDS*D59	0.530	0.794	0.762	2.921
PULP AND PAPER				
lnDS*D60	-1.953*	0.760		
lnDS*D61	-0.994**	0.188	-2.264**	0.365
lnDS*D62	-0.667**	0.172	-0.864**	0.224
lnDS*D63	-0.074	0.767		
RUBBER PRODUCTS				
lnDS*D64	-0.296	0.343	-1.231	6.473
lnDS*D65	-1.316	0.725	-1.052	1.278
lnDS*D66	-1.738	1.005		
lnDS*D67	-0.861**	0.259	-0.714	0.420
lnDS*D68	-0.751**	0.170	-1.408**	0.356
lnDS*D69	-0.100	0.299		
lnDS*D70	-0.487*	0.246	-1.046	0.773



Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
CHEMICALS				
lnDS*D71	-1.366**	0.155		
lnDS*D72	-0.012	0.369	0.235	0.421
lnDS*D73	-2.305**	0.586		
lnDS*D74	-1.279*	0.518		
lnDS*D75	-0.804**	0.291		
lnDS*D76	-0.840	1.004		
lnDS*D77	-0.852**	0.146	-1.134**	0.259
lnDS*D78	-1.608**	0.586		
lnDS*D79	-0.571*	0.291	0.022	0.378
lnDS*D80	-0.506	0.306	-0.691	0.666
lnDS*D81	-0.841**	0.227		
lnDS*D82	-1.079**	0.229	-1.437*	0.627
PHARMACEUTICAL, COSMETICS AND SOAPS				
lnDS*D83	-0.301	0.164	-0.437	0.319
lnDS*D84	-0.903**	0.251	-1.030**	0.393
lnDS*D85	-0.844**	0.215	-0.519	0.278
PLASTICS				
lnDS*D86	-0.873	0.581		
lnDS*D87	-0.432	0.324	-0.529	0.406
lnDS*D88	-0.437	0.382	-0.367	0.818
lnDS*D89	-0.338	1.084		
lnDS*D90	-0.777	0.513	2.567	2.708
lnDS*D91	0.115	0.434		
lnDS*D92	-0.548	0.323	-0.058	1.082
TEXTILES				
lnDS*D93	-1.458**	0.222	-1.003*	0.475
lnDS*D94	-0.746**	0.010	-1.247**	0.348
lnDS*D95	-0.988**	0.220	-0.968*	0.385
lnDS*D96	0.680	0.669		
lnDS*D97	-0.114	0.448		
lnDS*D98	-0.565	0.525		
lnDS*D99	-0.466	0.286	-0.369	2.611
CLOTHING				
lnDS*D100	-0.645**	0.163	-0.420	0.321
lnDS*D102	-1.751**	0.314	0.152	2.087
lnDS*D103	-0.035**	0.919	0.357	1.398
FOOTWEAR				
lnDS*D101	-1.233**	0.086	-0.656	0.415

Variable	Equation 09		Equation 12	
	coefficient	standard error	coefficient	standard error
FOOD				
lnDS*D104	-0.849	0.563	-0.715	0.586
lnDS*D105	-0.467	0.606		
lnDS*D106	-0.585	0.870	-1.117	1.144
lnDS*D107	-0.791	0.452		
lnDS*D108	-1.005**	0.130	0.368	0.968
lnDS*D109	-1.103**	0.230	-2.771**	0.731
lnDS*D110	-1.296**	0.230	-1.369**	0.300
lnDS*D111	-0.620	0.336	-1.230**	0.397
lnDS*D112	-0.996**	0.308	0.056	0.993
lnDS*D113	-1.369**	0.229	-1.356**	0.286
lnDS*D114	-1.466**	0.255	-1.420**	0.314
lnDS*D115	-0.327	0.345	-0.005	0.598
lnDS*D116	-0.598	0.758	-0.800	0.924
lnDS*D117	-0.582**	0.218	0.263	0.490
lnDS*D118	-1.901**	0.633		
lnDS*D119	-2.960	2.511		
lnDS*D120	-0.921**	0.311		
BEVERAGES				
lnDS*D121	-1.122	0.577	-0.927	0.690
lnDS*D122	-1.530**	0.248	-0.929**	0.356
lnDS*D123	-0.220	3.171		
lnDS*D124	-0.673	0.434		
TOBACCO				
lnDS*D125	-0.768**	0.203	-0.897**	0.245
PRINTING				
lnDS*D126	0.202	0.532		
lnDS*D127	-0.868	0.521	-2.285*	0.944
OTHER MANUFACTURES				
lnDS*D128	-0.177	0.519	1.049	1.219
lnDS*D129	0.302	0.440	-2.473	4.283
lnDS*D130	-0.028	0.458		
lnDS*D131	-0.886*	0.422		
lnDS*D132	1.369	0.716		
lnDS*D133	-2.707*	1.099		
lnDS*D134	-0.186	1.659		
lnDS*D135	0.703	1.217		
lnDS*D136	-0.461	0.683		
lnDS*D137	0.034	0.520		
lnDS*D138	-1.067	2.429		
lnDS*D139	-1.117**	0.123	0.180	0.745

Note: (\*) indicates significance at the .05 level of confidence and (\*\*) at the .01 level.

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