THE DETERMINANTS OF EXPORT PERFORMANCE

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ABSTRACT

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Neoclassical trade theory and its extensions are presented to provide a basis for understanding the determinants of export performance. Past empirical studies are also utilized to aid in the formulation of hypotheses to explain revealed comparative advantage in the case of Indian exports. A cross-sectoral analysis of 57 manufacturing industries within India employs both economic and policy explanatory variables. Ordinary least squares and Probit methods test the potential determinants of export performance and direction of trade.

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CHAPTER I

INTRODUCTION

Many theoretical and empirical studies emphasize relative cross-country performance in exports within the broad context of the role of exports in developmental strategy. The focus of this thesis is more limited; the goal is only to explain inter-industry differences in export performance within a country. The role of exports in development is not directly addressed; rather, it is implicitly assumed that improvements in export performance are desirable objectives and in this context, what becomes important is the identification of industry characteristics which are most conducive to export performance.

The methodology for identifying determinants of revealed comparative advantage (RCA) begins in chapter two with a discussion of the neoclassical trade theories of Ricardo and Hecksher-Ohlin, theory extensions that examine additional factors, and explanations of observed trade patterns which incorporate demand constraints and imperfectly competitive markets.

Chapter three presents approaches to measuring trade performance and constructing explanatory variables. Comparative

advantage determinants, including the effects of government policy, and their expected performances are discussed.

The source of the set of industrial data of India is discussed in chapter four. Dependent variables are constructed to measure export performance to developed countries (DCs) and to less-developed countries (LDCs). Regressions and the performance of independent variables are analyzed, in order that some standardized results can be extracted.

Chapter five completes the presentation with a summary and concluding remarks on the orientation of this analysis. Suggestions are posed for future approaches which might strengthen the results achieved here.

CHAPTER II

TRADE THEORY

Contemporary researchers give much attention to plausible explanations for trade flows because the existing neoclassical trade theory literature is inadequate in regards to explanation of observed trade patterns. It is therefore recognized that supply-side theories of comparative advantage must be supplemented by hypotheses which explain trade in an imperfectly competitive world and in light of demand constraints and factor mobility. This chapter surveys all hypotheses in order to augment the number of factors which may be suggested as determinants of export performance.

The Supply Side of a Trading Economy

Neoclassical trade theory centers upon a comparison of autarkic and open economies, examining conditions which give rise to trade between nations. Generally, models such as Ricardo's and the Hecksher-Ohlin theorem specify two commodities, each produced in two countries. Factors are homogeneous and mobile within, but not between, countries. David Ricardo hypothesized that economies may exhibit different production functions, and thus different relative prices, for identical commodities. Comparative advantage results

in incentives for trade, even when one country is more efficient in the production of both goods. After trade, each country tends toward specialization in the production of the good for which price, as measured in quantities of the other good, is cheaper relative to its trading partner. Terms of trade will prevail between the two autarkic relative price ratios. The reason for the existence of different production functions is not examined in detail by Ricardo; it is assumed to exist due to differences in technology. For this model, it is assumed that labor is the only input, however, this is not a crucial assumption.

Should technology be considered a factor input, then Ricardo's theory becomes one of different relative factor endowments. Hecksher and Ohlin identify endowment differentials as the precondition to trade, where production functions for each commodity are identical between countries, which necessarily implies identical technological states. Hecksher and Ohlin model a world where two countries produce two commodities utilizing two homogeneous factors of production, with incomplete specialization in production in each country. Pure competition in the goods and factor markets prevails, as does the absence of trade impediments such as tariffs and transport costs. Production functions are linearly homogeneous, with output dependent only on inputs of factors which enter into their respective production processes and factors indifferent between uses

and of the same quality in both countries. In addition, factors are inelastically supplied, and nonreversible and different factor intensities are exhibited in each commodity between countries (Chacholiades, 1973). Factors of production may be interpreted in the following manner, in order that the assumption of identical production functions is a more palatable one: "(a) a concrete input item purchasable in the market place; (b) as a nonappropriable factor (e.g., weather) that is free though [sic] not available in unlimited quantities; and (c) as a condition bearing on production (e.g., technical knowledge)" (Chacholiades, 1973, p. 224). When Samuelson's definition is applied, two countries employ the same tangible and intangible factors in their respective production functions, although each may operate in a different region on the function.

The Hecksher-Ohlin theorem predicts that countries employing two tangible and homogeneous factors, capital and labor, and numerous intangible inputs, will have a comparative advantage in the production of the commodity which more intensively uses that country's relatively abundant (tangible) factor. This way, factor endowments alone, and not production functions, are used to explain comparative advantage leading to specialization and trade patterns. The proof of this follows from the Rybczynski theorem. Explaining what happens to allocation of resources when factor endowments

change, this theorem also sheds light on the differences in production in autarkic economies with different relative endowments. "At constant prices, an increase in one factor endowment will increase by a greater proportion the output of the good intensive in that factor and will reduce the output of the other good" (Ethier, 1983, p. 100). The Lerner-Pearce diagram and the Edgeworth-Bowley box diagram (Appendix 1) illustrate these effects.

The Stolper-Samuelson theorem examines the effects upon relative factor prices when trade is initiated. Factor endowments in each country are assumed to be constant, hence "an increase in the relative price of the labor-intensive good will increase the wage rate relative to both commodity prices and reduce the rent relative to both commodity prices" (Ethier, 1983, p. 99). Thus, when a labor-abundant country offers the labor-intensive good in an international market, the change in the terms of trade occurs because of an increase in the capital-labor ratio in both industries. The proof of this is set forth in Appendix 1. A one-to-one correspondence between the wage-rental ratio and the capital-labor ratio requires that, given an increase in the wage-rental ratio, the capital-labor ratio employed in the capital-intensive industry will exhibit a greater responding change than the labor-intensive industry. The capital-intensive industry will reduce their demand for labor by more than their sacrifice of capital, and

the labor-intensive industry absorbs these displaced factors. Hence, initiation of trade in the case of the labor-abundant country raises the price of the labor-intensive good, the wage rate, and the output of the labor-intensive good, at the expense of output in the capital-intensive good. The labor-abundant country becomes more specialized after the initiation of trade, a result which is predicted by the Hecksher-Ohlin theorem when two countries are of disparate factor endowment ratios.

A related result of this model is the Factor-Price Equalization theorem. For the same reason that the wage-rental ratio rose in the labor-abundant country, so must it be that this ratio fell in the capital-abundant country at the onset of trade. Continuing trade between partners, where n factors produce n commodities which move freely between countries, will over time result in identical wage-rental ratios for all open economies. Note that equalization of factor prices is a misnomer; factor price rental ratios will be equalized, but actual prices may differ due to differing domestic interest rates.

Figure 2.1 represents the one-to-one correspondence of factor prices, relative commodity prices, and capital-labor ratios, for two goods, A and B, where commodity A is capital-intensive relative to B. Further results may be derived from this diagram. When a country's endowment is given by OE, the prevailing wage-rental ratio

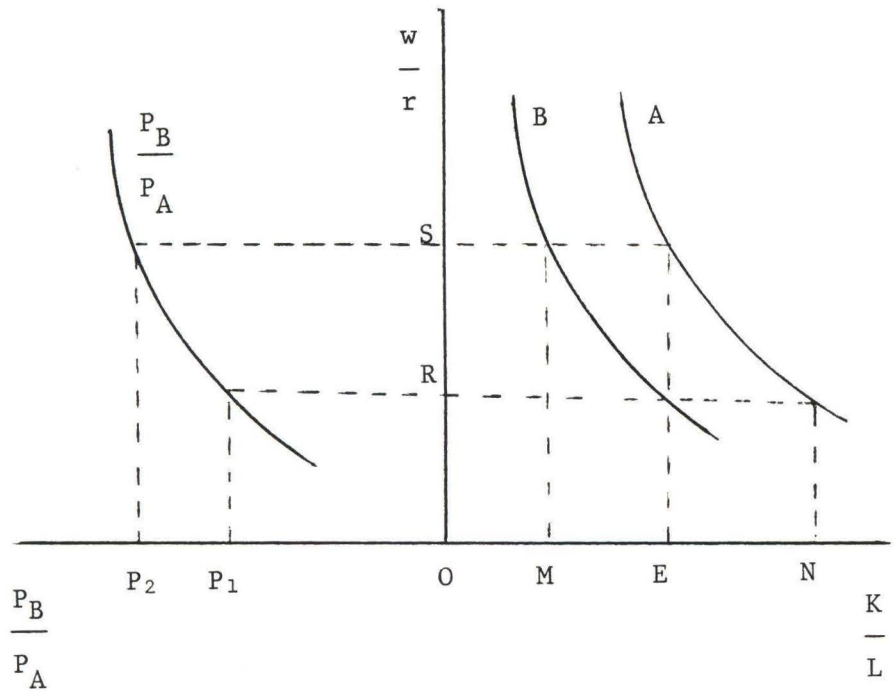

Figure 2.1

FACTOR PRICES AND CAPITAL-LABOR RATIOS

must lie between OR and OS, dependent upon which good possesses the comparative advantage. Relative prices will lie between OP_1 and OP_2. Trade will only occur with a country whose endowments are within the range of OM and ON, in order that pre-trade relative price ranges overlap. Without this precondition, the Factor-Price Equalization theorem fails. Also, when endowment levels are identical, not only factor-price ratios, but absolute factor prices will be equalized by trade. Hecksher-Ohlin require different relative endowments to explain directions of trade. However, it is clear from this analysis that some similarity between nations may be a prerequisite to trade.

The Hecksher-Ohlin theorem requires that a country must be classified as labor- or capital-abundant. A physical definition of factor abundance states that a country is capital-abundant when the ratio of total capital to labor endowment in that country is larger relative to another country. Because of a unique correspondence between factor quantities and prices, the price definition holds that a capital-abundant country may be so defined when its autarkic wage-rental ratio is greater relative to another country. The price definition may include some component of demand, so it is less practical to use within a theory of strictly the supply side. Lancaster defined factor abundance whereby a country is identified to be abundant in the factor which is intensively used in the production of the exported commodity. This would cause Hecksher-

Ohlin to be a tautology, rather than a theorem; this definition is therefore ignored.

Strict assumptions of the Hecksher-Ohlin theorem do not prevent it from having some explanatory power for empirical observations of trade. Demand and factor-intensity reversals change the outcome, but in general, it appears that trading countries frequently embody their abundant factors in exported goods. Leontief's paradox questions the reasons why this has presumably not been the case in the experience of the United States. The U.S., like other high-income countries, is capital-abundant relative to labor, yet its imports and import-competing goods are capital-intensive. Most explanations of the paradox allow for the general framework of Hecksher-Ohlin to stand. Factors are in reality, however, heterogeneous; Leontief hypothesizes that U.S. labor is more efficient than labor of trading partners. The U.S. is therefore relatively more abundant in human capital. With this adjustment, the actual experience of the U.S. conforms to Hecksher-Ohlin in that its exports are skilled labor-intensive.

When factor-intensity reversals occur, a crucial assumption of Hecksher-Ohlin is violated, and the theorem is unable to predict patterns of trade. Within some wage-rental ratio range, production is intensive in one factor; at different wage-rental ratio ranges,

production will be intensive in the other factor. Given the existence of reversals, no unique correspondence between capital-labor and wage-rental ratios is maintained and hence, the direction of trade cannot be predicted. In reference to figure 2.1, curves A and B would intersect at the point of reversal. When both countries are either above or below the point of reversal in autarkic factor prices, the contract curve (see Appendix 1) for each country will lie on the same side of the diagonal, but factor-intensity reversals will not occur. Factor prices will be equalized through trade and, given homothetic tastes, the results of Hecksher-Ohlin will hold. The Factor-Price equalization theorem and Hecksher-Ohlin are also true when one country is at, and the other country below, the point of reversal.

When both countries are at the point of reversal, factor prices will already be equal and no trade will occur. When each country's prevailing wage-rental ratio is on opposing sides of the reversal point, commodity A will be labor-intensive in one country and capital-intensive in the other. Both countries would tend toward specialization in the same commodity and, should trade occur in the labor-intensive good, the wage-rental ratios will rise in both countries. The size of the gap between countries' factor price ratios changes in an indeterminate

direction; hence, the Factor-Price Equalization theorem is not unambiguously true. The pattern of trade cannot be predicted, but it is clear that when the labor-abundant country exports the capital-intensive good, the wage-rental gap between trading partners will widen.

When explanations of the paradox do not support Hecksher-Ohlin, it may be due to the fact that this model fails to consider the demand side of the economy. The existence of demand reversals would mean that the U.S. was a net importer of capital-intensive goods because their preference for such goods was great, relative to the rest of the trading world. Further considerations of the demand side are presented in the following section.

The Demand Side of a Trading Economy

Ricardo's illustration of comparative advantage rested upon the assumption of two countries' linear production possibilities frontiers having different slopes. With the introduction of a second factor input by Hecksher-Ohlin, the same argument holds, except that frontiers are convex due to diminishing marginal productivity. Different slopes imply different marginal rates of transformation between countries. It is assumed that each country

is efficient in production, i.e., they operate at a point on their respective frontiers. It is a fallacy of composition to say that world-wide efficiency is realized when all countries operate on their frontiers. The theory of comparative advantage provides a unique point on each frontier to ensure world-wide efficiency.

For simplification purposes, all individuals in an economy are assumed to have similar and homothetic tastes. A community indifference curve may then be derived by summing over all individual indifference curves, with the slope reflecting the marginal rate of substitution in consumption. When the slopes of the production possibilities frontier and the community indifference curve are the same, equilibrium in the domestic goods market will prevail. In figure 2.2, TT represents a country's production possibilities frontier. In autarky, commodities A and B are produced in quantities Q_{A_0} and Q_{B_0}, respectively. Initiation of trade results in a movement from M to N, which increases the relative price of B, as shown by T'T'. Imports can satisfy an excess demand for A; the community is enabled by trade to move to the higher indifference curve III, to the point of tangency to T'T', S. The movement from indifference curve I to curve III is total gains from trade. Consumption of B, as drawn in this case,

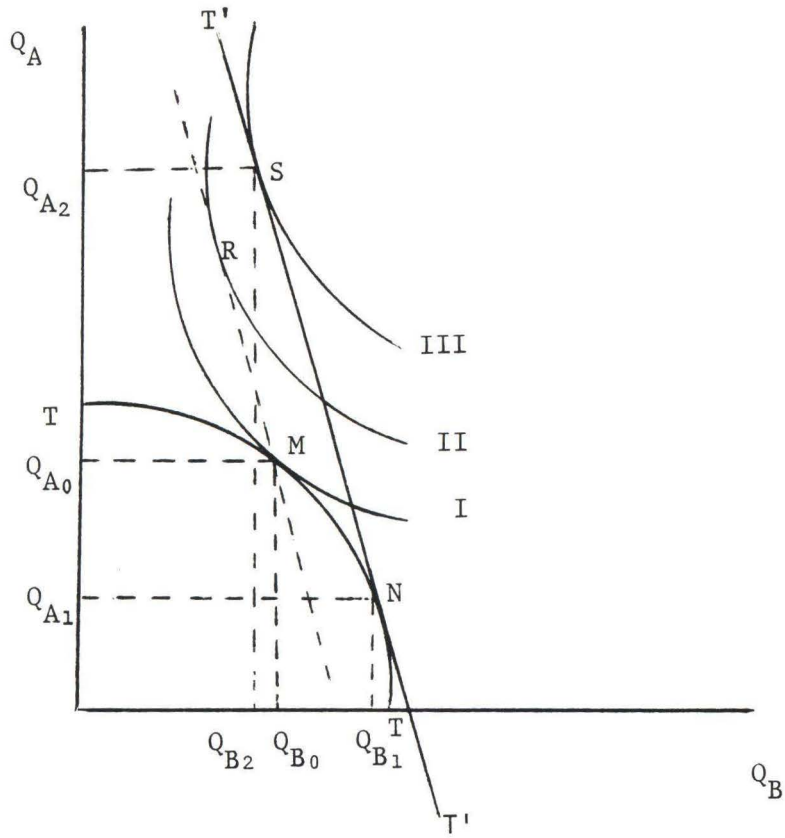

Figure 2.2

GAINS FROM TRADE

has declined because trading partners place a higher premium on B than do domestic consumers. Increasing exports of B diminish their marginal utility to the importing country, until universal marginal rates of substitution and world equilibrium exist. This is derived by drawing a parallel to T'T' through M. It is tangent to indifference curve II at point R, which is where marginal rates of substitution are everywhere the same. The movement from M to R thus represents the consumption gains to trade, and R to S, the production gains.

The patterns of trade will be such that Q_{B_1} minus Q_{B_2} quantities of B will be exported in exchange for Q_{A_2} minus Q_{A_1} quantities of A. Utility is maximized, as Q_{A_2} minus Q_{A_0} increased consumption of A more than compensates for the loss of Q_{B_0} minus Q_{B_2}, as shown by the movement from indifference curve I to III. When domestic demand constraints are lifted, a nation is free to choose the most efficient point on their production possibilities frontier, given world demand.

Prevailing terms of trade equate domestic excess supplies and demands, so that the value of exports equals imports. Succinctly stated by Walras' Law, the sum of all the excess demands for all commodities and services must be equal to zero. It is

clear that this condition is satisfied most optimally when it is applied to the broader world economy. Given two (domestic) markets, if one is in equilibrium, so must it be that the other market also be equilibrated.

In order that equilibrium is realized, there must exist some correspondence between a country's propensity to import and to export. Elasticity of import demand with respect to price, e, and elasticity of exports, f, are related in the following manner:

$$e - 1 = f$$

Elasticity of exports with respect to imports, g, is such that:

$$g = (f/e)$$

When e is greater than one, g is positive; conversely, an inelastic import demand causes g to be negative. When this is the case, a rise in imports will be met by a fall in exports.

The offer curves of figure 2.3 provide a graphic expression of demand in two countries. The domestic country, D, produces A for domestic consumption and export, therefore its offer curve is concave with respect to 0, representing the locus of excess supply and demand values at different relative prices. The trading partner, F, specializes in the production of B. Should comparative advantage

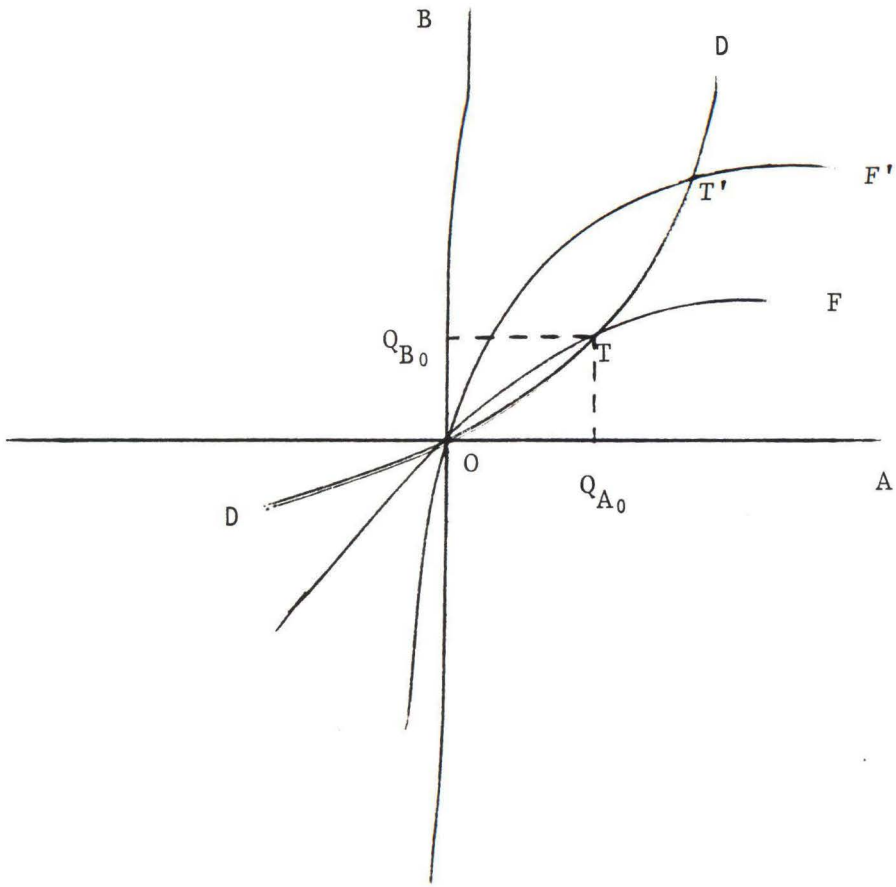

Figure 2.3

OFFER CURVES

for each country exist in the alternative commodity, their offer curves would intersect in quadrant three.

At O, no trade exists, and D has a lower autarkic price for A. Point T relates the quantity of exports of B, Q_{B_0}, that D will trade in exchange for Q_{A_0} units of A. The offer curve analysis may be extended to illustrate the results of the Rybczynski theorem. When F experiences an increase in the endowment of its abundant factor, comparative advantage is enhanced. Its production becomes more specialized in A, and levels of trade increase to T', on the new offer curve F'. Conversely, an increase in the non-abundant factor endowment will shift F's offer curve downward, diminishing trade levels. Note that positively-sloped portions of offer curves relate to an elastic import demand.

Demand for imports is dependent upon tastes, assumed to be similar and homothetic for all consumers within a country. Preference for type and variety of goods is reflective of per capita income levels, along with other sociological variables. Because a greater variety of commodities tend to be demanded at higher income levels, a greater diversification in domestic production is most often exhibited. It is the existence of a domestic market giving rise to production and interaction which Linder's hypothesis cites as the prerequisite to a potential export. Clearly, a domestic

market for imports must also exist, therefore it can be inferred that similarities between domestic markets lead to greater possibilities for traded goods. Income per capita is positively correlated with capital-labor ratios, so this appears to contradict Hecksher-Ohlin, which required differences between endowments of trading economies. Nevertheless, and as shown in figure 2.1, some similarity is required. Also, Linder's hypothesis can supplement the Hecksher-Ohlin theorem by explaining which goods may be traded, whereas Hecksher-Ohlin specifies the direction of trade.

The Product Cycle model, developed by Raymond Vernon, examines the transfer of productive facilities over the life cycle of a good. Initially, a good is produced in proximity to the domestic market it was created for, and nearby to suppliers of inputs. Ultimately, production takes place in the least-cost location, the economy with a relatively greater abundance of the significantly employed inputs. Entrepreneurs, aware of both potential risk and opportunities, are required to institute organization geared toward production. Although theoretically access to knowledge and comprehension should be uniform throughout the world, some may be better equipped to assimilate scientific principles in order to create new products. Proximity to markets enables an entrepreneur a better grasp of opportunities. Markets in the U.S. exhibit a demand for commodities which are extensive in their relatively scarce labor resources.

Labor-saving goods will be devised therefore in the U.S. to satisfy domestic tastes. Countries which first exhibit a demand to import this type of commodity will be similarly endowed with a relative abundance of capital.

Location of production must be justified via more than a potential market; it is determined by the location of least cost. However, the optimal input mix is indeterminate for an unstandardized, experimental product. Furthermore, a unique or highly differentiated product will exhibit a low price elasticity of demand. As few substitutes exist in the early stages, cost considerations are outweighed by a need for productive proximity to markets to facilitate communication ease for producers operating under conditions of uncertainty.

Production begins and rate of growth of output increases at first, with domestic consumption growing in a linear trend. Soon after, demand begins growing in the same fashion in other developed economies, who satisfy their needs by importation of the new commodity. These countries are nearly as well suited to production of the innovative good, and shortly begin to substitute for this import with their own production. As the product matures, productive processes become fixed, and cost concerns become increasingly important. Increasing abilities to make cost projections arise as

uncertainty diminishes. Nationally, location shifts to most efficient producers. Next, LDCs become hosts for production of the now-standardized commodity, eventually becoming net exporters.

The Product Cycle model explains some cases of Leontief's paradox beyond the predictions of Hecksher-Ohlin, whereby a capital-intensive good is developed in a capital-abundant country, this country eventually becoming a net importer of the same good. However, because the productive processes change as a good matures, the commodity in its standardized form in some ways may be a different good. New commodities require significant research and development inputs, which are most abundant in DCs. A theory which considers only two factor inputs must group the research and development costs with all other labor costs, thus making the product out to be a labor-intensive commodity. However, DCs are not abundant in labor, so forcing the phenomenon to fit a two-factor model makes it appear to go against the predictions of Hecksher-Ohlin.

Trade Under Imperfect Competition and Distortions

Barriers to trade are enacted through the public sector when governments justify tariffs and quotas by virtue of their

expected long-run benefits. Additionally, the private sector may influence the actions of public policymakers. Labor and owners of capital seek to protect vested self-interests, whereby each group opposes foreign competition from goods embodying similar factors of production. It is presumed that labor desires protection from labor-intensive imports. When capital is heterogeneous, the capital employed in production of a labor-intensive good may be strictly suited to that production. Hence, owners of capital may also favor protection from labor-intensive imports. Whether labor or capital owners benefit from trade depends upon which factor is used most intensively in the production of exports. Barriers to trade reduce this benefit, in addition to depriving the world of net gains. Individuals who stand to incur losses from trade in an imperfectly competitive world with constrained factor mobility may be compensated by others so that they will not oppose trade. Since trade provides a net benefit, some will be better off, and others no worse off, when the compensation principle is employed.

Because they do exist, an empirical endeavor must address the effects of barriers to trade and other sources of imperfect competition. Tariffs increase the effective donestic price of a good, thus causing a less-than-efficient allocation of resources

when production of the protected good is stimulated. Tariffs and quotas are enacted to improve terms of trade and the trade balance. However a country may not be successful in reducing imports to improve the trade balance for several reasons. When import-competing industries are heavily subsidized, trading partners may retaliate by restricting their own imports from the protected country. This reduction in exports for the subsidizing country will worsen the trade balance. Import-competing industries often are of the final assembly type, requiring large quantities of intermediate imported goods. Often, this requirement is initially greater than the reduction of imports of final goods. Because endowment levels are fixed, initiation of import-competing production requires a diversion of resources away from other activities. Excess demand for the contracted industry's goods may have to be satisfied through increased imports. Hence, tariffs do not necessarily improve the balance of payments.

The Laffer curve shows a diminishing effectiveness of tariff rates upon tariff revenues. Effectiveness also depends upon the size of the country enacting the tariff. A large country, or one with significant market power over a particular commodity, can employ tariffs to alter their import-export ratio. What is termed the optimum tariff is that tariff which will

be sought by a country that seeks to maximize domestic welfare, but reductions in trade impose net production and consumption losses on the world economy.

Countries with dissimilar absolute endowment levels may partake in imperfectly competitive trade, when the larger economies experience increasing returns to scale. Should this be the case, or when products are highly differentiated, inter-industry trade may be explained by comparative advantage, but similar countries partake in intra-industry trade. Krugman pursued an analysis similar to those of Ohlin (1933), Balassa (1967), and Kravis (1971), seeking to explain the rise in trade among developed countries after World War II, in the context of scale economies. A Chamberlinian approach is employed in a model similar to the one developed by Dixit and Stiglitz (1977), explaining intra-industry trade attributed to internal economies. One factor input, labor, is used to produce n variety of commodities. A community indifference curve is derived whereby elasticity of demand, e, declines with utility. The production function relates the demand for labor, 1, derived as a function of output of good i; all commodities share this function and hence, the same price and output level.

$$1_i = \alpha + \beta x_i$$

The full employment equilibrium condition exhausts total labor supplies:

$$L = \sum_{i=1}^{n} l_i$$

Supply equals demand, expressed as consumption of the i^{th} good, c_i, by all labor:

$$x_i = Lc_i$$

Lambda in the following equation represents diminishing marginal utility of income; υ' is the first derivative of e; each producer can equate price, p_i, to the following demand condition:

$$p_i = \lambda^{-1}\upsilon'(x_i/L)$$

The profit-maximizing producer makes independent pricing decisions based upon output revenues and costs. Profit is denoted by Π, wages as w.

$$\Pi_i = p_i x_i - (\alpha + \beta x_i)w$$

New firms entering the market drive profits to zero, as illustrated in figure 2.4. From the previous equation, setting profits equal to

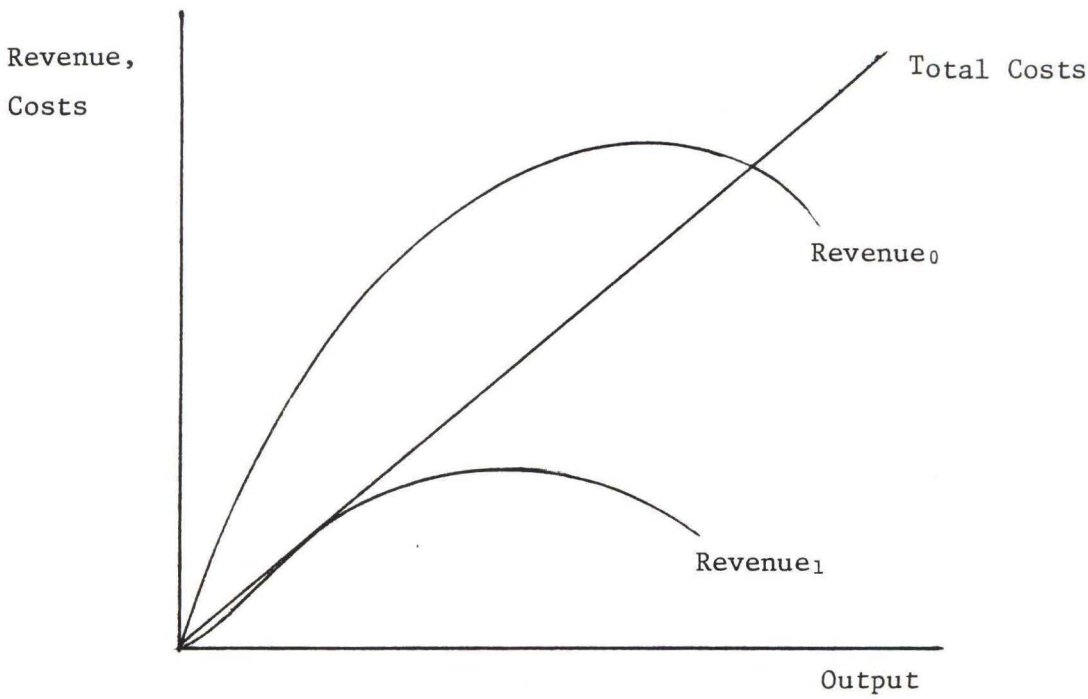

Figure 2.4

CHAMBERLIN'S TANGENCY SOLUTION (1962)

zero:

$$1) \quad \frac{p}{w} = \beta + \frac{\alpha}{Lc}$$

Given identical endowments and tastes amongst trading countries, the opening of trade is equivalent to an increase in the labor force, L. The number of commodities produced rises and consumption of each good declines when this occurs.

$$n = \frac{L}{\alpha} + \beta Lc$$

The graphic illustration of the result is provided in figure 2.5, where the ZZ curve, taken from equation 1, relates a change in consumption to a change in p/w, with profits set at zero. Equation two is reflected in the PP curve, showing that a rise in consumption reduces elasticity, necessitating an increase in the profit-maximizing price, p_i.

$$2) \quad p_i = \frac{e}{e-1} \beta w$$

Z'Z' is observed after trade; the new intersection shows how real wages may rise post-trade, number of commodities increases, and consumption of each good falls. Krugman's analysis derives the same conclusions as Linder's, who ignored economies of scale; both

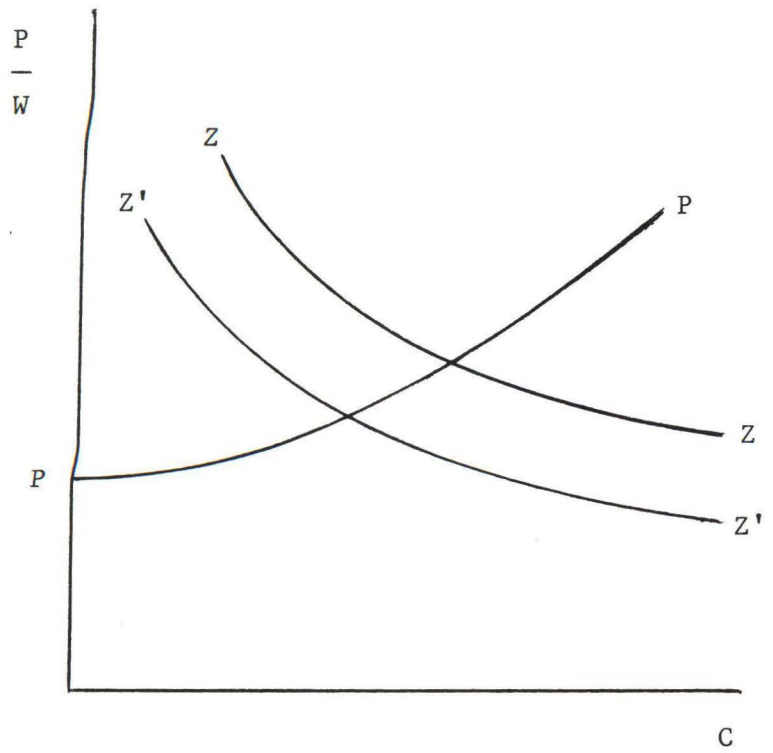

Figure 2.5

A LABOR FORCE EXPANSION

explain trade patterns between similar countries. This model cannot determine the direction of trade, but does point toward complete specialization. When trade occurs between different-sized economies, the larger region sustains a higher real wage and number of commodities, which further attracts labor. When one region is more efficient due to different production functions, this region will sustain the greatest growth.

Helpman (1981) hypothesizes a Hecksher-Ohlinian world with imperfect markets producing food and a variety of manufactured commodities. It is assumed that an array of utilities corresponding to consumption of manufactured goods lie along the circumference of a circle. Increasing arc distance from a consumer's ideal good requires compensation with successively larger quantities of the commodity in order to maintain utility. A simplifying assumption weights ideal goods of different consumers equally around the circle. Countries with relatively greater capital-labor ratios will trade a greater variety of manufactures, and some food will be imported. A larger divergence of factor ratios between countries reduces intra-industry trade and increases inter-industry trade.

The existence of scale economies requires the transformation of relative prices into "scale-adjusted prices" (Helpman) in order to predict trade patterns arising from comparative advantage.

When capital-labor ratios are identical, scale economies and not comparative advantage explain tendencies of trade. Since World War II, growth in food trade paralleled GNP growth, but growth in trade of manufactures greatly surpassed this rate. Helpman believes this is due to the realization of scale economies in manufacturing.

Lance Taylor (1981) divides the world economy into "North", "South", and "OPEC" countries, where it is assumed the North is the industrialized, capital-abundant country. Because demands for primary goods respond less to income changes than does demand for manufactures, the North exhibits inelastic demand for Southern exports, but are able to rectify their own excess capacities through exports to the South. The South grows in response to domestic savings, capital inputs from the North, which are fixed by political conditions, the North's marginal propensity to import, the Northern profit rate, and the proportion of GNP not required for oil imports. Constraints on growth rates are imposed by oil shocks, Northern productivity, savings, mark-up rate, and the proportionate cost of factor imports. The South's surplus of labor results in a fixed wage; commodity prices adjust to equilibrate markets. Conclusions are presented by Taylor which point toward tne need for a more competitive position by the South, to be achieved through exports of "more 'modern' products, reduction of

the need for imported capital goods, [and the] elimination of surplus labor" (Taylor, 1981, p. 601). Domestic growth is necessary for the South to become less dependent, because their foreign markets offer only inelastic demands.

Imperfections in actual trading conditions impair the results of trade theorems. Factor-price ratios fail to equalize when trade restrictions and transport costs inhibit trade flows, or when production functions differ. Furthermore, international factor movements may substitute for commodity movements across national boundaries. This possibility is taken up in the following section.

Substitutes to Trade

Incentives and disincentives to trade tend to affect the movements of factors, rather than commodities, in a positive way. Krugman's results from the initiation of trade are identical when labor moves between countries. The incentive for higher real wages attracts labor to the more efficient region; also, the attraction of more commodities causes the process of agglomeration to continue in the larger of the two regions. Increasing barriers to trade may lead to emigration as a substitute for trade, with

the economy enacting such barriers suffering the consequences of a "brain drain." Such losses are accentuated when labor embodies some private investment.

Capital investment decisions are undertaken primarily at the firm level; it is therefore less relevant to consider industry-wide or public sector concerns. Direct investment theories emphasize the microeconomic organization of the firm *which causes it to undertake foreign investments. Profit-*maximizers will direct capital toward the location where its employ yields the highest marginal productivity. Because capital movements flow both directions, a micro-macro perspective needs to be embraced which takes into consideration both the firm and the country of production. One theoretical approach emphasizes investment decisions which focus on capital formation rather than international movements. "Defensive investment" is undertaken to maintain a global market share (Robock & Simmonds, 1977, p. 38). Asset demand can determine the location of investment, when there are incentives and risks inherent in the holdings of different currencies.

Information may be a constraint which prevents firms from conducting a cost-benefit analysis, as distance hinders communi-

cation ease. Often it may be that the potential for such communication exists, but a firm which is not behaviorally-oriented toward international analysis of opportunities will fail to consider opportunities to invest abroad. A recent trend is one which takes many firms toward a philosophy encompassing global strategies in decision-making. This trend is seen as the main determinant of the historical growth of the multinational firm.

The oligopoly model hypothesizes that firms invest abroad when they may exploit a newfound monopoly power which arises in a foreign economy due to their possession of superior technology, management, marketing, financing, or scale. Access to capital or product differentiation through advertising can provide an edge over local producers. When net benefits are positive and greater than those potential gains from exportation of licensing of a local producer, capital will flow across countries. Vertical investments raise barriers to entry, thus perpetuating monopoly power. Used in concert with the behavioral theory, the oligopoly model explains contemporary patterns of capital movements.

Vernon's product cycle model (1966) explains the transfer of productive location. The new facility embodies foreign capital, when entrepreneurs' incentives justify a shift to the

least-cost location. Established exporters in the country of origin, potentially threatened by foreign governments and entrepreneurs, can preempt competition by timely relocation. In addition, international operators have access to financial capital in an international market, where interest rates are low and uniform relative to those in the local economy. These entrepreneurs only need justify the project on an international cost-benefit basis in order to secure the necessary funds.

The trend of growth of the international business organizatio can be explained in an historical perspective by environmental forces, technological trends, and the increase in the size of the typical firm. "Technological, managerial, and entrepreneurial skills, as well as natural resources, capital, and labor" are factors which have responded to supply and demand conditions, governmental actions, and desires of business firms (Robock & Simmonds, 1977, p. 43). Growth of the world economy is both a determinant and a result of expansion in the realm of the business organization. Cooperation between nations and reduction of trade barriers contributed to this growth, as did national developmental goals directed toward industrial expansion, where political, as well as economic goals have resulted in assistance for developing countries.

Sustained growth in LDCs is highly dependent upon the world's economic health. Upon the theoretical groundwork which has been presented, empirical trade patterns amongst LDCs, and between industrialized and less-developed economies, will be examined. Revealed comparative advantage (RCA) is presumed to be a result of relative efficiencies, endowments, market characteristics, barriers to trade, and international factor mobility. These issues will be addressed in the following chapter in the context of contemporary trade patterns.

Chapter III

EXAMINATION OF TRADE IN MANUFACTURES

The purpose of this chapter is to formulate hypotheses seeking to explain export performance of different manufacturing industries. Studies of cross-country variations in export performance are utilized when their conclusions are relevant for a cross-sectoral one-country analysis. Economic and policy variables designed to test various hypotheses regarding the determinants of export performance are discussed. Although they are interrelated, for purposes of clarity, economic and policy variables will be presented separately.

In recent literature, particular attention has been devoted to the export of manufactures from LDCs, partly because price fluctuations in primary goods have led to pessimistic attitudes for the future of LDCs' traditional exports. As the vast majority of manufactured exports of LDCs were produced in Brazil, Mexico, Argentina, India, Yugoslavia, and Turkey, these more advanced economies have been renamed the "Newly-Industrializing Countries" (NICs). All of the LDCs, including the aforementioned, export only the equivalent of Japan's exports in manufactures. With 50 percent of the world's population, 13 percent of its GNP, 8.8 percent of world output in manufactured goods, the share of LDCs in the export

of manufactures worldwide is 6.9 percent. There exists great disparity between actual performance and what is expected to be the potential of LDCs in the export of manufactures. The orientation of this thesis is a result of policy interest in exploiting this potential growth.

Measures of Export Performance

Two types of studies commonly conducted are cross-country and cross-sectoral analyses of trade performance. A common indicator of export performance in cross-country studies has been the export-output ratio. One of the inherent deficiencies of such studies is that countries vastly different in size have by definition greatly different national outputs. A large country may have therefore a much smaller export-output ratio, which need not imply that it is a less-successful exporter. Indeed, for an economy with a large domestic market, the need for export performance to aid developmental efforts may be less.[1] The measure of relative shares of exports in output across industries is void of such deficiencies, and the need for export performance should be undifferentiated amongst producers. The export-output ratio is therefore the most appropriate gauge of cross-sectoral performance.

A different specification of the performance measure indexes

exports of an industry i from a country j, relative to export performance of the same industry across countries (Hirsch, 1977).

$$EP_{ij} = \frac{\dfrac{X_{ij}}{\sum_{j=1}^{n} X_{ij}}}{\dfrac{\sum_{i=1}^{m} X_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} X_{ij}}}$$

Although this compares countries, it can easily be modified for use in a one-country analysis. In this case, an industry i's performance is measured relative to that of other industries in the domestic economy. Industries which export greater proportions of output, Q_i, than the average industry exhibit RCA in the production of that commodity.

$$EP_{ij} = \frac{\dfrac{X_i}{\sum_{i=1}^{n} X_i}}{\dfrac{Q_i}{\sum_{i=1}^{n} Q_i}}$$

Balassa's measure of RCA relates net exports to a trading partner of

good i, relative to total trade in i.

$$EP_i = \frac{X_i - M_i}{X_i + M_i}$$

It is the net flow which is more often observed, hence Balassa's method may be superior. Imports and exports of the same commodity don't make sense in the context of trade theories, but actual world trade is comprised of differentiated products. Hence a country may import and export what appears to be the same good. But data are not available in sufficiently disaggregated levels, so it is preferable to use net flows as a measure of performance.

The Determinants of Manufactured Export Performance

One of the most basic paradigms of trade theory as mentioned in chapter two is that of the Hecksher-Ohlin theorem. The capital-labor ratio measures intensity of these two factors in production. When wages, W_i, represent the contribution of workers, N_i, the remainder of value added, V_i, is attributed to capital (Hirsch, 1971).

$$K_i = \frac{V_i - W_i}{N_i}$$

However, labor and capital are not the only inputs, so a skill-expanded view of trade theory identifies human and physical capital intensities. Alternative approaches isolate skilled from unskilled labor, or technology as disembodied from the traditional two inputs. Cline & Delgado (1978) used extensions of Hecksher-Ohlin to include neo-factor proportion and neo-technology variables. The latter approach considers research and development expenditures relative to total costs, viewing the separate effects of technological and capital factors. It should be noted that research and development, capital, and skills indices are likely to be correlated as each involves investment expenditures. Skilled labor is created after a period of human capital investment spending, in much the same manner as physical capital formation.

Manufactured inputs produced within a country embody technical "know-how" of the domestic labor force. The larger is a country's capital goods sector, the better equipped it will be to accomodate the needs of producers for manufactured inputs. And the more intensively these inputs are employed, the greater is the reliance of producers on the quality and availability of capital goods. Hence, final goods can be more competitive when required manufactured inputs are efficiently and abundantly produced.

Natural resource abundance increases comparative advantage for

non-industrialized countries relative to their more developed trading partners in the production of raw material-intensive commodities. Proxies have been constructed by Morrison (1976), who uses an inverse of population density to represent natural resource abundance. Countries abundant in natural resources are less likely to export manufactured products, and of the leading industrialized exporters, few are rich in natural resources. But scarce natural resources do not confer a comparative advantage in manufacturing. Resource-poor Taiwan and Korea have achieved significant success in manufactured exports; of total manufactured exports from LDCs, sixty percent come from the densely settled East Asian countries. This statistic supports Morrison's measure, in that successful exporters from densely settled economies have had to rely upon the export of manufactures for satisfactory performance in exports. Within a resource-rich country, those industries which most intensively employ available raw materials would exhibit the greatest comparative advantage in exporting goods to the less endowed economies.

Directions of Trade in the Determination of Export Performance

It has been shown that neo-Hecksher-Ohlin approaches can be used to explain trade flows, but these trade theories must be utilized in the context of a country's comparative advantage relativ

to that of a trading partner's. Whereas exports of NICs to LDCs are often capital-intensive, the flow of goods from NICs to DCs is of the less-manufactured, primary group. Hecksher-Ohlin fails to explain trade between countries when relative endowments are identical, hence generalizations regarding North-South and South-South trade flows normally assume such differences in endowments do exist. South-South trade theories therefore examine the trading patterns between NICs and LDCs.

The changing direction of trade flows has been addressed in recent literature. Presently, penetration of DC markets by LDCs, especially in manufactures, is slight. In only a few goods, such as televisions, radios, and cotton, does there exist significant market penetration (Keesing, 1979b). Future potentials for export markets are analyzed in light of dynamic trends for South-South and South-North flows. Historically, South-North trade has diminished, and North-North trade has increased, relative to total trade flows. This trend has been particularly pronounced in the past 30 years. This has resulted in a great deal of research and optimism for the future of South-South trade, particularly as the Third World nations grow more economically heterogeneous.

In the 1960's South-South trade in manufactures grew at ten percent per annum, while North-North trade increased by 26 percent.

Export growth between two countries is reflective of changes in comparative advantage which occur over time, growth in demand for particular commodities, economic growth, and inflation. Tyler (1972) suggests that when Brazil's share of world trade declined, it may have been due to a small rate of growth in either the demand for those particular commodities, or in the export markets themselves. However, further analysis suggests that Brazil might have become less able to compete during this time, which is probably due to the misallocation of resources and subsequent cost-raising effects arising from high levels of protection.

During the 1960's, 25 percent of South-North trade in manufactures was comprised of clothing, with textiles, engineering, and metal products making up a large remainder. From 1962 to 1969, exports of these few commodities grew at more than two times the rate of growth of world trade, resulting in an increased share for developing nations in total trade. Most gains were realized by such countries as Hong Kong, Mexico, and Singapore, whose exports were purchased by the United States.

In the 1970's new commodity exports of Brazil found new markets in Socialist countries, and increasing manufactured exports were absorbed most by other LDCs. Of total Brazilian exports of manufactures, 42 percent were purchased in Latin America, 25

percent by Argentina. Mostly machinery was exported to the other Latin American countries, while chemicals for intermediate uses dominated the flow of manufactured exports to DCs. Correlating with this growth in South-South trade was a decline in the proportion of coffee exports and an increasing diversification of manufactured Brazilian exports.

Within the realm of a two-country analysis, trade flows for more than two commodities can be predicted using Deardorff's "chain-of-comparative advantage" (1979). In his model of free trade, it is necessarily the case that exports from the country with cheaper capital are in general more capital-intensive than the country's imports from this trading partner. Using this ranking to analyze strictly bilateral trade when intermediate goods and barriers to trade don't exist, Deardorff can explain directions of trade and potentially traded goods within the broad theoretical context of Hecksher-Ohlin.

Other Determinants of Performance

Growth in domestic or foreign economies can render a change in the export performance of a producer, and this growth is not only subject to market forces, but also it responds to influences from the government sector. Domestic demand has at times been

observed to be negatively correlated with export flows whereby a recession in the producer's economy might induce him to enlarge his export market. This "recession-boom" effect could feasibly be intensified by policies. For instance, the "exportable surplus" policy in Brazil specified that domestic markets must be satisfied before a producer should be allowed to export. In cases where a recession and an increase in export propensity have been simultaneously observed, the recession-boom effect appears to have declined over time, as exports became viewed by producers as more than merely a second-best solution to the problem of excess supply.

Often, manufactured exports of LDCs are initially in processed goods requiring imported factors. The domestic value added component of exports should be examined to determine factor intensities for domestic processing. It is conceivable that exports might be capital-intensive, but capital inputs are primarily imported, and domestic production is unambiguously labor-intensive. Also, imports don't represent consumption when imported inputs are "consumed" in the manufacturing of exports. For instance, Singapore has trade levels which are large relative to GNP, due to its functioning as an entrepôt. Minimal reliance upon imports means less uncertainty regarding future ability to export, and greater net foreign exchange earnings, important in a developing country which requires and demands growing imports for various purposes. As

countries develop, they often reduce dependency on foreign suppliers by becoming vertically integrated and domestically producing more and more of their inputs. Protection for import-competing industries can raise costs for users of factor imports. Thus producers of goods intensive in imports are vulnerable to foreign and domestic constraints created by both market forces and policy-makers.

Usually, 60 to 70 percent of a commodity's price is accounted for by raw materials and intermediate inputs, so a change in input costs will result in a significant impact on price. These costs, when inputs are imported, are beyond the control of the domestic producer. However, this heavy reliance upon costs, quality, time of delivery, and associated services suggests also that great caution should be exercised in attempting to substitute new domestically produced inputs for imported ones. Poor quality factors tend to result in less competitive exports.

Eleish (1963) utilized input-output analysis to measure linkages for Egyptian producers, most of whom were heavy import users. Capital-intensive goods require varying degrees of imports, depending upon their final use. Investment goods require 47 percent imported inputs, compared to 15 percent for consumer goods, 12 percent for government purchases, and seven percent for exports. As

technological proficiency proceeds with development, input-output ratios decline and the optimal input mix adjusts. Domestic factors may replace imports, resulting in a change in comparative advantage. Eleish found that these changes are gradual; thus, although it is a dynamic measure of import content that is useful for those concerned with opportunities for development, a static measure may be validly used for examining RCA.

Changes in production within an economy have been shown to occur over time, correlated with changes in relative abundance of factors. As development ensues, manufacturing displaces primary production and technologies employed become increasingly sophisticated. Traditional goods are replaced by processed substitutes as a result of both technological advances and dynamic comparative advantage adjustments. Natural resources may become exhausted, or at least relatively scarce; capital formation increases the size of the industrial sector, and population control and education alter the composition of the labor force. Economic growth may lead to the realization of scale economies in some sectors, and changes in demand in others. Export earnings become more stabilized as exports become both more diversified and sophisticated. Political interventions and instabilities may lessen, reducing uncertainty for entrepreneurial and research activities. In the changing environment of LDCs, dynamic comparative advantage shifts.

Policy actions can alter the course of dynamic comparative advantage. Observed performances of countries seem to have been greatly affected by the policies which were pursued. Keesing (1979b) questions to what extent policies have affected the present situations in India and Korea. Controversy arises between those who believe developing countries can successfully imitate their predecessors and those who specify the need to look at particular characteristics of countries. Brazil's successful export years were preceded by an era of poor trade performance. The change came in 1964, when policies underwent extensive revisions. As Brazil abandoned import substitution and "exportable surplus" policies in favor of an emphasis on export-led growth, their exporters became more competitive in world markets, realizing great gains in manufactured exports.

It would be easy to conclude that the more outwardly-oriented economies have been more successful in the export of diversified manufactured commodities. South Korea, Taiwan, and Malaysia have outperformed the import-substituting countries of Chile, Argentina, Egypt, and the Phillipines. There is controversy in the literature, however, and those who disagree often cite the performance of Mexico, an inwardly-oriented economy with a large domestic market. In additional support, they believe that Brazil's performance improved when it did only because it first did protect domestic

industries. If this is the case, it suggests that the path to follow may be to favor infant industries for a time long enough for threshold levels of output and scale to be realized.

When policymakers curtail imports, this creates excess domestic demand for those goods, which subsequently stimulates initial production. Output after a time reaches a level which satisfies domestic markets; this increase in gross domestic product then triggers a second-round effect in which output expands further to compensate the expanded market demands. Henceforth, additional stimulus must come from an expansion of export markets. The greater is the strength of domestic markets to sustain industrial output, the better equipped will an economy be to transgress this stage. Supply bottlenecks are often a hindrance to NICs, although many have been able to successfully pass through this stage, as Brazil did. At this point, ensuing diversification further aids developmental efforts by reducing dependence on imports and enabling debt service through export receipts.

Hence, although it is concurred that import-substitution and export promotion are not mutually exclusive ideologies, most nations favor either one or the other. Import substitution in Brazil in the 1950's resulted in many industries growing to attain a minimum threshold required to export competitive commodities. In the next

decade, policies recognized the need and gradually turned outward to promote exports. Protection levels usually recede, and increased trade levels lead the way toward export-led growth.

It is possible that export-oriented policies not preceded by import substitution are only successful in countries with large domestic markets, or other beneficial characteristics. When import substitution is used as a prerequisite to expansion of exports, policymakers should be cautious in granting optimal levels of protection to appropriate sectors. Since protection tends to increase prices, exporters will face a loss of competitiveness in world markets. When producers become less able to compete, they often desire further protection. Those most particularly affected will be industries which purchase significant quantities of imported inputs, or with significant linkages to other domestic sources of inputs which require imports.

Prevalent in India and Brazil is the case of often excessive and uneven policy intervention across industries. Policymakers stimulate some industries at the expense of others, which results in a less-than-efficient allocation of resources. Thus, many industries may be characterized by excess capacities. Producers with potential output in excess of actual domestic demand may attempt to enlarge the size of their export markets. On the other hand, it

may be that these inefficient producers are less able to compete in foreign markets. Hence, capacity utilization may be negatively correlated with export performance when suppliers are induced to aggressively seek markets, or utilization could be positively correlated with performance if it is these same conditions which give rise to an inability to export.

The cost-raising effects of tariffs can be measured with backward linkages to determine the proportionate changes in cost to be incurred by a producer. When markets are less than perfectly competitive, price changes are indeterminant. Cohen (1966) identifies different pricing behaviors among producers faced with increased costs attributed to tariffs. Changes in commodity prices, P_i, are comprised of changes in costs of domestic inputs, P_j, imported inputs, $\overline{P}_j$, and value added per unit of output of i, VA_i.

$$\Delta P_i = \sum_{j=1}^{n} a_{ij} \Delta P_j + \sum_{j=1}^{n} \overline{a}_{ij} \Delta \overline{P}_j + \Delta VA_i$$

A producer purchases a_{ij} units of domestically-produced inputs of j per unit of output of i, and purchases $\overline{a}_{ij}$ units of imported inputs of j per unit of output of i. When the behavior of a producer is to raise price by the same amount as an increase in costs,

$$\Delta VA_i = 0$$

If, on the other hand, price increases by the same proportion as costs, value added remains a constant percentage of price.

$$VA_i = k_t P_i$$

Then, the equation becomes:

$$\Delta P_i = \sum_{j=1} a_{ij} \Delta P_j + \sum_{j=1} \bar{a}_{ij} \Delta \bar{P}_j + k_t \Delta P_i$$

Assume that prices of imported raw materials rise by 20 percent. When imports comprise 50 percent of raw material costs, these will increase in price by 10 percent. Given that total raw material inputs equal 60 percent of costs, total cost will rise by six percent. A producer raising prices by six percent will be keeping value added the same amount. If value added is, on the other hand, to be kept a constant proportion of price, producers will raise price by 10 percent.

The total effects are estimated in the above equation whereby a tariff results in increases in import prices which are borne both directly and indirectly by a producer. When direct effects capture most of the total, the superiority of Cohen's analysis is reduced. Although Cohen finds that indirect effects are generally less than one-third of total effects, the direct effects may be overstated when data is highly aggregated. The method of

estimation for total effects depends upon pricing policies. When no change in value added is incorporated,

$$\Delta P = (I - A)^{-1} \bar{A} \Delta \bar{P}$$

where A is a matrix containing elements a_{ij}, I is the identity matrix, the $\bar{A}$ matrix contains elements $\bar{a}_{ij}$, and $\bar{P}$ is a column vector of $\bar{P}_i$'s. For producers who allow price to change so that the percentage change in raw material costs equals the percentage change in value added,

$$\Delta P = (I - A - K)^{-1} \bar{A} \Delta \bar{P}$$

where K is a diagonal matrix with k_i elements along the diagonal and zeros elsewhere.

In addition to the change in costs incurred by a producer, the knowledge that subsidization is granted to particular sectors might affect cross-sectoral export performance. The effects of trade policies are numerous, often resulting in changes in cross-country or cross-sectoral export performance. Brazilian policymakers stimulated manufactured output for import-substitution. At the same time, they emphasized utilization of abundant raw materials. Those sectors which were not export oriented increased their output, but those industries which exported manufactures required non-resource-based inputs in order to expand. Policymakers may allow

foreign investment into the economy, with the hope that the host country may benefit from a transfer of technology. When multinationals have access to foreign markets, production, or financing advantages over the local producers, their export performance is likely to be superior to domestic sectors. However, Brazil, who depends upon MNCs to produce high-technology goods, has found that greatest export growth occurred in domestically-owned firms (Tyler, 1972, p. 151).

Because policies may have such far-reaching effects, especially in countries with hegemonic government sectors, the need is stressed for judicious policymaking to maximize outward-oriented growth with minimal trade barriers. When second-best policies are needed to counteract the effects of inflexible protection measures, the result is often complex and administratively difficult trade regimes. The infant-industry argument in India seems to have been somewhat justified; however, in the face of continuing technological stagnation, policymakers face the prospect of revaluating their policies in this respect.

It has been shown that revealed comparative advantage and policy variables can be expected to affect the export performance of a producer. Other analyses of this type might seek to differentiate between manufactured and primary commodities,

degrees of manufactured goods, upper and lower income LDCs, or the backward linkages to foreign suppliers of manufactured inputs could be researched. This analyses continues with a cross-sectoral examination of exports of India's manufacturing sectors.

Chapter IV

CROSS-SECTORAL ANALYSIS OF INDIA

The characteristics and situation of India are in some ways unique from those of other LDCs. With the tenth largest capital goods sector in the world, an abundance of skilled labor especially in the engineering and science fields, more than 700 million total population, and good natural resources, the export performance of India has been extremely poor. In 1960, India's manufactured exports comprised 33 percent of the total coming from LDCs, but this fell to seven percent in 1975, at which time Taiwan and Korea each had export shares twice as large. If more relevant cross-country comparisons serve to better illustrate the point, Brazil, with the same size domestic market as India, exported only one-sixth the manufactures of India in 1965. Ten years later, they also had surpassed India's performance.

Trade theorists who examine North-South and South-South trade flows most often center their analyses around the flows originating from the NICs. Many are hesitant about including India in this group, considering its relative performance has been worsening. The pervasive government sector may have contributed to this decline in position. Conditions of excess capacity and

import-substitution strategies may have reduced the competitiveness of producers selling to foreign markets. The five-year plans enacted by the Government of India (GOI) were aimed at promoting the goal of self-reliance via import substitution. Until the early 1970's, India's foreign trade regime seemed particularly detrimental to export performance in manufactures. In order to acknowledge the presence of government intervention, policy variables will be employed in conjunction with potential comparative advantage determinants. To test RCA, this analysis utilizes industry-level information, which was aggregated to the two-digit Standard Industrial Trade Classification (SITC) level to comprise 100 industries. Of these, it is the 57 manufacturing industries which are employed to test the determination of export performance.

Measures of Export Performance

To test the determinants of exports and the direction of trade, two dummy dependent variables were created. XSP1 takes the value one for an industry which is export-oriented toward LDCs. That is, an industry which exports at least eight percent of output, the mean of the sample, is considered export-oriented. If this industry sends more than 50 percent to LDCs, XSP1 will equal one. If an industry is export-oriented and more than one-half of

exports are purchased by DCs, XSP2 will take the value one.

A survey of the observations in the sample which are export-oriented may aid the formulation of hypotheses regarding export propensity. Out of 57 industries, eight are oriented toward DC markets, and six toward LDC markets. Seven of the eight DC market-oriented exporters (DC MOEs), had exports greater than the mean of the sample, 807 million rupees; the average of the DC MOEs was 2782 million rupees, and for LDC MOEs, 1837 million rupees. Also, DC MOEs exported on average 34 percent of output, and LDC MOEs, 20 percent, relative to a mean of eight percent. Observations for export-output ratios, XS, for MOEs were fairly concentrated around the median value of 20 percent. DC MOEs sent 84 percent of their exports to DCs, whereas LDC MOEs favored LDCs with 63 percent of total exports. This suggests that MOEs are differentiated in the following characteristics:

1) There is a clear delineation between export-oriented producers and non-export-oriented producers; XS for MOEs is, on average, significantly different from the mean.

2) DC MOEs were larger than LDC MOEs in terms of export shares in output, total exports, and the share of exports sent to the major market.

Since the share of output in DC MOEs going to DC markets is

29 percent, relative to the 13 percent of output that LDC MOEs sell to LDC markets, it is suggested that DC MOEs are very much attuned to the characteristics of their export markets, particularly in DCs. The creation of XSP1 and XSP2 is expected to aid the strength of hypotheses of export propensity because these measures do in fact differentiate greatly among the observations. In particular, because XSP1 and XSP2 are mutually exclusive, they identify more succinctly the characteristics of producers of a particular orientation. The first measures of export performance were constructed for use in an ordinary least squares (OLS) estimation. Exports to LDCs as a percentage of output, LXS, and exports to DCs as a percentage of output, XDC, were employed as measures of RCA. If an industry has exports greater than zero to both LDCs and to DCs, these observations will be represented in both the XDC and LXS equations. It was felt that the identification of DC MOEs and LDC MOEs were superior measures to LXS and XDC, which examined the degree of export flows.

To analyze the characteristics of XSP1 and XSP2 observations, only those observations for which one of the dependent variables was equal to one were examined. However, the examination of 14 of 57 manufacturing industries provides a weak foundation on which to develop theories on the determination of export performance. The more desirable method of analysis is one which utilizes all obser-

vations to explain what characteristics determine whether or not an industry is likely to have superior export performance.

Probit is an estimation technique used in regression models containing dummy dependent variables.[2] The employ of dummy dependents requires a procedure other than OLS in order to get unbiased estimates. If the regression model is given by:

$$Y = \beta X + u$$

then when Y equals one, the residual will equal:

$$1 - \beta X$$

In this case, the expected value of the disturbances will not equal zero and hence, OLS estimates are not best, linear, and unbiased. Probit formulates a cumulative probability function, F, relating the likelihood of observing a value of one to the probability that a particular industry is export oriented. This is given by:

$$P_i = F(\alpha + \beta X_i) = F(Z_i)$$

where $F(Z_i)$ is the cumulative distribution of a $N(0,\sigma^2)$ random variable, Z_i is a continuous normally distributed variable equal to $\alpha + \beta X_i$; X_i determines the value of Z_i, which is not observed.

In order to support the hypothesis that the dependent variables

constructed for use in the Probit estimation are superior to LXS and XDC, both sets of regressions were run.

The Determinants of Manufactured Export Performance

The factor proportions approach to explaining trade patterns suggests that capital-labor ratios, KL, will determine the extent of trade to a particular direction. The index of KL that is used was constructed from data provided by the Annual Survey of Industries for 1978-79. Fixed capital stock, defined as "the depreciated value of all fixed assets of the factory as on the closing day of the accounting year," was deflated by labor to represent capital-intensity. The data for capital stock was provided at the three-digit National Industrial Classification level; hence they were aggregated to conform with classifications at the two-digit SITC level. "Labor" measures the number of workers in an industry, with the exclusion of the following skilled labor personnel: "supervisory, managerial, clerical, administrative, and technical (i.e., researchers and engineers)" (R. Lall, 1984, p. 106).

The magnitude of India's capital goods sector is large relative to other LDCs, but the (unskilled) labor force may be even larger. Hence, labor is relatively more abundant (cheap) and

capital more scarce (costly) in India than in most other economies with which they trade. It is expected that KL will have a stronger impact upon trade with DCs, as the divergence in capital-labor ratios is greater with this group.

The neo-factor proportions theory examines the inputs of human capital, the abundance of which is presumed to be positively correlated with a country's relative stage of development. For India, an index of educational investment in human capital, ED, is constructed for the various sectors by weighting the years education for each of 100 different skill categories, by the share of each skill in the labor force of an industry. This information was provided by the Directorate General of Employment and Training, Ministry of Labor, GOI, at the two-digit National Industrial Classification level (R. Lall, 1984, p. 108). India has what is possibly the largest pool of skilled labor of all LDCs, yet skilled relative to unskilled labor is scarce relative to all trading partners. The largest divergence in skilled-unskilled labor ratios should be between India and its northern trading partners, hence ED is expected to be a negative significant influence on exports to DC markets. The only expectation of ED in regards to exports to LDCs is that it is not as strong.

In the literature, these neo-factor proportions theories

utilize natural resource abundance to explain what is in the context of Hecksher-Ohlin a "paradox." For instance, the United States may have a relative abundance of capital, yet its imports are capital-intensive. Further examination shows them to be also natural-resource intensive, and capital inputs are highly correlated with such goods. To estimate natural resource intensity, NR, estimates are made of the input requirements from agricultural and mining sectors required for an increase of one unit of output for each sector. This is done by multiplying a selection matrix of agricultural and mining sectors by the backward-linkages matrix. India is presumed to have an abundance of resources relative to its northern trading partners, based upon Morrison's inverted density measure (see Ch. 3). Actual data on relative natural resource endowments have not been examined, so it is felt that Morrison's measure may be a weakly justified tool for purposes of this analysis. Therefore, there are no a priori expectations for the performance of NR.

Neo-technology approaches extend Hecksher-Ohlin to allow for both different endowments and differing production functions across countries. The latter is presumed to be due to the uneven incidence of technology. Industrialized countries embody this technology in their infrastructure, hence input-output ratios may

differ between DCs and LDCs for the same commodity. In regards to capital goods sectors, India is presumed to have a comparative advantage relative to other LDCs, and a relative disadvantage in their exports to DC markets. "The amount by which output of the domestic capital goods sector must increase to meet a unit increase" of output of industry i is the measurement of KG. This is estimated in the same manner as NR: a selection matrix containing capital goods sectors, S, is multiplied by the backward linkages matrix (R. Lall, 1984, p. 110). KG is a good proxy for availability of technological inputs, as it reflects both embodied technology and disembodied (learning-by-doing) experience.

Policy and Export Performance

Given demands by producers to utilize imported inputs, tariffs serve to increase the costs of output. To estimate both the direct and indirect cost-raising effects of tariffs, a method similar to Cohen's (see Ch. 3) was employed:

$$\Delta P = (I - A)^{-1} \overline{A} \, \Delta \overline{P}$$

Three matrices were used in the formulation of the increased costs incurred by producers due to tariffs, TPR (R. Lall, 1984). From the input-output table published by the Planning Commission for 1979-80, a matrix of intermediate use and final demands of 89 sectors reflected imports as a negative entry in the final demand sector.

From this, the import matrix was subtracted to derive the input coefficient matrix A. The nominal tariff, $\Delta\overline{P}$, was found by deflating import duties given in an indirect tax matrix by the vector of total imports which were net of their respective duties. The set of 57 manufacturing industries was extracted after the computations for TPR's effects on all 100 industries were made.

What is viewed as an attempt by policymakers to erect second-best alternatives is the granting of subsidies to those industries which purchase restricted imports. Given that TPR may hinder the export performance of producers, the granting of export subsidies might tend to counteract those effects. Therefore, it is almost necessary that an analysis include both, or neither. To measure the effects of subsidies, a dummy variable, XP, was created. In 1974-75, the GOI provided export incentives which amounted to five percent of total exports. However, these were very unevenly distributed amongst the manufacturing industries, with aggressively promoted sectors receiving on average 32 percent of the valuation of their exports, and non-aggressively promoted manufacturing sectors receiving less than five percent (R. Lall, 1984). For those industries which are heavily subsidized, XP takes the value one.

The final variable that is tested may reflect both demand and

supply constraints, in addition to the actions of policymakers. Conditions of excess capacity are often blamed on the government sector, which has implemented policies to stimulate "desirable" industries. In some cases, this takes the form of subsidization. Engineering and chemical industries are known to have been promoted; it is hypothesized that those industries characterized by excess capacities may behave differently in export markets. The "recession-boom" effect relates conditions of underutilization with a sudden increase in the propensity of a producer to enlarge export markets in order to eliminate excess supplies. On the other hand, such producers may be unable to competitively price, and thus export, their goods.

An index of actual, relative to potential, output is used as a measure of capacity utilization. Should the demand-type effects prevail, EXC would appear negatively correlated with performance. If, however, supply constraints play the stronger role, EXC will be positive. There are therefore no a priori expectations of sign for this dependent variable. Because of suggestions made in prior empirical analyses of South-South and South-North trade, it is suspected that EXC may perform differently with the direction of trade. Some literature discusses the possibility that excess capacity results in non-competitive exports which can only be "dumped on other LDC markets.

The Regression Analysis

The results of regressions performed to test the determinants of performance to LDCs and to DCs are presented in tables 4.1 and 4.2, respectively. For comparisons which the reader may wish to make, the OLS estimations are included, however, the Probit equations were superior, as expected. (For convenience, the construction of each variable, and expectations of sign, are presented in Appendix III.) Regressions employed independent variables which were transformed using a log function. For regressions without logs, the reader may wish to refer to Appendix II. Each regression tests three factor-proportions-type variables and three policy-affected variables. Because the correlation of ED and KL is .417, they were not combined in a single regression. Instead, regressions employed them alternatively, in order that the results may be compared. Also, ED's correlation with KG is .426, so the possibility of obtaining the best results was maximized by testing both regressions. The preferred set of regressions are the Probit estimations which include ED; ED is most often significant, whereas KL is not. Since the other variables perform basically the same whether KL or ED is used, only the regressions with ED need be discussed.

In the Probit estimation of XSP1, it is not surprising that only KG is significant; this is the primary factor which differentiates

TABLE 4.1

EXPORTS TO LDCs

														R^2
XSP1	=	.926 LEXC	−	.413 LTPR	+	1.02 LED	+	.385 LKG	+	.189 LNR	+	.783 XP	−	8.63	
		(2.57)		(.542)		(3.95)		(.276)*		(.639)		(.881)		(13.3)	
XSP1	=	1.03 LEXC	−	.401 LTPR	+	.004 LKL	+	.383 LKG	+	.142 LNR	+	.767 XP	−	7.10	
		(2.54)		(.537)		(.280)		(.275)*		(.608)		(.854)		(11.9)	
LXS	=	−.157 LEXC	−	.006 LTPR	−	.163 LED	+	.004 LKG	−	.005 LNR	+	.015 XP	+	1.01	.19
		(.071)*		(.009)		(.087)*		(.005)		(.010)		(.017)		(.359)	
LXS	=	−.163 LEXC	−	.007 LTPR	+	.002 LKL	+	.002 LKG	−	.005 LNR	+	.002 XP	+	.716	.14
		(.074)*		(.010)		(.006)		(.005)		(.011)		(.018)		(.333)	

* Significant at the .10 confidence level

TABLE 4.2

EXPORTS TO DCs

	R^2
$\underline{XSP2} = -5.77\ \underline{LEXC} + .122\ \underline{LTPR} - 10.4\ \underline{LED} - .387\ \underline{LKG} + .047\ \underline{LNR} + .439\ \underline{XP} + 43.6$	
$(2.82)^*\quad (.363)\quad (3.40)^*\quad (.273)^*\quad (.364)\quad (.718)\quad (16.4)$	
$\underline{XSP2} = -4.86\ \underline{LEXC} - .062\ \underline{LTPR} - .162\ \underline{LKL} - .380\ \underline{LKG} + .030\ \underline{LNR} - .179\ \underline{XP} + 19.2$	
$(2.47)^*\quad (.317)\quad (.230)\quad (.214)^*\quad (.313)\quad (.590)\quad (11.1)$	
$\underline{XDC} = -.400\ \underline{LEXC} - .018\ \underline{LTPR} - .535\ \underline{LED} - .012\ \underline{LKG} - .038\ \underline{LNR} - .039\ \underline{XP} + 2.67$	.36
$(.149)^*\quad (.020)\quad (.183)^*\quad (.011)\quad (.022)^*\quad (.037)\quad (.754)$	
$\underline{XDC} = -.406\ \underline{LEXC} - .021\ \underline{LTPR} + .003\ \underline{LKL} - .021\ \underline{LKG} - .040\ \underline{LNR} - .076\ \underline{XP} + 1.70$	.25
$(.162)^*\quad (.021)\quad (.014)\quad (.012)^*\quad (.024)^*\quad (.040)^*\quad (.732)$	

* Significant at the .10 confidence level

India from its LDC markets. In line with the predictions of Hecksher-Ohlin, trading partners will have a comparative advantage in the production which intensively employs its relatively abundant factor. It appears that, in regards to other factor ratios of India relative to its LDC markets, there is not as significant a disparity as there is in KG.

The Probit regressions to test the determinants of export performance to DC markets are provided in table 4.2. KG is now negative and significant at the ten percent confidence level. In the array of factor endowment ratios, India seems to be in the middle of its LDC and DC trading partners with respect to KG, which causes KG to have the same strength in affecting exports to either market. EXC is negative and significant, hence it seems that demand constraints prevail over supply characteristics. ED is also negative and significant, as expected, because India has a relative abundance of unskilled labor relative to its DC trading partners.

In general, more variables are significant and R^2's are higher for regressions testing the determinants of exports to DCs. Because their export shares to a particular region are the highest of any group, XSP2 producers might tend to be more oriented toward their favored market than are the LDC MOEs. Because the data seems to support it, generalizations can be drawn about the nature of

export flows to the North. Nearly all factor endowment ratios in India are much different from those in their DC markets; this is rarely true for India relative to its LDC trading partners. Hence more variables are significant in explaining South-North exports.

Due to the construction of the dependent variables, Probit and OLS regressions are measuring slightly different aspects of performance. XSP1 and XSP2 should express the observed tendencies for producers who are export oriented; LXS and XDC express tendencies for export flows relative to gross output to vary across industries. The Probit variables can be likened to the EP variable mentioned in chapter three which compared export performance among the different sectors within a country. Because XSP1 and XSP2 are more accurate reflections of what this study is attempting to analyze, the variations in results between Probit and OLS regressions are irrelevant here.

The DC MOEs are characterized by larger export values, larger export shares (the criterion), and larger shares to a particular region (DCs), in relation to both LDC MOEs and those industries which are not export oriented. Linder's hypothesis would suggest that the North provides an outlet for a lesser variety of exports from India, given the per capita income disparities between trading partners. On the other hand, greater per capita income is

associated with demands for a greater variety of commodities, so Indian producers may have more opportunities to gain market penetration. Whether or not this is the cause, those who are DC MOEs send 29 percent of output to DC markets. The continuation of this trade pattern, if not the cause, must be indicative of the propensity to export a commodity which is demanded in the DC market. The greater orientation of DC MOEs to DC demands may explain why they are easily accomodated in DC markets when the presumed "recession-boom" effect is initiated. DC MOEs, with greater knowledge of their export markets than the average producer, can successfully sell their competitive goods in foreign markets when it is so desired.

The degree of manufactured inputs is more significant a determinant of export performance for those producers who are already "in" export markets. As expected, KG was positive for South-South trade and negative for South-North flows, but KG does not perform as consistently well in the OLS equations. The future of South-South trade, which the literature examines in some depth, may pivot upon the manufactured input requirements for exporting industries, along with India's changing position in the array of relative factor abundances. If India continues to be differentiated from other LDCs primarily in the extent of its capital goods sector, this would suggest an increasing comparative

advantage for India relative to her LDC markets. If the gap between India and DC economies in their capital goods sectors is reduced, KG may become less significant a deterrent to trade.

For KL, results were disappointing. Some theorists have suggested that KL may be an inferior measure compared to ED; they specify an extensive breakdown of ED into as many categories of skills as possible, in order to eliminate the capital-labor ratio altogether. Also in the literature, it has been suggested that KL fails to be a significant determinant of export performance because it is mobile, relative to ED, KG, and NR, which are most often fixed. These claims were made in the context of cross-country analyses; they are mentioned primarily because many other studies employing different data sets and with different hypotheses have achieved no significant results from the employ of KL.

The policy variables which were constructed did not prove to be determinants of performance. TPR is never significant; XP is negative and significant in one equation. These results confirm the literature: export promotion policies don't work (Wolf, 1982). Therefore, the suggestion is made for policymakers to alter such export promotion schemes.

Criticisms directed at static analyses of this type believe

that their usefulness is limited for application to a dynamic economy. India's changing comparative advantage may be toward her increasing her strong points; for South-South trade, increasing endowments of KG should improve India's export performance. For the future of South-North trade, India might wish to adapt production processes to become more unskilled labor-intensive, in order to exploit the domestic labor force. Static studies can overcome constraints when data is obtained for identical cross-sectoral observations for two time periods. Then, the changes in the variables may be interpreted in a dynamic context. In LDCs, changes occur most rapidly at times, therefore it is hoped that other studies will take advantage of any opportunities to alter the static nature of this analysis.

CHAPTER V

SUMMARY

The purpose of this thesis was to analyze the determinants of export performance to be applied to a cross-sectoral analysis of India's manufacturing industries. A survey of trade theories was presented to suggest determinants which result from relative comparative advantages of trading partners. The theoretical extensions of Hecksher-Ohlin relax some of the simplifying assumptions in an attempt to provide a more realistic basis for explaining trade patterns. Chapter three employed the results of empirical studies, many of which examine cross-country export performance.

The orientation toward manufactured exports was a result of the emphasis placed upon this facet of performance of LDCs by policymakers and in contemporary trade literature. In light of comparative advantage theories, it was necessary to analyze the determinants of exports to a particular direction. For this purpose, generalizations were made about India's endowments relative to its northern and southern trading partners. Manufactured input intensity was positively correlated with Indian exports to LDCs and negatively correlated with exports to DCs. From

these results, it was hypothesized that India's relative endowments of manufactured inputs lie approximately halfway between those relative endowments of her DC and LDC markets. Suggestions were made for the future of South-South and South-North trade in light of this.

Skilled labor intensity was negatively correlated with export performance to developed markets. It was suggested that India would do best to exploit her comparative advantage in unskilled labor-intensive exports. Excess capacity was negatively correlated with northern trade flows, which loosely supports the concept of the "recession-boom" effect. Producers are able to tap into expanded export markets when industries are characterized by capacity underutilization.

There are more obvious determinants which correlate with trade flows to the North; this is logical because most factor ratios in India are dissimilar to those of the developed market economies, and similar to those of other LDCs. To best differentiate the conditions which give rise to a flow of exports to either LDCs or DCs, dummy dependent variables were constructed. Because of their mutual exclusivity, trade flows to LDCs and DCs were distinguishable from one another.

Empirical analyses of this type should be very useful for policymakers. In particular, the poor results of the export subsidy variable suggests that policymakers alter their export promotion programs. Further useful studies might compare data sets for two time frames in order to interpret the results in a dynamic context. Other approaches to the examination of the determinants of export performance include the comparison of primary and manufactured exports, the extent of processing of the final commodity, or the identification of the sources of imported inputs.

FOOTNOTES

[1]Keesing (1979b) notes that export expansion is a necessary precondition for development in all save possibly the largest economies. The more general consensus is that export performance is a desirable objective, whether or not it has significant links with development. Ways in which exports might aid development can be seen with an examination of the interactions of exports throughout an economy. Linkage models and the multiplier-accelerator model specified by Thorbecke and Condus serve this purpose. Linkage models trace the effects of exports on training and hiring of labor, other local inputs, management skills, and technology transfers which give rise to increased output. The multiplier-accelerator model relates an increase in exports to an increase in aggregate demand. Development follows from this growth in output, with the advancement of learning, knowledge, and competitiveness.

[2]The estimated coefficients provided in the Probit model measure the impact of the independent variables on the probability that a particular industry is export oriented. Probit is a maximum likelihood technique which does not provide a measure of goodness of fit.

APPENDIX I

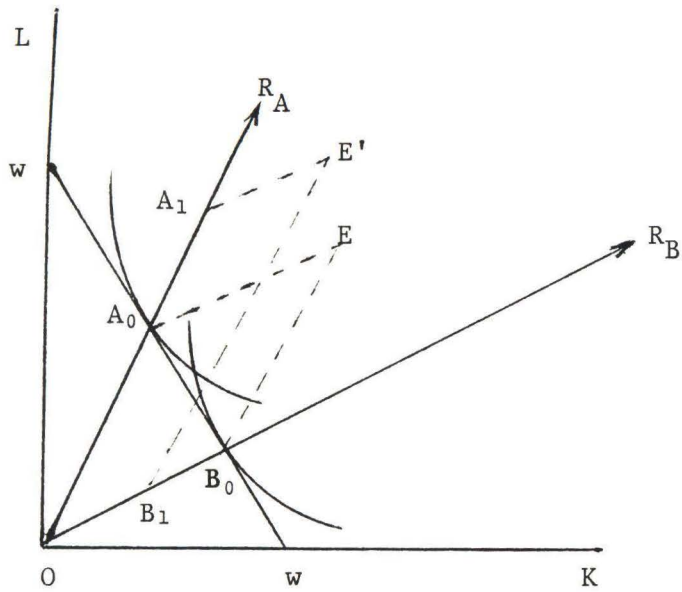

Figure A.1

The Lerner-Pearce Diagram

When factor rewards are assumed equal between industries, isoquants lie tangent to the same budget line, ww, the slope of which reflects factor-price ratios. Isoquants are positioned where expansion rays, OR_A and OR_B, reflect capital-labor ratios desired, given factor prices. Total endowments are E; an increase in labor supply shifts this to E'.

Post-labor force expansion, production occurs at the same capital-labor ratios, as factor-price ratios remain the same. Vector addition to E' proves that output of the labor-intensive

good A expands to A_1, while production of B shrinks to B_1. The capital-labor ratios for industries A and B are K_A/L_A and K_B/L_B, respectively. Hence:

$$K_A/L_A \times L_A/L + K_B/L_B \times L_B/L = K/L$$

When L increases,

$$K_A/L_A < K_B/L_B$$

L_A/L must rise and L_B/L must fall, due to equal factor rewards. Hence, L_A increases by more than L; industry A expands.

In figure A.2, the slope of the diagonal OxOy represents the capital-labor ratio for a country with OxE endowments of labor and EOy endowments of capital. Labor-intensive production occurs at point A, with OxA quantities (measured along the contract curve) of the labor-intensive good, X, and OyA quantities of the capital-intensive good, Y, produced. An increase in labor endowments to OxE' results in increased production of x to OxB, as measured along the new contract curve, OxO'y, and decreased production of y to O'yB.

Contract curves are derived from tangency points of production isoquants. A secant drawn from either origin (Ox or Oy) reflects respective capital-labor ratios in either

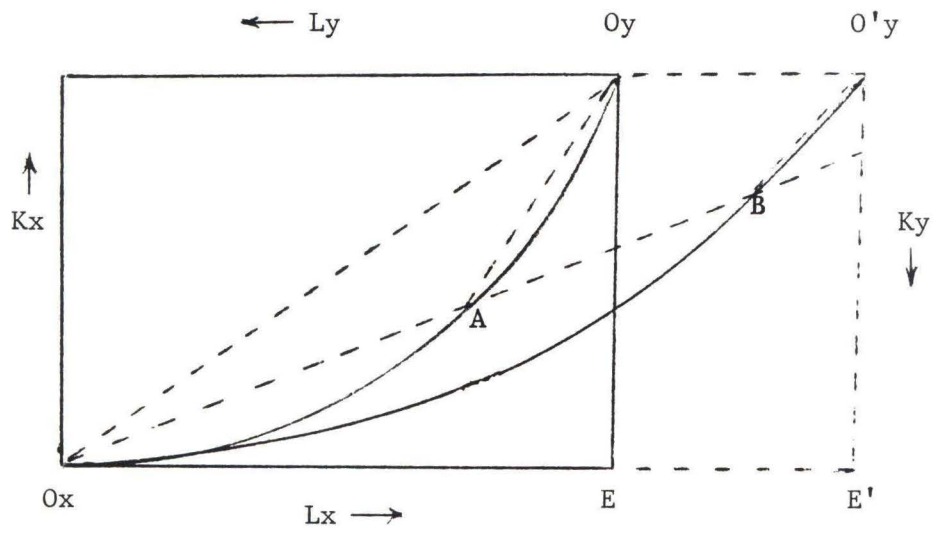

Figure A.2

The Edgeworth-Bowley Box Diagram

industry. Given constant factor-price ratios, capital-labor ratios remain the same. Hence point B is found where a parallel to secant OyA from O'y intersects secant OxA.

The increased endowment expands the production possibilities frontier; new production is allocated such that the marginal rate of technical substitution (i.e., slope) is left unchanged. Figure A.3 illustrates the shift in allocation of production from good y to good x when labor endowment increases.

Figure A.4 derives the wage-rental ratio when producers are

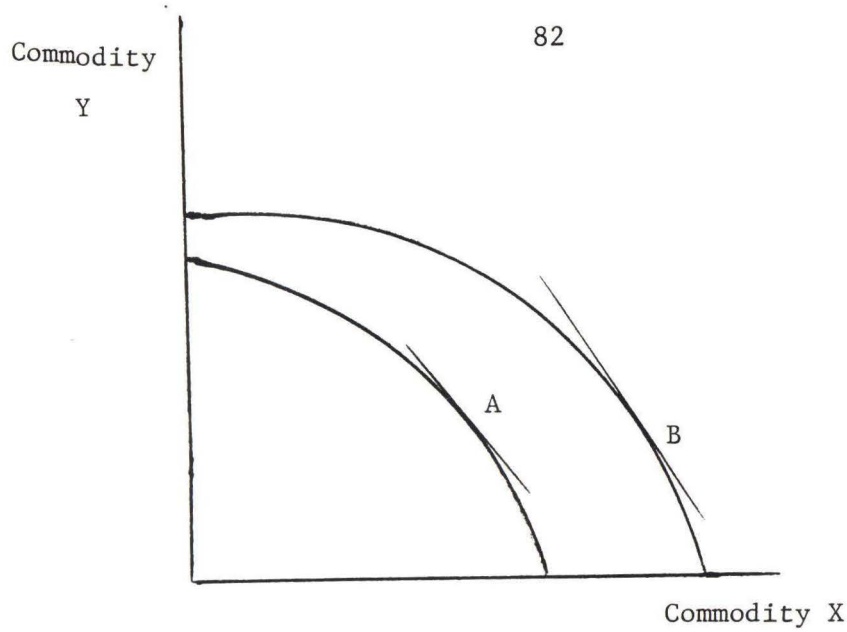

Figure A.3

Production Possibilities Frontier

characterized by constant returns to scale. Therefore, a linearly homogeneous production function of two variables,

$$Q = f(K,L)$$

can be rewritten as:

$$Q/L = f(K/L)$$

Diminishing marginal productivity determines the concave shape. In a perfectly competitive world, factor prices equal marginal products. The marginal product of capital is reflected in the slope of the tangent to the production function. Total

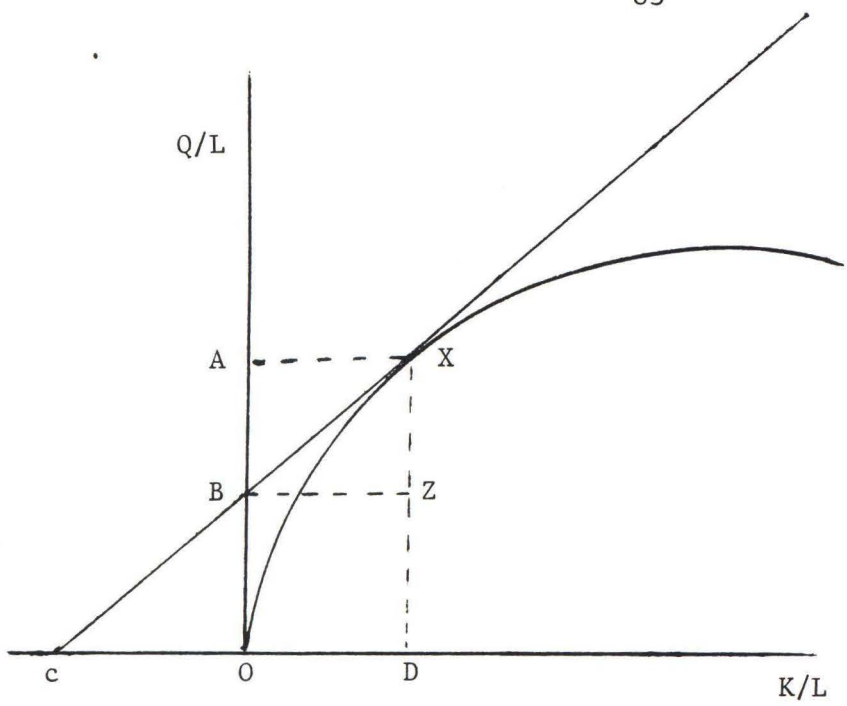

Figure A.4

Factor-Price and Capital-Labor Ratios

output attributed to capital is the number of capital inputs times their marginal product; this will equal total payments to capital, rK.

OD, or BZ, represents total capital per unit of labor employed to produce an output of X quantities. Rent is set equal to marginal product:

$$r = AB/BZ$$

Since BZ measures the factor ratio,

$$r = \frac{AB}{K/L}$$

$$rK/L = AB,$$

which is total output attributed to capital per unit of labor. Since total output per unit of labor is OA, OA minus AB must equal labor's share of output per unit of labor, denoted as the wage rate, w.

$$wL/L = w$$

Note also that:

$$OB/OC = r$$

$$w/OC = r$$

therefore,

$$OC = w/r$$

It has been shown that a unique correspondence exists between factor ratios, factor-price ratios, and commodity prices, as Stolper and Samuelson have set forth.

APPENDIX II

Table A.1

		R^2
XSP1	= .022 EXC − 15.3 TPR + .167 ED + .559 KG − .491 NR + .627 XP − 4.47	
	(.034) (16.4) (.555) (.525) (1.82) (.791) (4.62)	
XSP1	= .023 EXC − 15.0 TPR − .383 KL + .566 KG − .422 NR + .745 XP − 3.33	
	(.033) (15.9) (.775) (.528) (1.79) (.771) (2.99)	
LXS	= −.164 EXC − .905 TPR − .253 ED + .013 KG − .007 NR + .016 XP + .330	.18
	(.920)* (.188) (.013)* (.013) (.033) (.017) (.114)	
LXS	= −.002 EXC − .136 TPR − .003 KL + .006 KG − .013 NR + .004 XP + .170	.12
	(.001)* (.195) (.010) (.012) (.034) (.017)	

* Significant at the .10 confidence level

APPENDIX II

Table A.2

																	R^2
XSP2	= −.087	EXC	− 4.53	TPR	− 1.39	ED	− 1.98	KG	− .360	NR	+ .415	XP	+ 16.0				
	(.040)*		(8.89)		(.615)*		(1.43)*		(1.22)		(.717)		(5.52)				
XSP2	= −.073	EXC	− 12.6	TPR	− .419	KL	− 2.09	KG	− .602	NR	− .136	XP	+ 6.29				
	(.036)*		(11.3)		(.552)		(1.42)*		(1.02)		(.602)		(3.11)				
XDC	= −.005	EXC	− .375	TPR	− .076	ED	− .030	KG	− .078	NR	− .034	XP	+ 1.10				.33
	(.002)*		(.400)		(.028)*		(.027)		(.070)		(.037)		(.242)				
XDC	= −.005	EXC	− .525	TPR	− .016	KL	− .049	KG	− .093	NR	− .067	XP	+ .614				.24
	(.002)*		(.426)		(.021)		(.027)*		(.075)		(.037)*		(.179)				

* Significant at the .10 confidence level

APPENDIX III

Table A.3

Usage	Name	Definition or Measurement	Expectations of Sign
Dependent Variable	XSP1	=1 if Exports/Gross Output > .08 and if Exports to LDCs/Exports > .5 =0 otherwise	
Dependent Variable	XSP2	=1 if Exports/Gross Output > .08 and if Exports to LDCs/Exports > .5 =0 otherwise	
Dependent Variable	LXS	Exports to LDCs/Gross Output	
Dependent Variable	XDC	Exports to DCs/Gross Output	
Independent Variable	EXC	Actual Output/Potential Output	? to LDCs ? to DCs
Independent Variable	TPR	Cost-Raising Effects of Tariffs	- to LDCs - to DCs
Independent Variable	ED/KL	Index of Skilled Labor Inputs/ Capital-Labor Ratio	? to LDCs - to DCs
Independent Variable	KG	Manufactured Input Requirements	+ to LDCs - to DCs
Independent Variable	NR	Agricultural and Mining Input Requirements	- to LDCs + to DCs
Independent Variable	XP	=1 if Industry is Heavily Subsidized =0 otherwise	+ to LDCs + to DCs

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