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Ecuador's Competitiveness in Forest Products: Some Multi-Country Comparisons

By

Ralph J. Alig and C. Denise Ingram

Working Paper No. 38

School of Forest Resources
North Carolina State University

School of Forestry and Environmental Studies
Duke University

Office of International Cooperation and Development
Forest Service, Forestry Support Program and
Southeastern Forest Experiment Station

Supported and funded by
Bureau for Science and Technology
Agency for International Development

FPEI Working Papers Series

Southeastern Center for Forest Economics Research
Box 12254, Research Triangle Park, N.C. 27709 Telephone (919) 541-4221

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October 1988

The SCFER Institutions
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Alig, Ralph J. and C. Denise Ingram. 1988. Ecuador's Competitiveness in Forest Products: Some Multi-Country Comparisons. Southeastern Center for Forest Economics Research, Research Triangle Park, NC. **FPEI Working Paper No. 38, 44pp.**

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ECUADOR'S COMPETITIVENESS IN FOREST PRODUCTS: SOME MULTI-COUNTRY COMPARISONS

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SE-4851

FPEI Working Paper Series

September 1988

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ECUADOR'S COMPETITIVENESS IN FOREST PRODUCTS:

SOME MULTI-COUNTRY COMPARISONS

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Abstract

Emergence of new major sources of supplies of forest products around the world has increased concerns of forest products industries regarding international competitiveness. Because world markets are interrelated, trade affects the domestic timber resource situation in the U.S. as well, increasing the importance of capturing our best forest management opportunities. This paper discusses research methods for assessing competitiveness in forest products, applied to the case of Ecuador. A system for rating competitiveness factors in a multi-country context is developed. Data for particleboard production in Ecuador are compared to those in the U.S. South.

Acknowledgements

The authors thank Jan Laarman, Scott Lampman, Vicente Molinos, Mike Mussack, Jeff Prestamon, and Fernando Guerron for their assistance in this study. We also wish to acknowledge the cooperation of numerous individuals in Ecuador's woods products industry who provided information and advice.

Introduction

International market dynamics are playing an increasingly important role in influencing the outlook for the forestry sector in the U.S. South, Ecuador, and other countries. Emergence of new major sources of raw materials and forest products around the world have heightened interest of industry officials and policy makers regarding the U.S. South's competitiveness in world markets for forest products, including if and when countries in other regions might emerge as significant participants in world markets. Although the U.S. South has large forest reserves and a world-class forest industry, global realignments are occurring and those assessing the future outlook must consider a number of factors related to comparative advantage. This paper describes an exploratory research study by the Southeastern Center for Forest Economics Research (SCFER) involving assessment of such factors important for Ecuador and U.S. South forest products.

This first case study will investigate methods of assessing competitiveness and their application to the case of forest products in Ecuador. This study is designed to aid in developing export and foreign investment strategies for private firms and information for policy makers concerning forestry sector development. This study constructs a framework for systematically assessing a country or region's competitive position in timber production, including the initial assembling of an international data base designed to support multi-country comparative studies.

Before we can address the questions concerning the status of Ecuador's competitive position in forest products, it is first necessary to understand

the differences, and similarities, of competitiveness and comparative advantage. This distinction between competitiveness and comparative advantage is important because a region or country can experience a loss in competitiveness while maintaining its comparative advantage. However, competitiveness and comparative advantage are inextricably linked in the real world conduct of international forest products trade.

Comparative advantage is the economic advantage one nation or region holds compared to others in the production of a commodity and is one of the crucial elements of trade theory. Comparative advantage pertains to whether an economic unit (person, region, or nation) has an advantage in producing a particular good compared to other goods that can be produced and compared to the trading opportunities which may be available. Absolute advantage is simply the concept of being the low cost producer; thus, being the low-cost producer, by itself, is not the necessary nor sufficient condition for determination of the pattern of trade (Durmore 1987). The theory of comparative advantage proposes that there is an economic benefit for each country to specialize in certain tasks and then trade for other goods, even though one country may be better at producing all goods in an absolute sense. While the theory of comparative advantage is well developed, comparative advantage is difficult to measure in a real world context. Most attempts focus on comparison of relative costs and relative efficiencies, which will be discussed in the literature and data review section.

The existence of comparative advantage in a particular industry in one country over another usually results from economies of scale in processing or cost advantages in production (Holland 1977). Declining costs associated with large-scale industries are usually influenced by high capital

intensity, skilled labor and technology, and raw material availability. Or, comparative advantage can occur with the demand for unique or particular forest products or raw materials such as forest resources from a country.

Competitiveness is difficult to define because it is a less theoretically pure concept than comparative advantage. The concept of "competitiveness" is still evolving and there is little professional consensus on a precise definition (Dunmore 1987). Competitiveness reflects the "real world" of trade patterns, including distortions that offset some natural or pure comparative disadvantage. Competitiveness in forest products trade is the frame of reference in this paper, which includes comparative advantage as a central component. One measure of competitiveness in forest products trade, perhaps imperfect[1], is the ability to successfully sell forest products at a level sufficient to at least maintain the country's share of world markets. Factors that influence competitiveness in addition to the cost of growing timber include natural resource endowments; trade strategies (e.g., tariffs or quotas); geopolitical considerations; transportation costs; evolving preferences and technology; changing national ratios of land, labor, and capital resources; and development of other economics sectors. Uncertainty about them leads to institutional, strategic, and macroeconomic concerns about trade in forest products.

One major product of future related studies will be an international data base useful for comparing timber production costs in the U.S. South and

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[1] The lack of an adequate measure was also pointed out by Dr. Harold Wisdom, VPI, in a presentation at the recent conference, "The Global Advantage of the South in Forestry and Forest Products." August 23-24, 1988, Atlanta, Georgia.

Latin America. The Latin American portion of the data base, maintained by SCFER, will be drawn from studies in Brazil (e.g., Sedjo 1980, 1983) and Ecuador. Data for several Central American countries (e.g., Guatemala and Honduras), Chile, Argentina, and Indonesia may be added in the future, to allow even more far reaching comparisons, dependent in part on future AID funding and other supplemental funding.

FOREST PRODUCTS TRADE FOR ECUADOR--A QUICK COMPARISON WITH THE U.S.

Ecuador faces challenges typical of some other developing countries in a world economy, where downstream processing of forest products into finished goods may represent a substantial investment and development opportunity. Expanded manufacturing of processed forest products such as plywood and furniture could enhance foreign exchange, direct and indirect employment and income, infrastructural linkages, etc. The extent to which processed forest products can be marketed will, of course, depend on relative cost structures and type of technology utilized as well as other competitiveness factors such as trade barriers and product quality.

In 1981 wood industries accounted for about 1% of Ecuador's total GNP (Bremer-Fox and Bender 1987). Wood products comprise 2 percent of Ecuador's total merchandise exports, primarily in the form of balsa and plywood.

Total roundwood produced in Ecuador in 1984 amounted to 7.9 million cubic meters, of which industrial wood production accounted for only 27% of the total. The remainder of roundwood production was used for fuel (World Resources Institute 1985). Firewood consumption is about three times the total volume consumed by wood-based industries.

Ecuador's share of the world's total roundwood production is approximately 0.3% (FAO 1985). Small market shares in selected forest products trade indicate that Ecuador is presently a price-taker in forest products markets and in general has a relatively small role in world timber markets. Export statistics for specific wood products and the percent of world exports for Ecuador and the U.S. are compared in Table 1.

Table 1. Wood products exports for Ecuador and the U.S., 1985.

Product	Ecuador ($1000m^3$)	% of World Exports	United States (1000m3)	% of World Exports
Sawnwood/Sleepers	32	0.04	4534	5.27
Coniferous sawnwood[1]	1	0.00	3555	4.83
Nonconiferous sawnwood	32	0.27	901	7.69
Wood-based Panels	12	0.06	936	4.95
Plywood	11	0.13	215	2.54
Particleboard	1	0.02	211	3.33

Source: FAO, 1985.
[1]Latest figure for Ecuador is 1981.

An important influence on historical trade patterns for Ecuador was the erosion of the Andean Pact trade agreement. Before internal problems for this trade pact mushroomed during the early 1980s, Ecuador's trade activity in forest products was substantially higher. A large share of Ecuador's forest products trade before the 1980's was with nearby countries, due in part to the Andean Pact.

In terms of significantly expanding exports, Bremer-Fox and Bender (1987) discuss 3 trade-related problem areas facing Ecuadorian forest products sectors: 1) decreasing availability of the wood resource, 2) limited access to international markets, and 3) underdeveloped export

markets for furniture. These factors will be examined in this study along with other existing limitations and effects of institutional factors.

LITERATURE AND DATA REVIEW: METHODS OF ASSESSING COMPETITIVENESS

Most of the approaches for analyzing competitiveness in forest products are drawn from the agriculture economics literature. At this stage, a complete review of all such techniques is not feasible and only a brief review of the more common approaches for comparing measures of international competitiveness in production of commodities will be discussed.

Heckscher-Ohlin Two-Factor Production Model

Most comparisons of trade and competitiveness are derived from the standard Heckscher-Ohlin theory of a two-factor production model of trade between two countries: (2x2 model). A simplified description is that a country with balanced trade will export the commodity that intensively uses its relatively abundant factor and will import the commodity whose production intensively uses its relatively scarce factor (Leamer 1984). Modifications of this theory have led to multi-country, multi-commodity models relating domestic and international prices and costs (Balassa 1986; Anderson 1980).

Presently, one of the major drawbacks in applying the Heckscher-Ohlin approach to Ecuador's forestry industry is the basic shortcoming of the model for most agricultural-based industries. The inclusion of land as a

factor is important for such an industry based on the land resource and land cannot be assumed mobile or tradable as are labor and capital in the standard model. Secondly, the assumption that production functions for timber are similar across countries is unrealistic due to the country-specific differences affecting production functions such as topography, soil, and climate (Anderson 1980).

Labor quality as well as labor endowments must be considered in a meaningful analysis involving developing economies. As with many developing countries, questions regarding Ecuador's labor availability pertain not only to overall numbers, but also the availability of skilled technical labor and managerial labor, which can strongly affect the efficiency and productivity of an industry (Roemer 1979).

Domestic Resource Cost Ratio (DRC) and Related Approaches

Use of the Domestic Resource Cost (DRC) ratio is one of the most common forms of comparative advantage analysis employed in agriculture. The DRC concept suggests that a country has a comparative advantage in exporting a product if the value of all factors used--in their best alternative employment or opportunity cost--in producing the product is less than the product export price (Chenery 1961). This approach allows measures of comparative advantage (relative economic efficiency) among activities within a country and between countries.

The DRC is a single-period, social cost-benefit indicator often used when market and shadow prices diverge. Empirically, the DRC is a ratio of factor costs (usually capital and labor) valued at shadow prices, divided by

the value-added for the particular product or activity.[2] A low ratio indicates an area of production that should be considered for export expansion or import substitution.

Comparisons of domestic resource cost-of-production data across countries are especially difficult because data are generally unavailable or unreliable (Dunmore 1987). Data are frequently not available or reliable enough to allow social cost to be derived from accounting costs, and analysts often fall back to direct comparisons of accounting costs. The existence of market failures can also contribute to the inability of accounting data to track social costs. For example, industrial accounting data in the U.S. are fairly reliable, but they do not currently include all social costs, such as that related to air pollution.

Other drawbacks when using DRC ratios are the static quality of the approach and the inability to explain past effects and predict future trends (Nishimizu and Page 1986). In the case of Ecuador, currently a relatively small participant in world forest products markets, comparative analyses need to consider possible future changes in competitiveness based on capitalizing on advantages in costs of production.

Total Factor Productivity (TFP) measures the change in output levels of a product, controlling for changes in input levels (Nishimizu and Page 1986). It is based on the existing structure of domestic prices and usually measures relative changes in productivity. Nishimizu and Page (1986) found that when testing the decomposition of DRC ratios, price movements and factor productivity changes are major sources of change in international

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[2] A reviewer pointed out that because value-added is defined as only the labor and capital components of the factor bill, it does not address natural resource issues, in that no material bill is considered.

competition. Results of TFP analyses for highly distorted economies, such as Ecuador's, fail to provide sufficient information regarding domestic prices relative to international competitors.

The Policy Analysis Matrix (PAM) is an accounting procedure for estimating the efficiency of different sectors of a country and the effects of government policy on the profitability (private and social) of those sectors. It is a fairly new approach in terms of coverage in the literature and has recently been applied to several developing countries for policy analysis (Zimbabwe (Jansen 1988), Mali, Ecuador).

One advantage of PAM for certain applications is its relatively simple accounting approach, which utilizes average cost and revenue data (which are more readily available than more complex data required for constructing production functions and supply curves of inputs and outputs). Survey information to drive PAM applications have been obtained from government agencies, statistical offices, and firms in developing countries through the utilization of a fairly straightforward, short survey instrument. Jansen (1988) recently applied the PAM to Ecuador's nontraditional export sectors (including 4 forestry firms) for USAID, which was accomplished in a few months. Further applications of this approach to the forestry sector are in process (e.g., Guerron 1988).

Limitations of the PAM method in forestry applications center around the simplification of empirical analyses to represent complex, dynamic economic and biological relationships. The PAM, similar to other methods (Domestic Cost Resource Ratio), is a static approach based on a single point in time perspective rather than the trend and time series analyses that are more commonly utilized in addressing forest economics problems.

Representative Plantation

Sedjo's (1983) approach at comparative analysis uses a forest plantation simulation model to determine the economic returns to plantation forestry for major timber producing regions of the world (e.g., U.S. South). A "representative" plantation is defined and extrapolations of plantation area are used in modeling impacts on world market prices and stumpage prices. Accompanying the results is a sensitivity analysis reflecting changes in exogenous variables.

This approach is useful for comparing production costs for plantations in different countries. It allows the breakdown of various costs for timber production and allows comparisons along the production stream to pinpoint differences in costs advantages.

The main drawback for applying this method to Ecuador is that a large proportion of raw materials still originate from natural tropical stands. A comprehensive economic assessment of supply potential for these stands is hampered by data limitations pertaining to yields and total costs of production, as well as ownership patterns and the unsystematic removal patterns. The "representative stand" for each important timber growing region of Ecuador should incorporate essential biological characteristics (e.g., soil quality) and the set of management practices appropriate for the region.

Revealed Comparative Advantage (RCA)

The previous examples of comparative advantage models rely heavily upon domestic data and demand and supply functions that are not always readily available in many developing countries. One fairly common measure that is based solely on analysis of trade statistics is the Revealed Comparative Advantage (RCA) ratio. These estimates are considered "revealed," and sometimes questioned, because one must assume that commodity trade patterns can reflect the differences in costs of production between countries (Vollrath 1985).

A measure of revealed comparative advantage was first developed by Balassa (1965), using only export data. Vollrath later developed a revealed <u>competitive</u> advantage ratio utilizing import and export data to estimate the difference between a good's relative export share and its relative import share. Coefficients are derived by subtracting the country's comparative demand for a commodity from its comparative supply for that commodity. Measures greater than zero indicate that a commodity has a competitive advantage (Vollrath 1986).

Again, a limitation facing the analyst in using this approach for Ecuador's forestry industry would be the relatively negligible share the country has in world forest products trade. This approach would contribute little information towards analyzing the effects of policy on competitiveness in forest products.

Data for Analyzing Comparative Advantage of Timber Production

In order to evaluate the comparative advantage of timber production as part of a competitiveness assessment, information on timber production costs, potential revenues, and yields of plantations and natural stands must be assembled. The emphasis in such assessments is on the most productive forest lands and efficient woods operations in order to make a comparison of timber production potential at the high end of the scale. Several recent studies provide data on timber production and processing costs in Ecuador (e.g., McCormick 1987; Mussack 1987; Prestamon and Laarman 1988)(Appendix A).

Cost of timber production under different forestland management alternatives consists of both variable and fixed components. A cost function consists of an explicit function of the level of timber management inputs multiplied by the variable cost per unit of input, plus the cost of the fixed inputs. Three basic alternative methods for estimating the total costs of producing different levels of outputs in economic analyses are: (1) classification of costs for a process into fixed, variable, and semivariable components using an accounting framework, on the basis of inspection and judgment; (2) estimation of the relationships of cost to output on the basis of engineering conjectures and past cost behavior; and (3) determination of the functional relationship of cost to rate of output by statistical analysis of recorded cost, output, and other operating conditions (Alig et al. 1984).

Research by McCormick (1987) provides some information on costs of plantation production. McCormick (1987) examined timber production costs

for six Ecuadorian species--t. grandis, c. alliodora, s. parahyba, p. radiata, p. patula, and e. globulus--as part of an analysis of plantation management (Analisis de Inversiones en Plantaciones Forestales en Ecuador--The Economic and Social Importance of the Forestry and Wood Sector in Ecuador). This is one of the few cross-sectional data sets pertaining to forest production available for Ecuador. Cost data are lacking for balsa, pacheco, Fernan sanchez, and other species. Reliable time series of cost data for many Ecuadorian species do not exist. It should be noted that validation of existing cost studies is also lacking.

In other studies, Mussack (1987) analyzed wood supply costs for agro-forestry operations, Prestamon and Laarman (1988) are investigating efficiency of resource use in forest products processing in Ecuador, and Harou (1982) and others (Burwell 1982; De Bonis 1985; MacDonald 1982; McCredie 1982; and Pfeiffer 1984) provide analyses and evaluations of Ecuador's forestry sector and specific studies on silvicultural management practices. As mentioned earlier, Sedjo (1983) assembled cost data as part of a comparative analysis of plantations in major timber growing regions in the hemisphere, including Brazil and Chile, that may be useful for comparison purposes.

Possible sources of secondary data for Ecuador include The United Nations Food and Agricultural Organization (FAO) Production Yearbook, FAO Yearbook of Forest Products, and data from government and private sources in Ecuador (Ministry of Agriculture (MAG); an industrial wood products group AIMA, and private wood products firms).

Timber production costs for the U.S. South, for comparison purposes, are available from three major sources: (1) a recent regional study of

timber investment opportunities (USDA Forest Service 1988); (2) a time series of average costs of forestry practices for 1952 to 1987, from surveys of individuals, public agencies, and private firms (e.g., Moak et al. 1980); and (3) cost data assembled for evaluation of the Forestry Incentives Program (on file with SCFER). For the time series of cost data, several problems hamper trend analysis: (1) categories of management practices in the surveys have changed over time and (2) the embodied technology has also changed, with no correction applied in the accounting approach.

Review Summary

It is important to point out that no standard approach or measure exists for analyzing competitiveness in forest products. Candidate methods for measuring competitiveness need to be gauged against other methods, in the context of a particular application, in light of limitations in theory when measuring specific factors, as well as requirements of data, resources, and time. Usefulness and accuracy of decisions based on a particular approach should be evaluated along with expediency considerations for a particular application.

As previously shown, Ecuador's trade in forest products is still minimal and reliance on trade-based approaches, while convenient, may be misleading and irrelevant. Given the data requirements of the DRC-based approaches, more meaningful analysis at this stage appears possible by direct comparison of accounting costs. The DRC approach will be more fully investigated by Guerron (1988) in Ecuador in a related study. Modifications

or extensions of methods which attempt to pinpoint the importance of different factors and their relative influence on changes in competitiveness would be more beneficial for a country such as Ecuador at this point. Relative ratings of the importance of such factors, in a multi-country comparative framework, would be a useful first step in this process. Results from this approach will provide insights into those areas of advantage that Ecuador possesses and areas for improvement and the potential for enhancing future competitiveness in world forest products markets.

COMPETITIVENESS FACTORS

This section reviews factors that are not easily analyzed and measured using the techniques reviewed in the preceding section. Competitiveness is a complex issue, involving interactions among public and private sectors, as well as short-run versus longer term aspects. The major factors will be reviewed next and then a rating system is proposed to provide insights regarding how the U.S. South, Ecuador, and selected other countries measure up in competitiveness terms in markets for forest products. Three major categories of factors affect a country's competitiveness in world markets for forest products: (1) public policy factors, (2) economic factors, and (3) natural resources (U.S. GAO 1986). These factors are addressed to the extent that they affect U.S. and Ecuador competitiveness in forest products trade.

Public Policy Factors

Policies may enhance or impede a country's participation in the international marketplace, thereby affecting the country's ability to maintain its relative share of forest products trade. Seven major types of policy instruments are: 1) Trade agreements and countertrade practices; 2) Price supports and other subsidies; 3) Government organizational structure; 4) Nontariff barriers; 5) Levies; 6) Credit policies; and 7) Sales suspensions, moratoriums, and embargoes. While all types have been represented historically to some degree in Ecuador's case only several of them are significant currently in terms of competitiveness in forest products and will be examined.

Political instability and uncertainty have also posed difficulties in the past in Ecuador for forest industries and continue to hamper competitiveness. Costs of imported inputs which already comprise a significant portion of costs in the furniture, particleboard, and plywood industries are also affected by changes in political leadership and subsequent changes in taxes, subsidies, and exchange rates policies. Assessment of these uncertainties involves some speculative aspects, but must be factored into the comparative analysis.

Credit polices or subsidies may be crucial in determining producer cost advantages of forest production in one country compared to another. The government subsidy program in Ecuador, called Plan Bosque, could notably augment investment by forestry industries. Plan Bosque subsidizes interest charges on loans used to fund reforestation activities. However, the actual impact of the plan will be affected by constraints due to administrative

requirements and the time delays in realizing the funds for applicants (i.e., transaction costs).

Trade agreements or pacts have been important in terms of Ecuador's past participation in Latin American markets. The erosion of the Andean Pact among neighboring nations appears to have severely cut export markets and trade potential for Ecuador, at least in the short term.

A variety of opinions exists as to the different forest policy objectives and goals that should be pursued for Ecuador.[3] Forest policy as a process of evolving compromises tends to be dominated in Ecuador, as in some other countries, by concerns for commodity production and economic development. Experts in Ecuador are increasingly debating forest policy options, including enhanced integration of environmental concerns in natural resources planning. Forestry sector development will depend heavily upon the evolving public policy.

Economic Factors

Economic factors on both the production and consumption sides of the international market form the underlying relationships that are affected or altered by the policy measures above. For example, despite high production levels, the U.S. became a net wood deficit country in recent years because of very high domestic demand levels. Product or supply-side factors that

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[3] For example, a pulp and paper industry in Ecuador is felt by some to be a worthy and profitable venture with potential competitiveness in the international market. Differing views feel that the tremendous investment required could be more prudently spent when, for the same capital investment, at least 4-5 average-sized sawmills could be established to help improve the sawn lumber sector of the industry.

influence competitiveness of forest products exports can be classified into 3 groups: 1) cost of production, including productivity and technological change, 2) product quality and differentiation, and 3) infrastructure costs. Associated factors on the demand-side are 4) world economic recession/expansion tied to income levels and population changes, and 5) exchange rate fluctuations.

One obstacle to enhanced competitiveness for forest industries in Ecuador involves the costs for imported inputs in the furniture and plywood industries. In some cases, these costs (for adhesives, foams, sandpaper, resins, etc.) account for approximately 40-60% of total production costs. Future political changes could further increase the costs of imports through currency and exchange rate adjustments and thus, decrease competitiveness for forest production in Ecuador.

Any study of competitiveness should include some measure of the effects of transportation costs. Rising costs related to the infrastructure are mainly due to the nature of transportation systems in Ecuador. Limitations of the transportation system represent a major obstacle to accessing raw material supplies for a growing wood products industry. The lack of adequate transportation facilities leads to high access costs for the natural forest resource. While timber growing conditions are favorable, extraction and hauling costs are relatively high. Increased transportation costs are also expected as the distance of the wood supply to processing plants continues to increase as natural stands closer to plants are harvested and are not actively regenerated. In contrast, Mortensen (1987) projects that the U.S. South can remain competitive with major competitors in the southern hemisphere in regard to pine production costs, in part

because of its relatively well-developed and maintained infrastructure. The U.S. South has an advantage in lower fixed costs, which more than offset higher variable costs.

One limiting factor related to capital investments in Ecuador is the lack of adequate dry kilns for the wood processing industries. Increased investments in this technology would enhance competitiveness in terms of the quality of furniture and other processed products in the export markets.

Labor costs in the manufacturing sector of Ecuador have increased recently and account for increased percentages of total production costs. One furniture company surveyed in this study cited a 48% increase in furniture factory wages over the last year (1987-1988) and calculates real total labor costs per person as 2.5 times the base salary. Increases in labor costs are strongly influenced by existing government laws and regulations which provide double salaries for the months of April and December (salaries are adjusted for inflation), 15% profit sharing for all employees and their children, and strong labor protection laws. The potential for change in these laws will depend on the newly elected administration in Quito.

Many countries with abundant natural forest resources fail to compete due to technological differences in forest production processes that are inconsistent with international standards (Johnson and Smith 1988). The adoption of common industry standards and the ability to process the quantity of orders received on the world market are two supply-side factors of concern to forest industries in Ecuador and limitations to their growth in export markets.

More uncertain economic factors such as high inflation rates, increasing costs of capital, and exchange rate treatments will affect Ecuador's competitive position and are closely tied to the unpredictable evolution of public policy. In a developing country such as Ecuador, exchange rates and inflation rates often react notably to rumblings about political or governmental changes, which may promote economic instability.

Natural Resource Factors

Natural resource factors that affect timber resources include climate/weather and geography (e.g., arable land). In addition, the initial forest resource endowment and cumulative exploitation need to be examined in the context of raw material supplies for the forest industries. Although a major timber growing region such as the U.S. South has favorable climatic conditions, the longer growing season of Ecuador provides an advantage in terms of production.

Nevertheless, Ecuador's lack of an adequate supply of long fibers species and low utilization or production (an average of 30-45% recovery in sawmills) could partially offset the competitiveness edge provided by other favorable natural resource factors (McCredie 1982). Also, transportation limitations discussed earlier affect the ability to access the abundant tropical hardwood resources in Ecuador. Research on natural stand management and utilization of tropical species could provide new areas of forest production for the industry.

Forest resource statistics for the three major contiguous subregions of Ecuador--the Costa, Oriente, and the Sierra--are sketchy, but some important characteristics can be noted. Most of the plantations and more intensive

forestry occur in the Costa and Sierra regions. The Oriente is largely undeveloped, with limited road transportation systems.

Production by species follows geographical lines. In the coastal region, Laurel (Cordia alliodora) is the primary species with approximately 9 m3/hectare/year of growth, and teak (Tectonis grandis) with 12 m3/ha/yr (IDB 1982). Pine (Pinus radiata) and eucalyptus (Eucalyptus grandis) are the primary species in the Sierra region, with annual growth volumes of 13.1 and 27.2 m3/ha/yr, respectively. Average rotation age is 15 years. The total plantation area reforested in the Costa and Sierra regions are estimated at 10-15 and 40-50 thousand hectares, respectively.

Although comprehensive and detailed forest surveys of Ecuador have not been conducted, FAO (1981) estimated that Ecuador has 14.2 million hectares of broadleaved species (1.6 billion m^3) and 20,000 hectares of coniferous forest species (1.0 million m^3)(Appendix B). Total forest area is less than 1/5 of that for the U.S. South and much of the Ecuador forestland is not classified as commercial. Seventy-seven percent of the broadleaved area is considered productive forest land, but only 12% of this productive forest is considered merchantable by FAO standards.

Of the coniferous forests in Ecuador, 25% of the land area is considered productive and only 1/3 is considered merchantable (FAO 1981). This apparent lack of adequate merchantable coniferous volume is mirrored in supply constraints cited for Ecuador's woodworking sector (Van der Slooten 1986).

In terms of raw materials, the increasing scarcity of high-value species and their rising stumpage and extraction costs affect both the large plywood firms and the small furniture manufacturers. The increasingly

remote location of natural stands and overall decline in log size mean that exploitation costs of the Coastal forest will continue to rise. Chainsaw operators that produce lumber on site, who are relatively inefficient in their utilization of logs, often are the first to exploit areas such as the Amazon forest and pick out the highest-value species.

Long-term aspects of competitiveness in forest products dictate that assessment of prospective plantation forestry be included as part of the analysis. In a competitive world market for products such as particleboard, the ability to compete in the longer term will require more dependence on plantation wood sources that are relatively low cost and sustainable. Although the largest percentage of industrial wood in Ecuador still originates from natural stands, in the future there may be a shift in dependence to volumes of industrial wood from plantations. Plantation data are needed to allow comparisons to related assessments (e.g., Sedjo 1983).

For many developing countries, native forest supplies must be examined closely in view of indefinite ownership controls (e.g., control of access), competing land uses (e.g., energy exploitation, road building, colonization), infrastructure difficulties such as local transportation networks, and the management of numerous species. Potential supplies from agro-forestry operations must also be examined with careful consideration of the grower's overall objectives.

The desire for increased commercial timber supplies is being supplemented by plantation forestry practices. In 1980, Ecuador had a total of 43 thousand hectares in plantations, of which twenty percent (8700 hectares) were of coniferous species. Some 3,500 hectares were established

between 1978 and 1980 (FAO 1981). Statistics compiled in 1981 show as much as 63,500 hectares in plantations (IDB 1982).

Recommendations for industrial forest management in Ecuador include establishing many more hectares of fast-growing industrial plantations in the Sierra region, management of 1 million hectares of natural forest in the Esmeraldes region, and forest inventory activities in the Amazonian region, requiring approximately US$20 million (World Resources Institute 1985).

RATING COMPETITIVENESS FACTORS

As described in the previous sections, the three major categories of competitiveness factors contain numerous and diverse elements that can not be easily or rigorously boiled down to relatively few measures. Table 2 summarizes the major elements pertaining to competitiveness in timber products and sets up a comparative rating for Ecuador, the U.S. South, Chile, and Taiwan. These countries were selected because they represent diverse conditions pertaining to natural resource endowments, access to major markets, and other competitiveness considerations. For example, Taiwan is relatively resource-poor in terms of domestic timber supplies but has fared well in certain forest products markets such as furniture.

Each factor component is given a factor rating (on a scale of 1-5), which is a relative measure of the level of impact that particular component may have on the competitiveness of a forest industry. Each component is also assessed an indicator of whether it is a relative advantage (+), disadvantage (-), or no clear advantage (0) to competitiveness in the forest industry of a particular country. The indicator is multiplied by the

factor impact (weight) rating for a total weighted rating, to determine an overall rating of competitiveness. A total rating results from the sum of all the weighted ratings for each country.

Even with the subjective nature of the ratings, the "bottom line" competitiveness rating for Ecuador's forest products trade in Table 2 is clearly much lower than these for the other 3 countries. This is consistent with Ecuador's current small role in world markets.

While Ecuador has positive ratings for natural resource factors, these are overwhelmed in the rating system by factors related primarily to public policy and infrastructure. The other competitors are better positioned to compete in world markets, although their competitive strengths vary noticeably.

The subjective ratings are intended not to be conclusive, but suggestive of key aspects where Ecuador should focus efforts to improve competitiveness. Specific related policy questions will be explored in the next section. Expanded applications of this type of method could utilize numerical values for the indicators of each factor and fractional weights as factor impact ratings.

It should be noted that this rating system contains some overlap between elements, but this preliminary framework will be useful in facilitating expert review in gauging the relative importance of the elements. This procedure is designed to isolate the crucial aspects of competitiveness for Ecuador, using sensitivity analysis, and help focus policy analysis.

Table 2. Competitiveness factor ratings for Ecuador, U.S. South, Chile, and Taiwan.

SAMPLE—PRELIMINARY, FOR DISCUSSION PURPOSES ONLY

Factor	Factor Impact	Weighted Factor Rating			
Component	Rating	U.S. South	Ecuador	Chile	Taiwan
Policy Factors					
Guiding Forest Policy	3	(0)* 0	(-) -3	(+) +3	(+) +3
Subsidies/Incentives	3	(0) 0	(+) +3	(+) +3	(0) 0
Tax Policies	5	(0) 0	(+) +5	(+) +5	(+) +5
Government subsidies for exports	4	(0) 0	(0) 0	(0) 0	(0) 0
Government Stability	3	(+) +3	(-) -3	(0) 0	(0) 0
Foreign Exchange	2	(+) +2	(-) -2	(0) 0	(0) 0
Foreign Debt Load	1	(0) 0	(-) -1	(0) 0	(0) 0
Exchange Rate Treatment	3	(0) 0	(-) -3	(0) 0	(0) 0
Infrastructure	2	(+) +2	(-) -2	(0) 0	(0) 0
Extension/Technical Assistance	2	(+) +2	(-) -2	(+) +2	(0) 0
Economic Factors					
Access to Markets	3	(+) +3	(+) +3	(+) +3	(+) +3
International Transport	2	(+) +2	(+) +2	(+) +2	(+) +2
Domestic Transport	4	(+) +4	(-) -4	(+) +4	(+) +4
Silvicultural Technology	2	(+) +2	(0) 0	(+) +2	(-) -2
Timber Processing	4	(+) +4	(-) -4	(+) +4	(+) +4
Utilization Capacity	2	(+) +2	(-) -2	(-) -2	(+) +2
Capital Availability	3	(+) +3	(-) -3	(+) +3	(+) +3
Labor Supply	1	(0) 0	(+) +1	(0) 0	(0) 0
Product Quality	3	(+) +3	(+) +3	(+) +3	(+) +3
Inputs Costs	4	(+) +4	(-) -3	(-) -4	(-) -4
Natural Resource Factors					
Land Availability	2	(+) +2	(+) +2	(+) +2	(-) -2
Availability of Quality Timber	2	(+) +2	(+) +2	(+) +2	(-) -2
Timber Yields	4	(0) 0	(+) +4	(+) +4	(-) -4
Length of Growing Season	3	(-) -3	(+) +3	(+) +3	(0) 0
Total Weighted Ratings		+37	-4	+39	+15

*Numbers in () are indicators of the relative advantage (+), relative disadvantage (-), or no clear advantage or disadvantage (0) of each factor on the competitiveness of forest production in each country.

Table 3 presents cost data for particleboard production in the U. S. South and Ecuador. The cost figures illustrate that Ecuador has a cost advantage in raw materials, but has significantly higher processing costs. The higher processing costs are due in part to the high costs of imported inputs such as resin and relatively higher internal transportation costs. Figures 1 and 2 present trends, based on FAO (1985) data, for export-based values for selected forest products for Ecuador and the U.S. Although the data values for selected forest products are not strictly comparable because of differences such as species mix and quality differentials, the trends broadly reflect recent slow increases or decreases since peaks around the beginning of the 1980's.

POLICY QUESTIONS

Those addressing the problem of adjusting public policies related to trade issues must consider internal and external balance. Although Ecuador selects policies in pursuit of its own objectives, its choices may elicit responses by other countries. Ecuador likewise will continue to be affected increasingly by international economic relationships, as is true in general for all countries, and the Andean Pact experience exemplifies the importance of such relationships. This section examines public policy choices facing Ecuador in terms of forest products trade.

Given the importance of forces external to the forestry sector in Ecuador, those examining of public choices for effecting substantial aggregate gains in export volumes of forest products need to carefully weigh short and long-term considerations, with consideration of institutional

Table 3. Costs of production for particleboard in Ecuador and the U.S. South ($US 1986). (Preliminary estimates)

	Ecuador	U.S. South
Species	P. radiata	P. taeda[1]
Yield (m3/ha)	464.0	620.2
Stumpage Prices ($US/m3)		
Pulpwood thinning	1.92	14.94
Sawtimber thinning	8.80	27.88
Pulpwood harvest	1.92	18.94
Sawtimber harvest	12.10	31.88
Establishment Costs ($US/ha)	350.00	415.32
Processing Costs ($US/m3)	663.80	131.81
F.O.B. Export Values ($US/m3)	116.49	115.24
International Transportation Costs ($US/m3)	42.77	42.33
C.I.F. Import ($US/m3)	159.26	158.57

Sources: McCormick 1987; Prestamon 1987; Sedjo 1983; FAO 1985; Stumbo n.d..

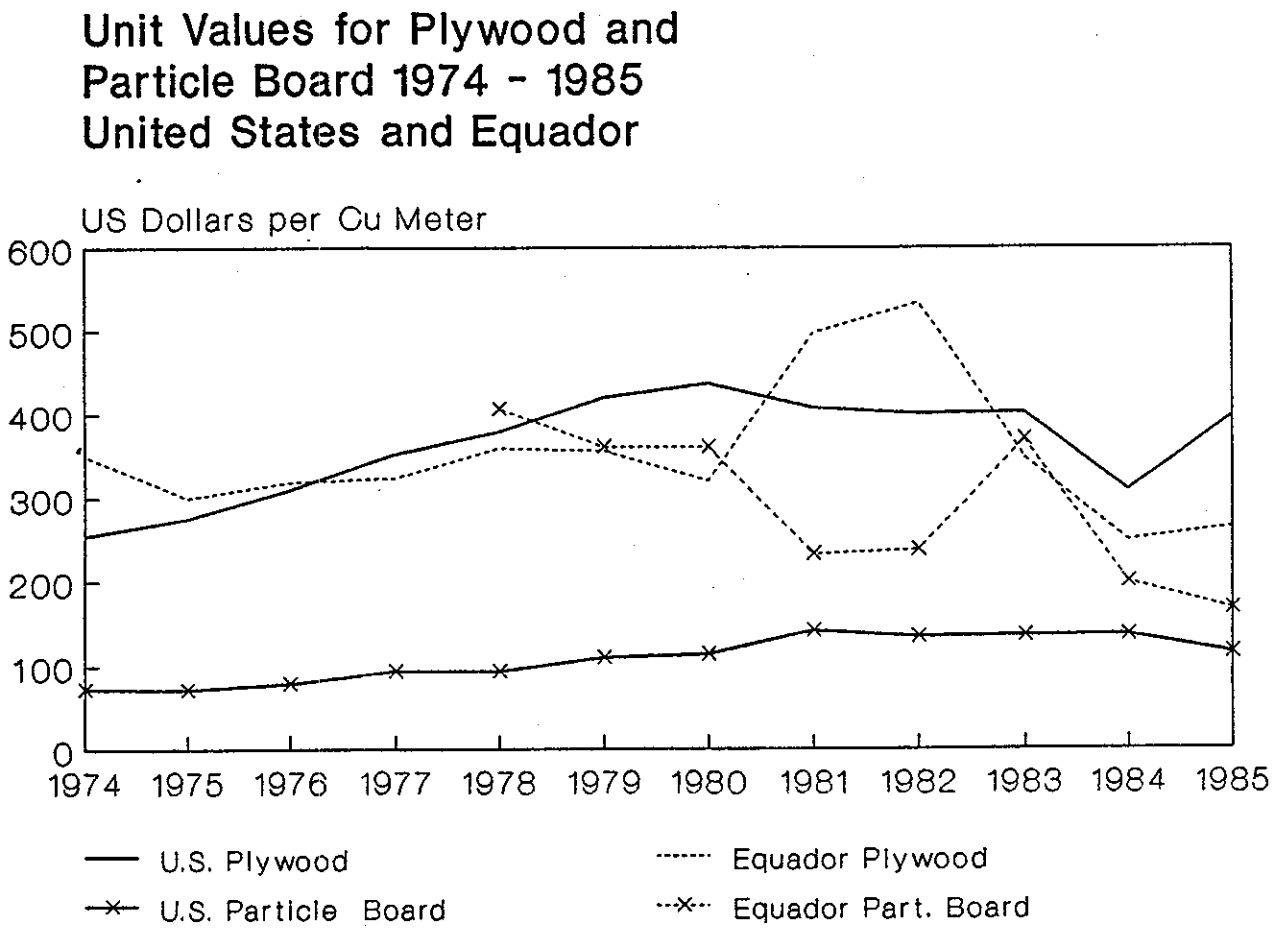

Figure 1. Trends in FOB values for Ecuador and the United States for particleboard and plywood, 1974-1985. Source: FAO (1985).

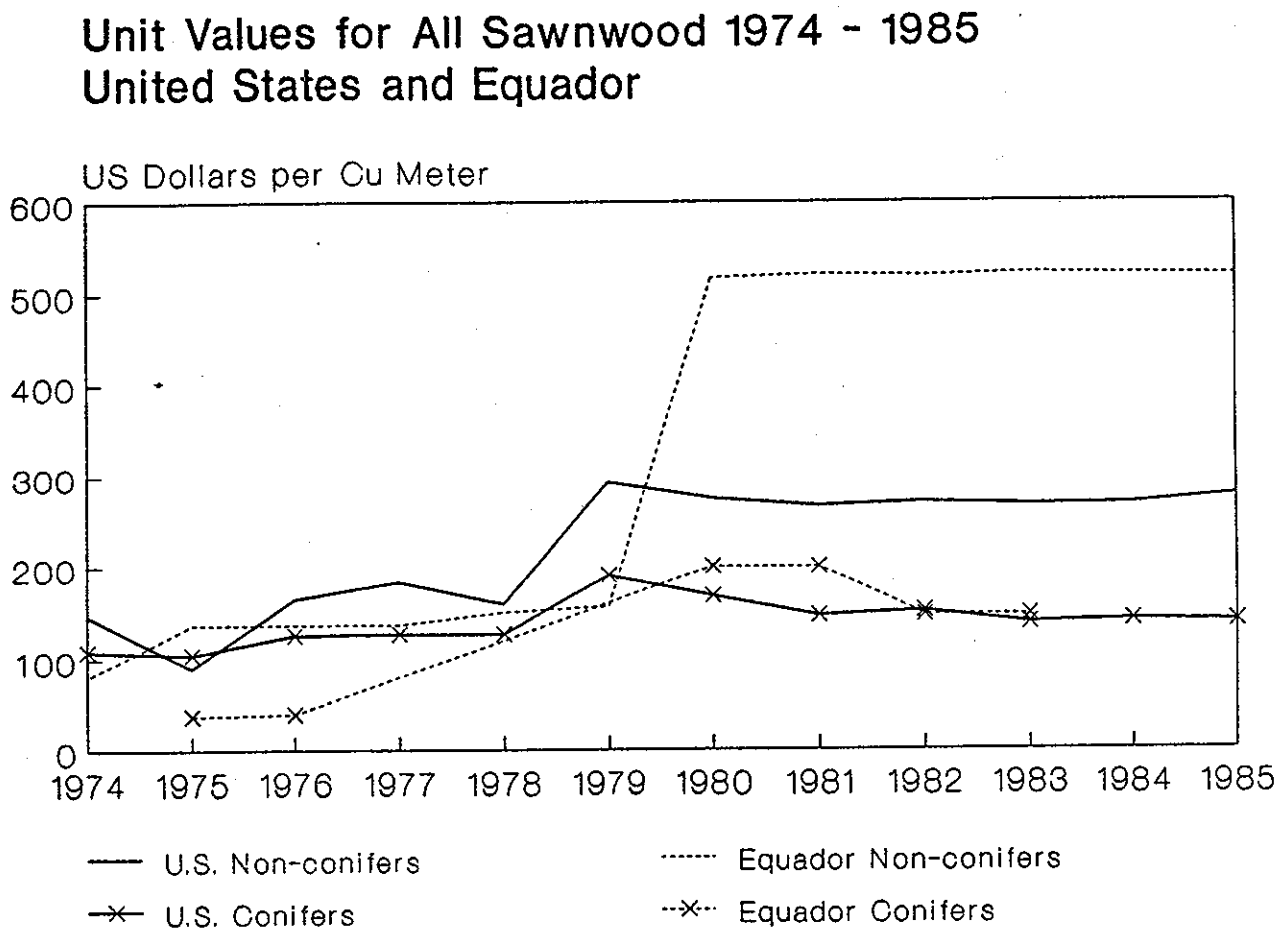

Figure 2. Trends in FOB values for Ecuador and the United States for sawnwood, 1974-1985. Source: FAO (1985).

norms. A static notion of comparative advantage suggest that the position of any nation in world trade depends largely upon its natural resources, int population, and its capital. This view would have lead many observers to conclude that Japan at the end of World War II was doomed to remain poor and could have only developed by making maximum use of its major resource at that time: cheap labor (Scott and Lodge 1985). Japan, and countries such as Taiwan in the case of forest products, have learned how to create comparative advantage through a global strategy that also considers intangible assets (e.g., well-trained work force), in addition to natural resource endowments, and in view of future economic trends based on a product's income elasticity and rate of technological change. Thus, governments are directly concerned with the outcomes, not just the rules of trade, and they manage their national portfolios by designing policies and institutions both to enhance competitiveness and to ease the costs of industrial transition in their country.

National strategies in terms of competitiveness can differ in the degree to which they are resource versus opportunity oriented. Resource-oriented ones tend to view markets and competition guided by Adam Smith's invisible hand as the most effective way to develop resources, with government in the role of referee and regulation. Those that are opportunity oriented see a role for the visible hand of government as supplementing market forces, not as a substitute, such as a supplement in shaping incentives to alter risk/reward relationships or to promote mobility of resources (Scott and Lodge 1985).

One specific policy issue related to the allocation of forest resources for domestic versus export uses is the need to increase and sustain income

and employment levels in rural areas. Forestry's potential contribution to the economy could be better realized through more efficient use of the resource, which would both boost the supply of wood and the incomes of groups such as the chainsaw operators. Cost and return information for micro-enterprises gained from studies such as Prestamon and Laarman's (1988) could aid policy makers in addressing human resource questions pertaining to industrial transition and inherent employment consequences. The environment within which all industries function has become increasingly internationalized and interdependent, and macroeconomic policies are ever more directly linked to employment policy.

A few of the larger firms have realized notably increased exports and other firms appear to be in the process of identifying solutions suited to their means and corporate strategies (Bremer-Fox and Bender 1987). If smaller firms are to attain significant export sales, particularly in the highly competitive international furniture market, they will have to improve quality, volume, and supply reliability. Firms must realistically assess external constraints as well. For example, the effectiveness of policies designed to change forest products trade will vary with variations in the exchange rate, and Ecuador's trade in all commodities, not just forest products, determines the value of Ecuador's currency relative to other currencies. From a cost of production perspective, further improvements in Ecuador's competitiveness are possible through domestic substitution of inputs that are currently imported (e.g., adhesives).

Some of Ecuador's best opportunities for improving competitiveness in the foreseeable future may be through specializing in areas of potential comparative advantage in forest products. Based on preliminary and sketchy

cost data, these areas appear to include particleboard, furniture, and plywood. International marketing research will become increasingly important. Firms might find it necessary to rely more on cooperative arrangements among themselves to offset the disadvantages of the small size of many firms. This type of investigation has by necessity been broad in its coverage and more specific examinations of export potential are needed and better accomplished by experts in country. Efforts at this stage should focus on specific firms rather than general approaches.

Adoption of additional technological improvements could significantly boost timber productivity and lower per unit production costs in Ecuador. These may include genetically improved stock, species selection, spacing control, reduction of vegetative competition, and fertilization.

A recently elected government in Ecuador has expounded views that appear to be quite different from the preceding administration, which espoused more free-market oriented policies. The specific impacts of the new government's policies on the forestry sector are difficult to predict, as it remains to be seen whether the rhetoric of the political campaign is consistent with policies that are implemented. Important policy choices to monitor include tax policies, export subsidies, and currency controls. Whether forestry will receive favorable treatment under new policies will greatly influence Ecuador's future prospects for expanding forest products exports. The potential of enhanced regional cooperation among neighboring Latin American countries is another policy-related development that could substantially influence the level of future exports.

SUMMARY AND CONCLUSIONS

According to the competitiveness rating system developed in this study, Ecuador currently is at a notable disadvantage relative to 3 other countries that represent a diverse mix of forest resource endowments and government support for forest products industries. Major factors contributing to Ecuador's lower rating are public policy and infrastructure limitations. Options to change the pattern of Ecuador's forest products trade are constrained because of Ecuador's position in a world economy, where counter measures are often quickly developed by competitors in response to trade policy initiatives.

Selected cost comparisons with the U.S. South indicate that Ecuadorian timber growing costs compare favorably. Plantation area in Ecuador is currently less than 100,000 hectares, but plantations supply about 30 percent of the industry's wood supply needs. Plantations are expected to supply a much larger share in the future as the cost of exploiting more distant natural stands will continue to rise. Ecuador is at a disadvantage for the internal transport and processing stages. In particular, processes requiring imported inputs are considerably more costly than major competitors in world markets.

Future studies of Ecuador's comparative advantage and competitiveness in the world forest sector would be beneficial for government decision-makers, private firms, and organizations responsible for forestry sector development. Numerous approaches for the agricultural sector have been utilized as measures of competitiveness within countries as well as internationally. For forestry, considerations must be given to the unique

time characteristics of the resource in contrast to agricultural and other investment activities. One conclusion from this study is that existing competitiveness measures are imperfect and important competitiveness factors tend to be unique by country (e.g., labor protection laws and tax policies).

A forthcoming comparative analysis of Ecuador's forestry sector using the Policy Analysis Matrix approach by Guerron (1988) will focus on policy factors affecting forestry production. However, further steps must be made to devise specific empirical models that may be tested through case studies of various major, and potentially major, competitors in world forest products trade. The competitiveness factors and sample data presented here serve as a basis for initiating expert comment and discussion on the priorities in selecting variables and methods for an overall comparative advantage approach.

A reliable cost model at the enterprise level for Ecuador would assist decision-makers in assessing competitiveness issues, but development of a widely applicable model is hampered by heterogeneous production activities and weak data. Due to the proportion of log supplies originating from natural stands in Ecuador, data are needed on production costs, prices, and yields of logs representative of the tropical hardwoods sector of the country. Problems in multiple species management in Ecuador will require further study before substantial gains in wood yield are realized. Potential increases in wood supply from agro-forestry operations have also not been fully tapped.

The collection of subsequent data for the comparison of export potential and world competitiveness of Ecuador's forest industry is also needed. Supplemental data on international transportation costs, domestic

policy factors, international trade policy factors and monetary exchange rates trends would advance the analysis of production advantages and barriers to market destinations. Assessing competitiveness requires consideration of interdependent public policy and economic factors that warrant continued monitoring in Ecuador because of their dynamic nature. While Ecuador is not projected to have a major role in world production and trade patterns for industrial wood products, information on timber production costs is useful in assessing domestic production potentials relative to other countries in Latin America (e.g., Brazil and Chile).

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APPENDIX A: COSTS OF PARTICLEBOARD PRODUCTION IN ECUADOR

The following table contains initial estimates of production costs and revenues for Pinus radiata, used for particleboard production in Ecuador. These estimates are compared to estimates of southern pine species used for particleboard production in the United States.

Pinus radiata

Year	Practice	Cost (per hectare) ($U.S. 1986)	Stumpage (price per m^3) ($U.S. 1986)	Yield (per hectare) (m3)
0	Site prep	$163		
2	Crown clearing	13		
3	1st pruning	16		
4	Crown clearing	13		
5	Marking for thinning	40		
5	1st thinning	32	(noncommercial)	
5	2nd pruning	16		
7	Volume estimation	11		
8	2nd thinning	16	1.92[1]	36.2
			8.80[2]	15.5
8	3rd pruning	16		
16	Final harvest	11	1.92[1]	144.3
			8.80[2]	123.7
17	Administrative	3	12.10[3]	144.3

[1] Chip'n'saw logs; [2] Grade 2 logs; [3] Grade 1, clear logs

In-plant processing costs (1987 $ U.S.) for Artepractico's furniture and particleboard:

COSTS	(yearly)
Labor	$1.1 million
Inputs	.706
Raw materials	.880
Taxes	.116
Services	.786
Other	.309
REVENUES	
Total Revenues	$5.027 million
Total Exports	.005 (F.O.B.)
Particleboard Revenues[1]	.406
Particleboard Exports	.049 (F.O.B.)

1 Particleboard sales accounts for 4% of total sales for Artepractico and particleboard export sales accounts for 12% of total exports.

Data for this study were obtained from various sources, including cost data from other ongoing studies as summarized below:

Species Represented	Area Sample	Product Types	Year	Types of Data	Stand Type
		MUSSACK (1987)			
F. Sanchez Laurel S. de Gall. Tangare Pine	Esmeraldas Cuenca Babahayo Ventanas Guayaquil	Logs	'79- '86	Costs: in-plant stumpage exploitation permit transportation labor chain saw Wood consumption by mill Log volumes Species composition of wood consumed by mill Log classification by mill	Natural
		MCCORMICK (1987)			
Laurel Pachaco Radiata pine Patula pine Eucalyptus Teak	National(?)	Major product by species	1986	Costs: establishment silvicultural systems Silvicultural systems Production Levels Stumpage values by product and species Production earnings by level of production, price, and product Volume production and MAI by site index and rotation age	Plantation
		PRESTAMON AND LAARMAN (1988)			
Variable by province	National	All products	1987	Costs*: employment input transportation taxes investment/infrastructure services primary materials Professional affiliations Training needs Consumption of raw materials Production levels and sales Export volumes, values, and destinations Reserve inventory	Natural & Plantation

* Costs and other data are collected from nurseries, reforestation firms, exploitation firms, transportation firms, primary industries, and secondary industries.

APPENDIX B: LAND AND FOREST RESOURCES OF ECUADOR

A recent overview of the forest situation in Ecuador is presented in an assessment of INFORDE's activities prepared for USAID/QUITO (Bremmer-Fox 1987). For comparison purposes, an overview of the forest resource situation in the U.S. South and discussion of associated production costs are provided by a recent comprehensive study (USDA Forest Service 1988).

Ecuador covers about 27 million hectares of land, including approximately 11 million hectares that have commercial timber resources. Forest resource statistics for the three major contiguous subregions of Ecuador--the Costa, Oriente, and the Sierra--are sketchy, but some important characteristics can be noted. Most of the plantations and more intensive forestry occur in the Costa and Sierra regions. The Oriente is largely species follows geographical lines. In the coastal region, Laurel (Cordia alliodora) is the primary species with approximately 9 m^3/ha of growth annually and teak (Tectonis grandis) with 12 m^3/ha (IDB 1982). Pine (Pinus radiata) and eucalyptus (Eucalyptus grandis) are the primary species in the Sierra region with 13.1 and 27.2 m^3/ha, respectively.

Indigenous hardwood forests contain about 100 million cubic meters of timber inventory. The average log diameter is 50 to 70 centimeters. Standing softwood inventory totals around 15 million cubic meters. The average softwood log diameter is 70 to 90 centimeters.

The desire for increased commercial timber supplies is being supplemented by plantation forestry practices. In 1980, Ecuador had a total of approximately 43 thousand hectares in plantations (FAO 1981). Some reports of 1981 show as much as 63.5 thousand hectares in plantations (IDB 1982). These plantations consist largely of eucalyptus, pachaco, and pine species. Many of these have been planted by producers of wood based panels to provide raw materials. Of the 43 thousand hectares of plantations cited, twenty percent (8700 hectares) of these plantations were of coniferous species. Some 3500 hectares were established between 1978 and 1980.

Recommendations for industrial forest management in Ecuador include establishing many more hectares of fast-growing industrial plantations in the Sierra region, management of 1 million hectares of natural forest in the Esmeraldes region, and forest inventory activities in the Amazonian region, requiring approximately $20 million US (World Resources Institute 1985).