

SOUTH AMERICA: INDUSTRIAL ROUNDWOOD SUPPLY POTENTIAL

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South America has substantial potential to expand its forest plantations and raw material supply. From 1997 to 2005, South America had a high annual growth rate in the production of industrial roundwood, with Brazil and Chile being the most important countries. In the same period, Asia had the only negative regional production growth rate in the world, and China became the largest round wood importer in the world. This paper summarizes the status of production, consumption, imports, and exports of industrial roundwood and forest products in South America. Production and exports from South America have continually increased at annual growth rates exceeding the forestry sector in general and the U.S. in particular. Based on timber growing investments to date, a strong timber production and forest products manufacturing sector has developed in the Southern Cone countries of Chile, Brazil, Argentina, and Uruguay, and is increasing in other countries in Latin America. There will be continued opportunities for forest plantations and new manufacturing facilities throughout South America, tempered somewhat by perceived country financial and political risks. These opportunities will allow South America to increase its share of world production and increase imports to North America and to Asia.

Keywords: Roundwood; Wood Trade; South America; China; India; Emerging Markets

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INTRODUCTION

The market of forest products world-wide is always dynamic, but is currently experiencing considerable changes due to the role that the emerging economies are playing. The imports of forest products by China grew from US\$ 5 billion to US\$ 20 billion (annually) in 16 years (1990-2005) (FAO 2007a). In addition, India's forest products imports grew from US\$ 0.8 billion to US\$ 2.3 billion in just seven years (1999-2005) (FAO 2007a). The message is clear that "there will be a need for more raw material and plantations to supply the increasing forest products world demand." It was estimated that around 50 to 100 million hectares of new forest plantations are needed to meet the world industrial wood demand by the year 2010 (Boyle 1999).

South America, comprising Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Peru, Paraguay, Uruguay, Suriname, and Venezuela, possesses considerable potential for the establishment of new plantations and for increasing its roundwood supply to support its domestic forest products manufacturing and exports.

Latin America had the highest annual increase in the world in industrial roundwood production from 1997 to 2005. Commodity industrial roundwood includes: saw logs or veneer logs, pulpwood, other industrial roundwood, and, in the case of trade, wood chips, wood particles, and residues as noted by FAO (FAO 2007 a).

Brazil and Chile are the largest forest product exporters in South America. Both generally have a positive balance in the trade of forest products, with exports greater than imports. On the other hand, Uruguay, while being the largest exporter of roundwood, ranks fourth in total exports of forest products commodities (FAO 2007a).

South America has a comparative advantage in developing new plantations and forest product industries based on fast growing exotic species, which have the greatest rates of returns in the Americas (Cubbage et al. 2007). Sedjo (1999) summarized how these plantations can help to meet the increasing timber demand, and the favorable situation has continued.

This paper analyzes existing secondary data of forest plantations and production in South America, assesses political and financial risks, and draws conclusions about the potential of South America to provide roundwood and manufactured products to North America and emerging economies in Asia. We synthesize literature from various UN FAO reports and summarize data collected from other industry trade sources from Latin America in order to analyze region-wide opportunities and the merits of individual countries in South America.

DEMAND, PRODUCTION, AND EXPORTS

The emerging economies in Asia are changing the face of the world forest products market. The shortage of available fiber and timber resources, the expanding middle-income economy, and the potential for export manufacturing has led to significant imports of raw materials by China and India. The growing imports of the two countries are creating extremely large structural shifts in the forest products trade; however, the effects on raw material availability and prices of the commodities are still unknown.

Industrial Roundwood Demand of the Emerging Markets

China leads the world in roundwood imports (with Japan in the second place) and the furniture exports. China imports roundwood and sawn wood from the UNECE region (United Nations Economic Commission for Europe), and production from China competes strongly with furniture manufacturers in Europe (FAO 2007(b)). China's imports of industrial roundwood grew from 6 million m³ in 1995 to 30.4 million m³ in 2005 (Fig. 1). Moreover, its imports of pulp for paper increased by 6.4 million tons during the same period. In addition, India imports of industrial roundwood in 2005 (ca. 4.6 million m³) were thirteen times the quantities imported in 1995, although this compared to a relatively low base (FAO 2007a).

The population of Asia is estimated to grow by nearly 2 billion people by 2050. The increase in population alone will mean a 148% increase in production of wood and paper products necessary by 2050 (Juslin and Hansen 2003). The growing demand coupled with the raw material deficit in this region is likely to continue to create

pressures on wood import increases. These increases, in fact, dominate world roundwood production, increasing from 40 million m³ in 1995 to 56 million m³ in 2005 (FAO 2007a). Exports in the rest of the world have changed much less, so China and India will continue to drive much of the new trade in roundwood and pulp in the future.

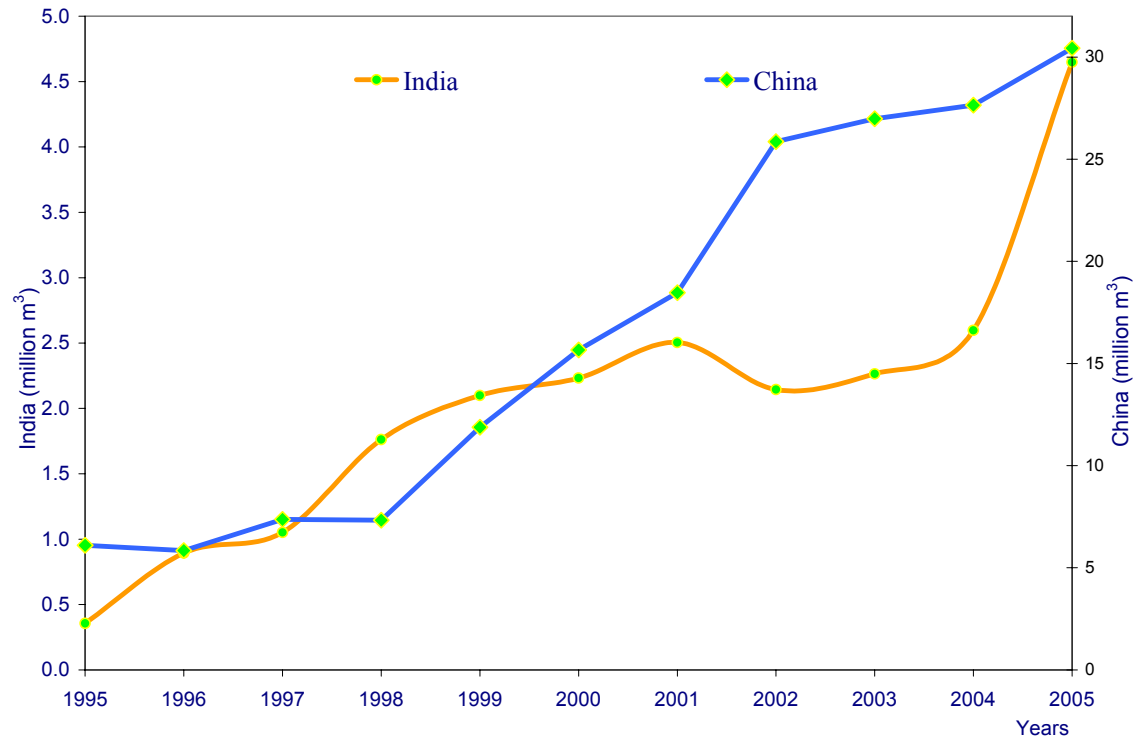


Figure 1. Imports of industrial roundwood-China and India (1995-2005)

Source: FAO, 2007a.

Production and Consumption of Industrial Roundwood in South America: Methodology

A database for South America with information on consumption of industrial roundwood for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Peru, Paraguay, Uruguay, Suriname, and Venezuela was developed for different periods. The consumption was estimated as follows:

$$AC = NP + IMP - EXP \quad (1)$$

where:

AC = Apparent Consumption (m³)

NP = National Production (m³)

IMP = Imports (m³)

EXP = Exports (m³)

In addition, the database includes relevant information such as population, gross domestic product (GDP in US\$) and the trade of some commodities between the U.S. and

South American countries. For these, the per capita value was calculated, by dividing each one of them by the size of the population for the corresponding year and country. The database was built by processing and combining online information from the Food and Agriculture Organization of the United Nations (FAO 2007a), the United States International Trade Commission, and the reports of national forestry associations in selected South American countries (BRACELPA 2007; CORMA 2007; INFOR 2007).

The average annual change in the data over time is inherently an exponential function. Accordingly, it was estimated using the price indices method as described by Cubbage and Davis (1986). A log-linear least square regression was performed in order to obtain the slope of the exponential function. The general formula is as follows:

$$\text{Log } (P_n) = \text{Log } (P_o) + n \log (1+i) \quad (2)$$

$\text{Log } (P_o)$ and $\log (1+i)$ are constants, so this equation is of the form:

$$y = a + bx \quad (3)$$

where:

$y = \log (P_n)$ is the dependent variable

$x = n$ is the independent variable

$b = \log (1+i)$ is the slope

$a = \log (P_o)$ is the intercept

To find the annual increase rate the antilog of the slope is calculated and subtracted from (1).

Trends in Production and Consumption

Analyzing the trends from the data reveals several key points. Figure 2 illustrates the South American production and its world share; both variables show a steady growing trend. In 2005, the world production of industrial roundwood was about 1.7 billion m^3 , of which 10% (174.8 million m^3) was accounted for by South America (FAO, 2007a). In the same year, the world share of production for North and Central America, Europe, Asia, Africa, and Oceania were 37%, 32%, 14%, 4%, and 3%, respectively.

As calculated using equation 2, the annual increase in production (%) in the period from 1961 to 2005 was 4.5%, indicating that in 20 years South America has almost doubled its share of world production. During the period from 1997 to 2005, the region showed the highest interannual growing rate in the globe, followed by Europe. The region with the lowest increase in production was Africa, and the only region that experienced a decrease was Asia, at 1.17% percent per year (Fig. 3).

Figure 3 indicates that among countries in South America, Brazil and Chile accounted for up to 95% of the increase in production of industrial roundwood. Certainly, the production of industrial roundwood, sawnwood, wood-based panels, and fiberboard is expected to increase at a consistent rate until 2020 in Brazil and Chile as well as other countries in South America as result of significant planned investments in plantations by both governments, and by local and international companies in the region

(Zhang 2007). This increase in wood production in the region, combined with investments in new and expansion in existing facilities, have led South America to increase paper production by 27% in just 6 years, 2000-2005 (Gonzalez and Rojas 2007; Rojas and Gonzalez 2007).

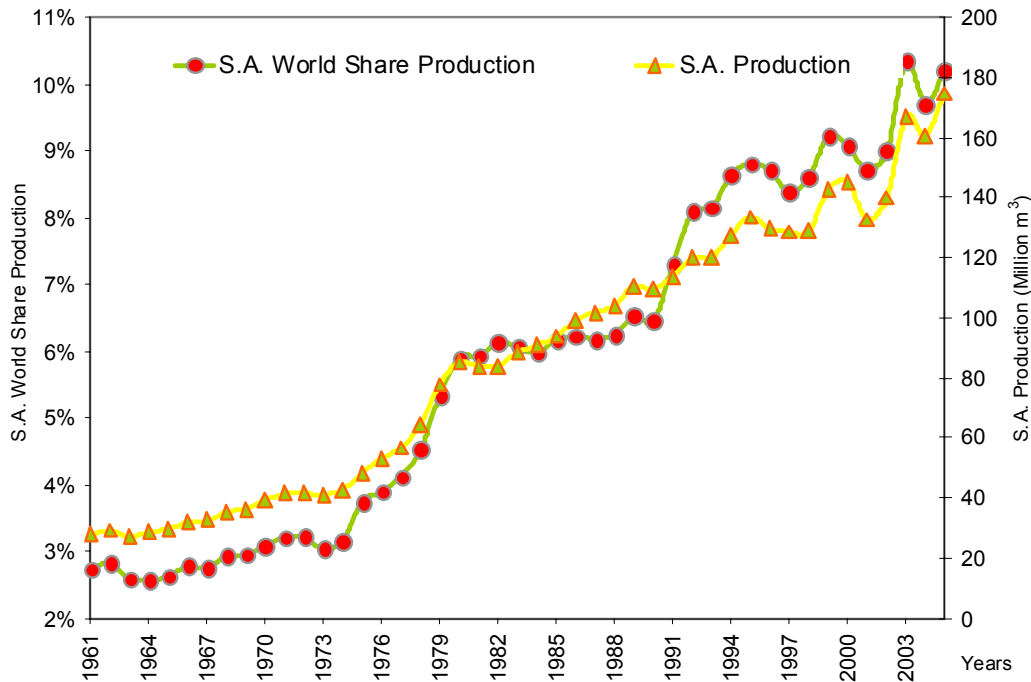


Figure 2. Production of industrial roundwood in South America (1961-2005). Source: FAO, 2007a

Figure 4 shows the consumption and production of industrial roundwood by country in South America. Brazil has about 68% of the total production and consumption in the region, followed by Chile and Argentina. These three countries account for about 92% of the total share of industrial roundwood production in the region. On average, most of the countries consume what they produce, with the exception of Uruguay, where the production is 34% more than its consumption. Uruguay, therefore, is the leading exporter of roundwood, mostly hardwood, in the region. A comparison of the proportion of softwood vs. hardwood for the major producer countries in South America shows that softwoods dominate in Chile (79%) and Argentina (62%), and hardwood production is the highest in Brazil (63%) (Fig. 4).

Chile has the highest annual per capita consumption (2.2 m³ per person) of industrial roundwood among all countries in South America (Fig. 5). The country houses the two largest (by sales in 2006) forest products companies in South America (Arauco and CMPC, respectively). Investments in modern production technologies by these and other forest products businesses, high levels of infrastructure development, plantation development, and extensive domestic and export markets have contributed to the high consumption. Chile is the second largest exporter of forest products in South America (Table 1), with cellulose as the largest export commodity, followed by wood products

(CORMA 2007). As shown in Fig. 5, Uruguay, Paraguay, and Brazil rank next to Chile in annual per capita consumption levels (between 0.66 and 0.63 m³).

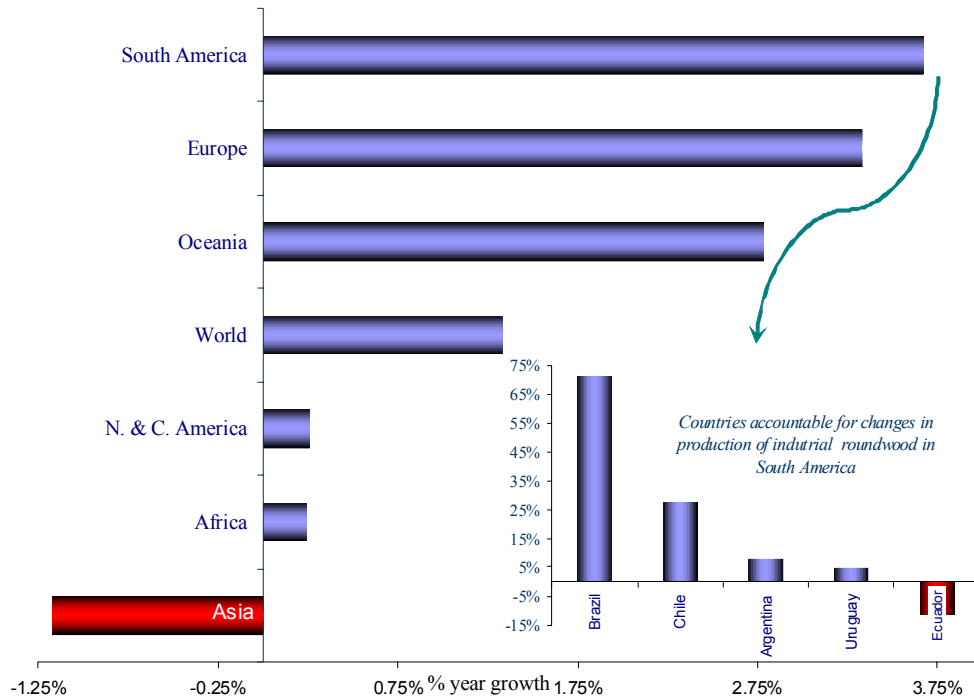


Figure 3. Annual production increase by region (1997-2005)
Source: Data from FAO, 2007a.

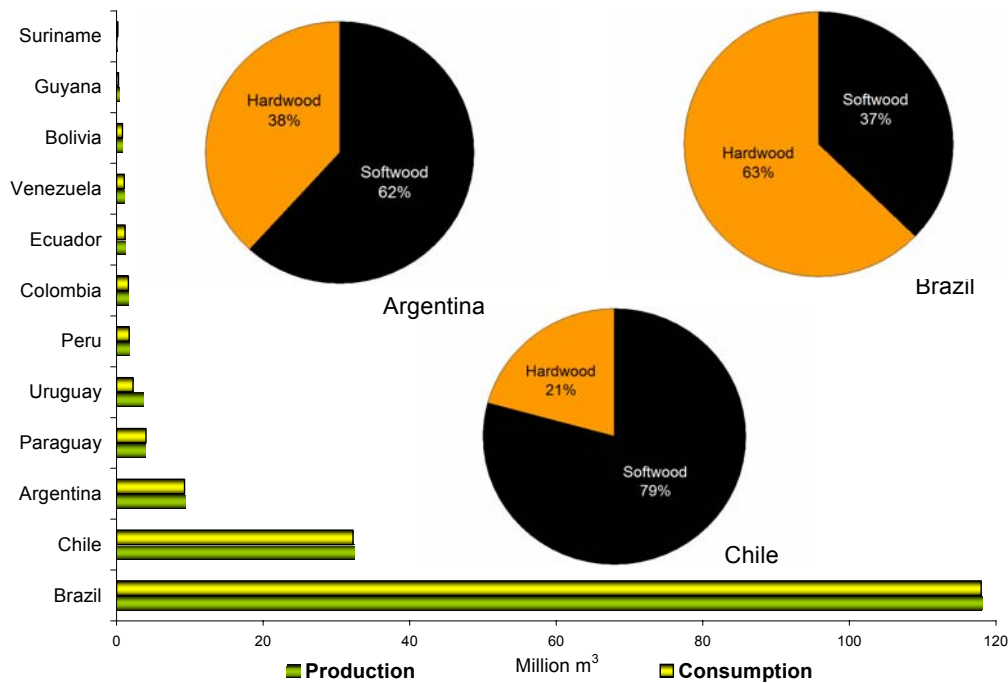


Figure 4. Production and consumption of industrial roundwood by country in South America (2003). Source: FAO, 2007a.

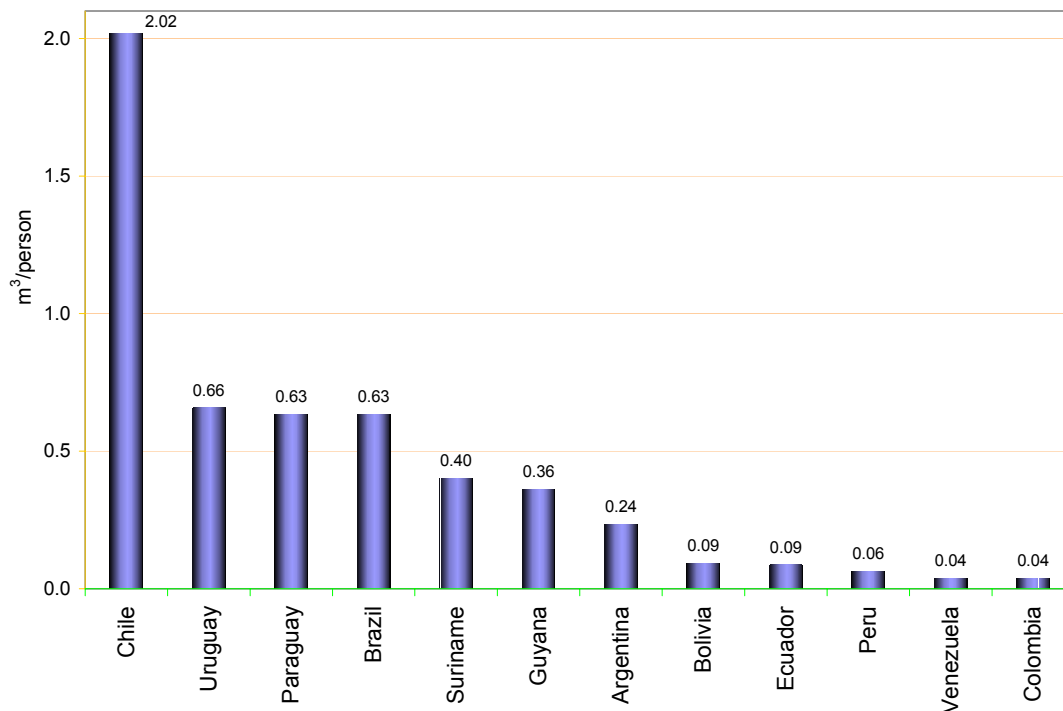


Figure 5. Per capita consumption of industrial roundwood by country in South America (2005)
Source: FAO, 2007a.

Industrial Roundwood and Forest Products Trade

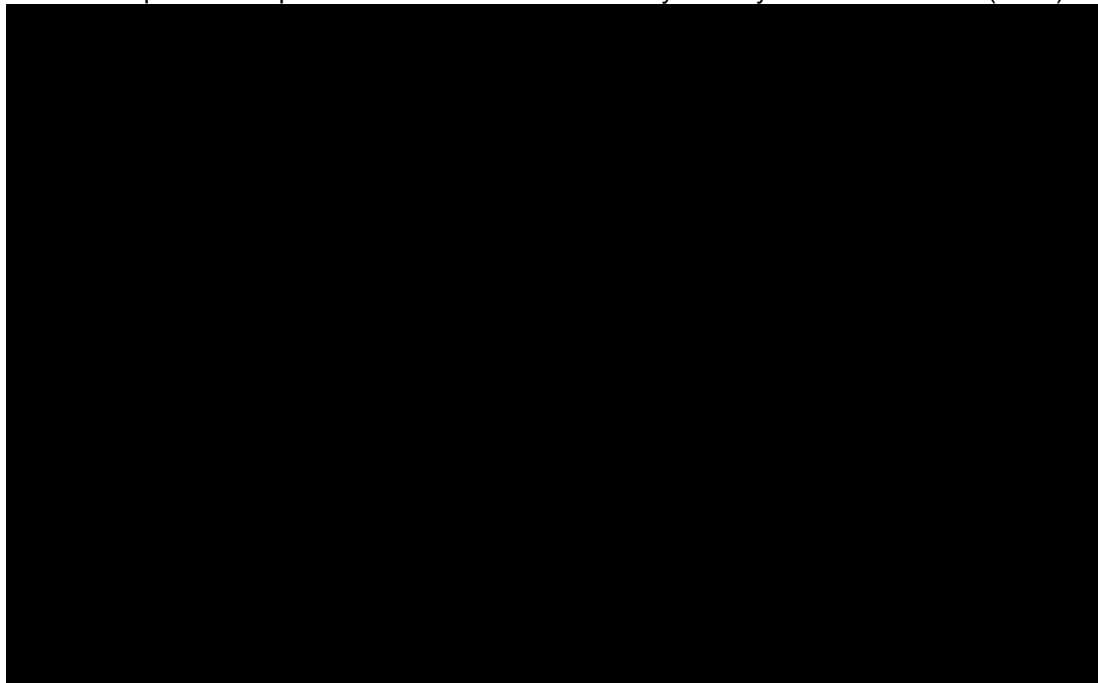
Over the last two decades, South America has increased its trade of forest products as a result of the abundantly available fiber from its maturing plantations and reduced trade barriers.

Uruguay is the largest exporter of industrial roundwood in the region, with about 1.5 million m³ per year (Table 1). Uruguay's roundwood exports currently constitute mostly hardwood timber (*Eucalyptus* sp.), but there are large areas of softwood plantations (*Pinus taeda*) that will mature in the next few years as well. The availability of the Eucalyptus timber and fiber in Uruguay is the basis for the recent announcement for the development of three pulp mill plants in this region, with a combined production of about 3 million tones per year of commercial pulp (Various sources including newspaper articles and personal communication with companies, June 2007). Of these proposed constructions, at least one pulp mill is receiving strong opposition (including a challenge in the world court) from Argentina for environmental and other reasons. If the capacity from the three new mills is realized, Uruguay will rank third among the countries in pulp exports in South America.

Table 1 also illustrates the exports and imports (in US dollar) of forest products by country in South America. Brazil and Chile account for about 87% of the exports from South America. In addition, these are the only two countries that show a positive balance in the trade of forest products. Brazil is one of the major suppliers of hardwood chips to the U.S. The total import values of Brazilian wood chips into the U.S. (hardwood-Eucalyptus) rose from almost none in 2002 to more than US\$ 25 million in

2004 (USITC 2007). The surge in chip imports was an expected response to domestic price increases resulting from local scarcity of hardwoods in the United States. In addition, *Eucalyptus sp.* chips are a highly preferred fiber source for some paper grades over native hardwood chips. The extent of hardwood chip imports to the U.S. from South America is unknown in the future; however, the price ceiling by the chip imports from South America will play an important role in defining the U.S. Southern hardwood stumpage price in the future (Wear et al. 2007). Argentina, Uruguay, Columbia are the third, fourth, and fifth largest countries in terms of their exports of forest products. Among forest products exports, wood pulp accounted for approximately US\$ 3.5 billion in 2005. The Southern U.S. was the most important market for the wood pulp. Other forest products exports include sawnwood and panels that find markets in Europe, North America and Asia. The U.S. import of lumber from South America has been relatively minimal between 1994 and 2005, albeit, increasing steadily. The U.S. imported approximately 1.8 million m³ of softwood lumber in 2005 from South America (Wear et al. 2007).

Table 1. Export and Import Values of Forest Products by country in South America (2005)



Source: FAO, 2007 (a).

Brazil, Argentina, and Columbia account for the largest imports of forest products in the region. These three countries account for 71% of the total amount imported by South America. Paper and paper products such as newsprint, coated paper, and magazine paper account for a substantial amount of imports into this region because of the immaturity in the consumer markets in this region.

FOREST PLANTATIONS

The forest industry in South America is based largely on growth and harvest of forest plantations, consisting mostly of exotic hardwood and softwood species. Natural advantages offered by deep and fertile soils, adequate to plentiful rainfall, almost year-long growing seasons, and advanced silvicultural practices have contributed to South America's leadership in commercial plantation forestry. This region has continued opportunities for establishment of new forest plantations. These opportunities are fueled by the aforementioned factors, coupled with a better ability of the region to establish very well known fast growing exotic species (such as *Eucalyptus* sp, *Gmelina* sp, *Pinus* sp, etc.), moderate land and forest management costs, enhanced research and development, and increasing political stability in most countries. These factors have helped to attract timberland investors such as Timber Investment Management Organizations (TIMOs) and associated industries in the region.

Forest investments have attracted tens of millions of dollars of capital in the last decade, and investors world-wide are continuing to seek safe investments with reasonable rates of return. Uruguay and Brazil with plantations of *Eucalyptus grandis* have had the highest rates of return of all exotic and native forest plantations in the Americas (Cubbage et al. 2007). Moreover, forestry companies in Brazil are the leaders in managing Eucalyptus plantations. Years of research in tree improvement and silviculture have resulted in very fast growth and yields. For example, plantations of *Eucalyptus dunii* are harvested at 7 years old with a mean annual increment of 43 m³/ha/year. For comparison, in the 1980s, the average productivity of eucalyptus plantations in Brazil was about 24 m³/ha/year. Twenty five years later in 2005 the average productivity of *Eucalyptus* sp increased 63 percent to about 39 m³/ha/year (BRACELPA, 2007). Table 2 shows the rotation ages, growth, timberland costs, and rate of return for selected native and exotics plantation in the Americas (Cubbage et al. 2007). The highest rates of return are from plantations of *E. dunii* in Brazil and *E. grandis* in Uruguay (22.9 and 21.9 percent respectively). Plantations of *Pinus taeda* in Brazil produce 1.5 times more than the average production of the same species in the U.S. in a little over half of the time. The higher mean annual increments (MAI) in hardwoods occur in *Eucalyptus* sp. plantations in Brazil and Argentina (43 and 40 m³/ha/year), while the higher MAI in softwood are from *Pinus taeda* plantations in Argentina (35 m³/ha/year).

Brazil has perhaps taken the most advantage of exotic species. These plantations have allowed Brazil to expand its forest products industry rapidly, mostly with short fibers from Eucalyptus plantations. These species and *pinus* sp., to a lesser extent, also form the basis for the rapid growth of the forest products industry in Uruguay, Argentina, Colombia and Venezuela.

Table 3 shows the area under forest plantations in each country in South America in 2005. There are almost 12 million ha of plantations in South America. Most of the planted forest area is concentrated in Brazil, Chile and Argentina. Brazil ranks the highest with more than 5.3 million hectares of planted forest area, which is approximately twice that of Chile, which ranks second. Paraguay and Bolivia are at the end of the list with relatively smaller area under planted forests. The cost of forestland, which affects the returns greatly, varies considerably in the Americas. Values range from US\$ 800-1000/ha

in Argentina, Uruguay, and Venezuela to approximately US\$ 1500-2500/ha in Chile and Brazil.

Table 2. Growth, Timberland Cost and IRR% for Selected Exotic Plantations and Native Species in the Americas

Country	Species	Rotation (years)	Growth (m ³ /ha·yr)	Total yield per rotation (m ³)	Timberland cost (US\$/ha)	Internal rate of return * (%)
Argentina	<i>Pinus taeda</i> -Misiones	20	35	700	800	12.9
	<i>Eucalyptus grandis</i>	14	40	560		13.8
Brazil	<i>Pinus taeda</i>	18	30	540	2,500	16.0
	<i>Eucalyptus dunii</i>	7	43	301		22.9
Chile	<i>Pinus radiata</i>	22	22	484	1,500	16.9
	<i>Nethofagus dombayi</i>	30	18	540		13.6
Uruguay	<i>Pinus taeda</i>	22	20	440	1,000	15.1
	<i>Eucalyptus grandis</i>	16	30	480		21.9
Venezuela ¹	<i>Eucalyptus sp.</i>	6	28	168	1,000	19.0
USA	<i>Pinus taeda</i> planted	30	12	360	1,500	9.5
	<i>Pinus taeda</i> natural	40	7.4	300		7.8
	<i>Pinus palustris</i>	80	4	320		4.3
	Hardwood sp.	80	4	320		3.6

* Discount rate = 8%

Source: Cubbage et al., 2007; Venezuela, estimated by authors.

Table 3. Planted Area by Country in South America (2005)

Country	Planted Forest Area (000 ha)
Brazil	5,384
Chile	2,661
Argentina	1,229
Uruguay	766
Peru	754
Venezuela*	627
Colombia	328
Ecuador	164
Paraguay	43
Bolivia	20
Total	11,976

Source: FAO, 2006. * Asoplant 2007

FINANCIAL AND POLITICAL ENVIRONMENT FOR INVESTMENTS

Perceived and actual financial and political risks are perhaps the most important factors affecting timber and forest products investments. Various data sources estimate financial and political risk (financial, regulatory or political events that contribute to a company's operational risks) in South America by country, as discussed below.

Global Edge (2007) ranks political risk in each country as follows from the most risky (lowest numbers) to least risky (largest numbers): Argentina 1, Venezuela 4, Peru 19, Colombia 20, Brazil 28, and Chile 57. Compared to other countries in this region, Argentina and Venezuela contribute to the highest risk on investments, while Brazil and Chile have the lowest risk in the region.

The COFAC international risk assessments for 2006 provide a country risk rating, using letter grades ranging from A1 (steady political and economic environment with a good payment record of companies and little default probability) to D (a high risk economic and political environment that will further worsen a very bad payment record) (COFAC, 2007). Most developed countries such as Canada, the U.S., and Europe receive an A1 classification. Chile received an A2 (default probability is still weak), and Brazil and Colombia received A4 (an already patchy payment record could be worsened by a deteriorating political and economic environment, but the probability of default is still acceptable). Uruguay and Peru received a B (an unsteady political and economic environment is likely to affect further an already poor payment record). Argentina, Paraguay, Ecuador, and Venezuela received a C rating (a very unsteady political and economic environment could deteriorate an already bad payment record).

The Organisation for Economic Cooperation and Development also rates countries for their political risk related to export transactions and for direct investment, on a scale ranging from 1 (very safe) to 7 (very dangerous). It ranks risk for seven criteria, and six are summarized in Table 4 for each country in South America, as well as the three large North American countries for comparison. As of 2007, the short-term political risk for export transactions in each country was modest, at 4 or less. Long-term political risks in several countries, which are most relevant for forestry investments, were much greater, including a 7 in Argentina, Bolivia, Ecuador, Guyana, Suriname, and a 6 in Venezuela. Chile and Uruguay had the best commercial risk ratings in South America, with an A grade. Seven countries had a commercial risk rating of C, including Argentina, Colombia, and Venezuela. For direct investments, Bolivia, Venezuela, and Ecuador were the most risky for risk of expropriation and government action, and Chile and Uruguay were safest. For the major countries, the transfer risk was greatest in Argentina, Bolivia, and Venezuela. Overall, Chile, Brazil, and Uruguay were ranked as the least risky for export transactions and direct investments in South America.

In addition to risk factors, there are several parameters to consider in the viability and feasibility of investments in these countries, such as the availability of specialized intermediary firms and different types of outsourcing (Khanna et al. 2005).

The organizational environment found in the developing countries can be somewhat frustrating, and bureaucracy is just one of the major problems. The ability to establish businesses rapidly with a minimum amount of red tape and government bureaucracy is another measure of business climate. Figure 6 shows that the number of

days and procedures that are needed to start a business are the greatest in Brazil and Venezuela, followed by Peru and Paraguay (World Bank, 2007). Chile has the lowest number of days and procedures required to establish a business. For comparison, Canada required only 2 days and 3 procedures to establish a business, and the U.S. was 5 days and 5 procedures (World Bank 2007).

Table 4. Risk Assessment for Selected Factors and Countries by the OECD 2007

Country	Export Transactions			Direct Investments		
	Political Risk Short Term	Political Risk Medium/ Long Term	Commercial Risk	War Risk	Risk of Expropriation and Government Action	Transfer Risk
Argentina	3	7	C	2	3	6
Bolivia	3	7	C	4	7	6
Brazil	1	3	B	2	2	3
Canada	1	1	A	1	1	1
Chile	1	2	A	1	1	2
Colombia	2	4	C	5	3	4
Ecuador	4	7	C	5	3	4
French Guiana	1	2	B	2	Na	2
Gayana Mexico	1	2	B	2	1	2
Paraguay	3	6	C	4	4	5
Peru	1	4	B	3	3	3
Suriname	4	7	C	3	5	7
United States	1	1	A	1	1	1
Uruguay	3	4	A	2	2	4
Venezuela	4	6	C	4	7	5

Source: OECD, 2007.

CONCLUSIONS

The emerging economies in Asia and in Latin America are increasing the consumption of forest products and other consumer goods rapidly, which will require increased world production. This growth in consumption will continue, and the greater demand will prompt price increases. The increased demand and prices will allow more opportunities for wood fiber production and secondary manufacturing in South America. Forest products fiber can be supplied in shorter time in South America with the use of fast growing species in appropriate locations. Biological growth factors and economic advantages of low costs of production and high rates of return will favor investment growth in Latin America versus sources in North America.

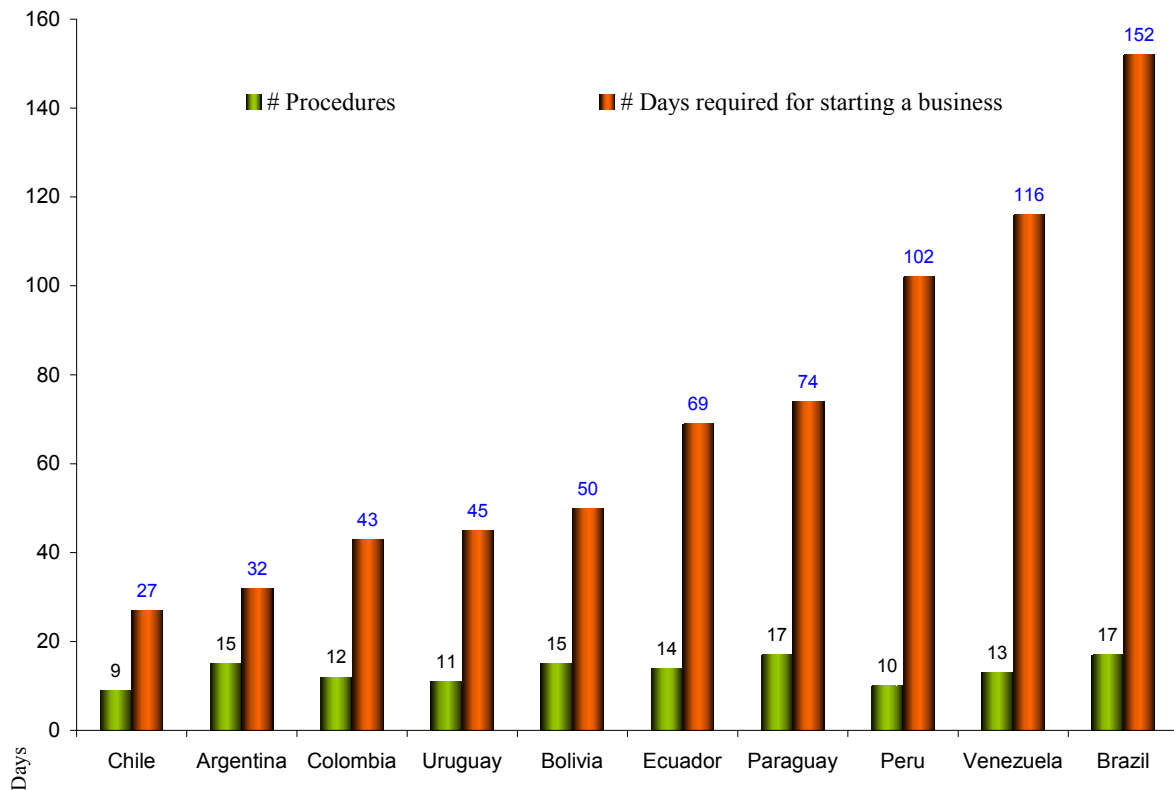


Figure 6. Number of days and procedures required to establish a new business by country in South America (2005); Source: Data from World Bank (2007).

In the last nine years, South America has had rapid annual increases in plantation area and productivity, as well as in secondary forest products. Brazil and Chile are the most important countries accounting for such changes. The largest exporter of industrial roundwood in the region is Uruguay, with 1.5 million m³/year; nevertheless it is placed fourth in total forest product exports. This situation is expected to change with the entry in production of three pulp mills that are being planned or under construction. One of these mills is under construction and should be completed soon. The other has been delayed due to major demonstrations and protests from Argentina, and the third is announced but not yet begun. If realized, the three new pulp mills would make Uruguay the third largest forest product market exporter.

The four Southern Cone countries of Chile, Brazil, Argentina, and Uruguay have the most obvious potential for increased investments in forest plantations and forest products manufacturing in the Americas. They have good biological plantation growth, high rates of return for plantation investments, rapidly increasing domestic economies, relatively stable political conditions, and improving qualities of life.

In addition, Brazil, Chile, and Argentina are able to generate significant amounts of capital for internal investments from internal sources, which allows expansion of their relatively attractive and competitive forestry sectors. Uruguay relies more on foreign

direct investment, but has been the most successful country in all of South Americas in this regard recently. The Coface and OECD rankings class Chile, Brazil, and Uruguay as the countries with the least export and direct investment risks, followed somewhat by Colombia. The other South American countries are classed as having moderate to major country risks, export risks, or direct investment risks. They still may have significant investments made by internal investors, or by other investors in Latin America or Asia, but are less likely to be attractive to North American or perhaps European firms.

Perceived political and financial risk may limit Argentina, Bolivia, and Ecuador more, but the overall attractiveness of at least Argentina remains substantial. It still has attracted major investments from the other Latin America countries such as Chile and Brazil, as well as some from Europe. Other countries such as Colombia, Venezuela, and Paraguay seem to offer significant biological opportunities for forest plantations, and are seeking foreign direct investments. At the moment, Colombia is seeking forestry investments most aggressively, and could achieve some success if their political and personal risk remains low.

In conclusion, South America will be able to supply increasing amounts of raw and processed wood fiber to world markets. Internal and external capital will drive these investments and growth in the forest products sector. The attractive timber-based investments and increasing world demand, especially from Asia, will continue to attract proportionately more investments to the southern hemisphere, and South America still has a large amount of land and reasonable business climates in most countries. Other more developed northern and southern hemisphere countries have much less opportunity for growth in the forestry sector, so South America has a comparative advantage. It will increase its share of the exports to emerging markets and capture more markets in North America and Europe.

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