Management of and Methods for the Configuration of Globally Efficient Supply Chains in the Containerboard Sector

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1. Introduction

"In today's rapidly changing world, global corporations face the continuing challenge of constantly evaluating and configuring their production and distribution systems and strategies to provide the desired customer service at the lowest possible cost. Not only are the geographical and political boundaries changing rapidly due to the formation and/or further strengthening of trade alliances, but also the global corporations themselves constantly acquire and divest themselves of suppliers, product groups, and customer markets.

Logistics, defined as the combination of materials acquisition, production, and distribution, is one of the integrating factors that ties the different components of a corporation together. The logistics components of a corporation consist of 1) a number of manufacturing plants, 2) zero, one, or more distribution echelons with distribution centers, 3) the customers, 4) the suppliers of components and raw materials, 5) recycling centers for used products and returned packaging containers, and finally 6) the transportation channels that link all of the above components." (Goetschalckx et al. (2002)). In the pulp and paper industry, global supply chains that trace materials from the raw and recycled material sources to the ultimate consumer through various facilities and transportation channels in different countries. The nature of operations in this industry and the dynamic and global challenges that it faces makes it critically important for firms in this industry to pay careful attention to the configuration, efficiency and robustness of their global supply chains. The corporations must take into consideration the framework of the global trade environment, where there exists a multiplicity of country-specific tax codes, tariffs, environmental regulations, and exchange rate risks.

However, the literature does not provide a comprehensive methodology for designing global supply chains. Given this context, our research has identified the basic elements of global supply chains in the paper and pulp industry, provided a review of the literature and developed a high level verbal model of a global supply chain. We also developed a detailed survey instrument for the purpose of surveying industry members, but were unable to obtain detailed survey responses. The survey instrument is included in this report in Appendix A to facilitate future research in this area using the survey methodology, as and when it becomes possible.

The rest of this report is organized as follows. Section 2 defines the global supply chain in the containerboard sector, while Section 3 presents the data and descriptive analysis of the extent of globalization taking place in this sector. Section 4 is a literature review of the global factors influencing global supply chains, Section 5 presents the detailed verbal model of the global supply chain that incorporates the comprehensive set of global factors discussed in section 4, and Section 6 concludes the report with a summary of the findings.

2. Definition of a global supply chain system

A global supply chain system is a supply chain that operates without consideration of national and geographical boundaries. We can describe a general global

Figure 1: Global paperboard supply chain system
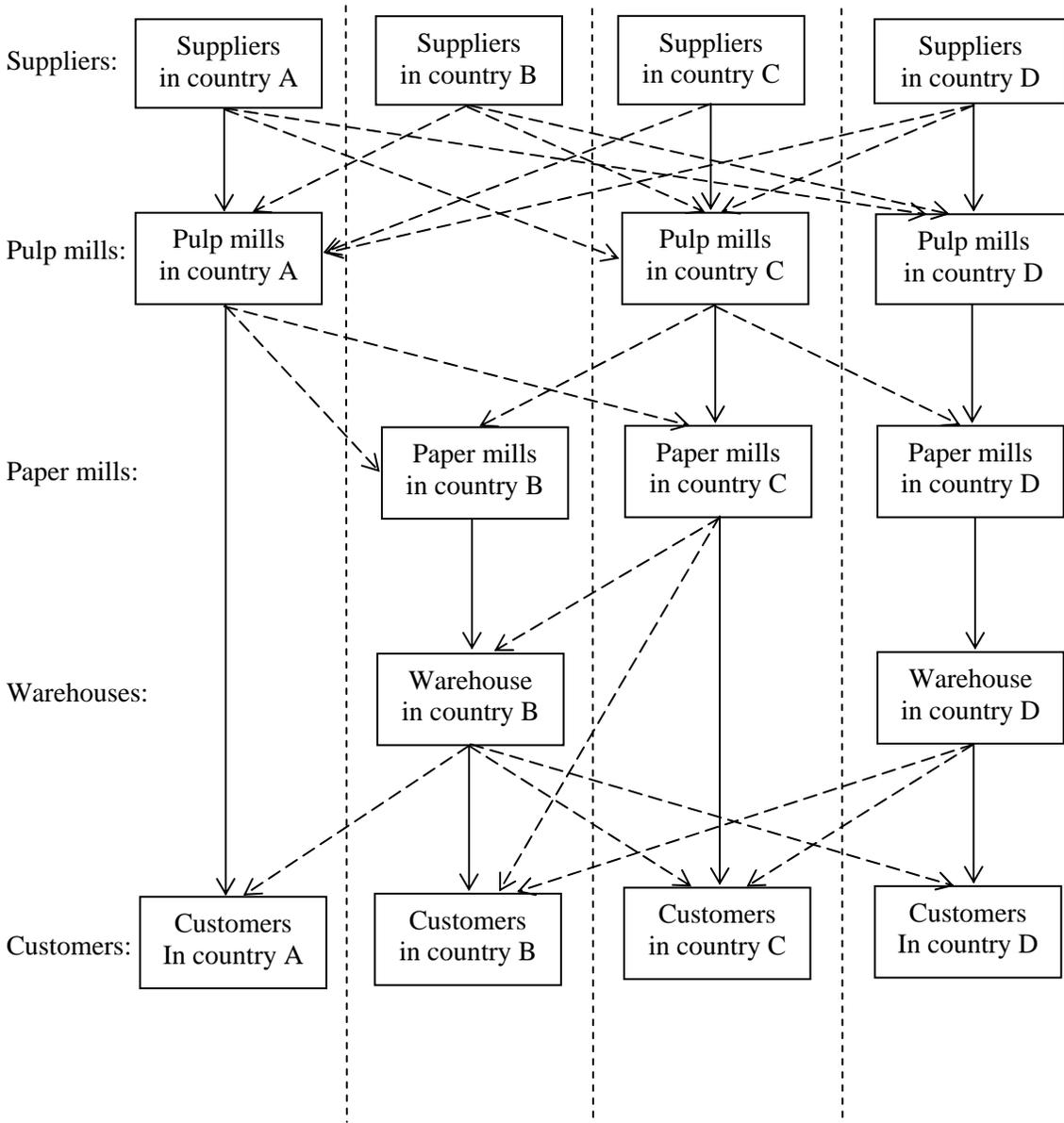
Note:

Vertical line ┊ is a border between countries.

Directed line ⟶ is the flow within a country. There is no global factor involved in this flow.

Directed line −−⟩ is the flow across countries. Some global factors are involved in this flow.

supply chain system as a system that consists of five different major components: raw materials, production, consumption, inventory, and transportation. The transportation of material flows across national boundaries or import and export activities are influenced by several global factors such as exchange rate risks, transfer pricing laws, tariffs and non-tariff barriers, etc. In addition, global supply chains are characterized by complicating physical and administrative factors. Examples of complicating physical factors are larger distances and corresponding longer transportation times, and often multiple modes of transportation on a single trip. Complicating administrative factors are documentation at border crossings, multiple authorities for taxes, duties, and regulations, different currencies, languages, units, and customs. The additional complexity and cost of global transactions has led to one or more of the following: use of international transportation brokers, larger transfer batch quantities, contract manufacturing, and repetitive transactions. Repetitive global transactions are used only when there is systematic and relatively stable advantage present.

3. Data and Descriptive Analysis

In order to better understand the strategic importance of integrating a full set of global factors into a global supply chain model for the paper industry, we now discuss the extent of globalization in the industry.

a. Overview of global paper and paper products industries

Based on annual review from Pulp and Paper International (PPI), in year 2000, the global consumption was approximately 189 million tons of pulp and 323 million tons of paper, with a total value of about US$ 600 billion. This is a 9.2% and 17.0% increase compared with the world consumption of pulp and paper in 1995, respectively. Table 1 indicates that the production of tissue and paperboard is about 181 million tons in 1999, 185 million tons in 2000, and 153 million tons in 2001.

Bolton (1998) presents in Figure 2 below the monetary contribution of each of the five components of pulp and paper supply chain system: raw material management, pulp mills, paper production, mineral and chemical processor, and waste paper management.

Figure 2: Contribution of each component in supply chain system

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                        ┌──────────────────────────┐
                        │ Raw material management  │
                        │       (5 - 6 %)          │
                        └──────────────────────────┘
                                                    ┌──────────────┐
                        ┌──────────────────┐        │ Mineral and  │
                        │   Pulp mills     │◄───────│  chemical    │
                        │   (22 - 23 %)    │        │  processor   │
   ┌──────────────┐     └──────────────────┘        │  (2 - 3 %)   │
   │ Waste paper  │                                 └──────────────┘
   │ management   │──────────►        ◄──────────────────┘
   │  (2 - 3 %)   │
   └──────────────┘     ┌──────────────────┐
         ▲              │ Paper production │
         │              │   (64 - 65 %)    │
         │              └──────────────────┘
         │                      │
         │              ┌──────────────────┐
         └──────────────│    Customers     │
                        └──────────────────┘
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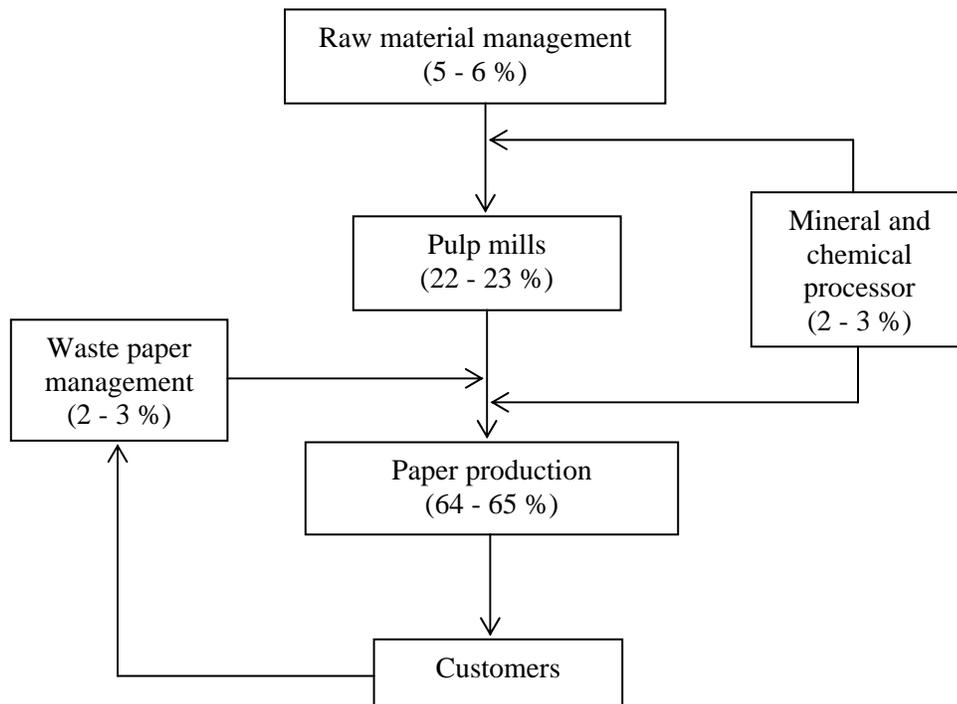
Table 1 also presents additional details regarding worldwide paper and paper-related production for the years 1999 to 2001. Newsprint, printing paper, paperboard and tissue respectively accounted for 12%, 30% and 58% of the total world production in 1999. This composition remains at the almost same level for year 2000, while during 2001 newsprint accounted for 13% of the total production, printing and writing paper for 33% and paperboard and tissue about 54%, indicating the importance of paperboard and tissue in world paper production. In 2001 the paperboard and tissue sector accounted for 43% of the total production in Europe, 49% in North America, 53% in Asia, 34.5% in Australia, 60% in Latin America and 63% in Africa.

Table 1. Worldwide paper and paper related production year 1999-2001

1999 (1,000 tonnes)	Europe Weight	%	North America Weight	%	Asia Weight	%	Australia Weight	%	Latin America Weight	%	Africa Weight	%	Total Weight
Newsprint	12,361.00	13.14	15,717.00	14.52	7,666.00	8.35	765.00	22.84	882.00	6.08	360.00	11.91	37,751.00
Printing/writing paper	33,932.00	36.06	30,410.00	28.09	26,477.00	28.83	508.00	15.17	3,514.00	24.22	676.00	22.36	95,517.00
Paperboard & Tissue	47,803.00	50.80	62,129.00	57.39	57,705.00	62.83	2,076.00	61.99	10,110.00	69.70	1,987.00	65.73	181,810.00
Total	94,096.00		108,256.00		91,848.00		3,349.00		14,506.00		3,023.00		315,078.00

2000 (1,000 tonnes)	Europe Weight	%	North America Weight	%	Asia Weight	%	Australia Weight	%	Latin America Weight	%	Africa Weight	%	Total Weight
Newsprint	12,690.00	12.70	15,898.00	14.97	8,440.00	8.82	782.00	22.19	946.00	6.39	367.00	11.45	39,123.00
Printing/writing paper	36,296.00	36.33	30,417.00	28.65	27,661.00	28.92	565.00	16.03	3,527.00	23.81	706.00	22.03	99,172.00
Paperboard & Tissue	50,925.00	50.97	59,869.00	56.38	59,557.00	62.26	2,177.00	61.78	10,340.00	69.80	2,132.00	66.52	185,000.00
Total	99,911.00		106,184.00		95,658.00		3,524.00		14,813.00		3,205.00		323,295.00

2001 (1,000 tones)	Europe Weight	%	North America Weight	%	Asia Weight	%	Australia Weight	%	Latin America Weight	%	Africa Weight	%	Total Weight
newsprint	12,864.00	14.74	14,147.00	14.72	8,730.00	10.30	738.00	36.50	928.00	7.05	359.00	11.99	37,766.00
printing/writing paper	34,233.00	39.22	28,464.00	29.62	27,277.00	32.17	586.00	28.98	3,522.00	24.28	727.00	24.29	94,809.00
paperboard and tissue	40,186.00	46.04	53,489.00	55.66	48,791.00	57.54	698.00	34.52	8,721.00	60.12	1,907.00	63.72	153,792.00
total	87,283		96,100.00		84,798.00		2,022.00		13,171.00		2,993.00		286,367.00

Source: *Paper and Pulp International, Annual Review*, 2001, 2002

Table 2 presents the details regarding the worldwide pulp production categorized into chemical pulp including semi-chemical pulp, mechanical pulp, and other pulp.

Table 2. Worldwide pulp production, 2000-2001

2000	Europe		North America		Asia		Australia		Latin America		Africa		Total
(1,000 tonnes)	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	
Chemical pulp	30,465.00	64.29	65,982.00	79.10	20,012.00	51.77	1,290.00	31.91	10,320.00	83.67	1,766.00	61.90	129,835.00
Mechanical pulp	15,236.00	32.15	17,431.00	20.90	2,232.00	5.77	1,200.00	29.68	702.00	5.69	320.00	11.22	37,121.00
Other pulp	1,685.00	3.56	0.00	0.00	16,411.00	42.46	1,553.00	38.41	1,312.00	10.64	767.00	26.88	21,728.00
Total	47,386.00		83,413.00		38,655.00		4,043.00		12,334.00		2,853.00		188,684.00

2001	Europe		North america		Asia		Australia		Latin America		Africa		Total
(1,000 tonnes)	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight
Chemical Pulp	28,843.00	63.09	61,800.00	79.52	14,637.00	37.54	1,232.00	21.91	10,193.00	83.89	1,645.00	69.18	118,350.00
Mechanical Pulp	14,539.00	31.80	15,912.00	20.48	2,390.00	6.13	1,190.00	21.16	403.00	3.32	290.00	12.20	34,724.00
Other Pulp	2,986.00	6.53	1.00	0.00	3,745.00	9.60	3,202.00	56.93	1,027.00	8.45	109.00	4.58	11,070.00
Total	45,718.00		77,713.00		38,993.00		5,624.00		12,150.00		2,378.00		179,374.00

Source: *Paper and Pulp International, Annual Review*, 2001, 2002

The top 10 pulp and paper producers in the world are listed in Table 3. The US retains its position as the leading producer of both paper and pulp. However, we notice that while there has been a decline in US production of both paper and pulp in 2000 and 2001, Chinese production has grown in both paper and pulp.

Table 3: World's top 10 pulp and paper producers

Total Paper Production	2000	% increase from 1999	Total Pulp Production	2000	% increase From 1999
1. US	85,495	-2.9	1. US	57,002	-0.1
2. Japan	31,828	3.9	2. Canada	26,411	5.1
3. China	30,900	4.4	3. China	17,150	4.4
4. Canada	20,689	2.4	4. Finland	11,910	2.8
5. Germany	18,182	8.6	5. Sweden	11,517	7.7
6. Finland	13,509	4.3	6. Japan	11,399	3.7
7. Sweden	10,786	7.1	7. Brazil	7,463	3.5
8. France	9,991	4.1	8. Russia	5,814	14.2
9. Rep. Of Korea	9,308	4.9	9. Indonesia	4,089	10.7
10. Italy	9,000	3.9	10. Chile	2,841	18.5

Total Paper Production	2001	% increase from 2000	Total Pulp Production	2001	% increase From 2001
1. US	80,759	-5.9	1. US	52,795	-7.3
2. China	32,000	3.6	2. Canada	24,918	-5.6
3. Japan	30,731	-3.4	3. China	17,570	2.4
4. Canada	19,686	-5.2	4. Finland	11,169	-6.3
5. Germany	17,879	-1.7	5. Sweden	11,000	-4.5
6. Finland	12,503	-7.4	6. Japan	10,813	-5.2
7. Sweden	10,534	-2.3	7. Brazil	7,405	-0.8
8. Rep. Of Korea	9,724	4.5	8. Russia	6.225	5.7
9. France	9,630	-3.8	9. Indonesia	4,326	5.8
10. Italy	8,924	-2.2	10. Chile	2,921	2.8

Source: *Pulp and Paper International, Annual Review*, 2002

US firms are trading with at least 125 countries around the world. However, the domestic consumption of paper is still around 90% of its total production. Based on the data from US International Trade Commission (2000), export of paper and paper related products from US is composed of 21% pulp, 48% paper and paperboard, 25% tissue and other sanitary papers, and 6% other products.

Table 4 gives the profiles of the top 10 North American producers of paper and paperboard. Paperloop.com (Dec16, 2002) reveals that the total paper and paperboard capacity of the 10 largest producers now accounts for 53.5% of the North American total, compared with 48.5% for the top 10 producers last year.

Table 4: TOTAL PAPER AND PAPERBOARD CAPACITY[1]						
Rank 2002	Rank 2001	Company	Capacity (000 tons)	Share	% Paper	% Paperboard
1	1	International Paper	13,026	10.2%	55%	45%
2	2	Smurfit-Stone Container	9,905	7.8%	3%	97%
3	5,8	Weyerhaeuser	9,860	7.7%	36%	64%
4	3	Georgia-Pacific	8,969	7.0%	49%	51%
5	4	Abitibi-Consolidated	7,121	5.6	100%	-
6	7,9	MeadWestvaco	5,740	4.5%	38%	62%
7	6	Bowater	4,492	3.5%	100%	-
8	13	Temple-Inland	3,393	2.7%	5%	95%
9	10	Stora Enso North America	3,025	2.4%	99%	1%
10	11	Domtar	2,700	2.1%	100%	-
10	12	Boise Cascade	2,700	2.1%	74%	26%
Source: 2002 North American Pulp & Paper Company Profiles						

b. Description of activities at each stage in the supply chain

In order to understand how global factors can be incorporated within the paper industry supply chain, we now summarize the activities at each stage in the supply chain.

Table 5: Activities and analyses at each stage in paper supply chain

Raw material supply	Pulp production	Paper production	Paper & Board Converting Operation	Shipping and distribution
1. Production of non-fibrous materials 2. Production of fibrous raw materials	- Virgin pulp manufacture - Recycled fiber mfg. - Disposal of waste	- Paper and board manufacture - Disposal of waste	Manufacture of packing paper, stationary, box, tissue, etc.	- Freight assignment - Delivery schedule

Supplier (1) Companies

Integrated pulp and paper

Pulp mills producing pulp

Vertically integrated pulp and paper companies

(Source: Peel D. John, *Paper science and paper manufacture*, Angus Wilde Inc., 1999)

In the next sub-sections, we discuss four different segments of the integrated supply chain namely, fibrous raw material production, pulp production, paper production, and converting operations, and investigate the contribution of global factors at each stage.

Fibrous raw material production

The US has around 490 million acres forest and harvested approximately 20 billion cubic feet of softwood and hardwood per year. According to US Forest Service, of

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[1] http://www.paperloop.com/db_area/archive/pponews/2002/wk12_16_2002/11.shtml

the wood produced 38% is used as lumber, 31% for pulp and paper production, 19% for fuel, 9% for plywood, and the remaining 3% for miscellaneous uses.

Figure 3: Usage composition of US wood production
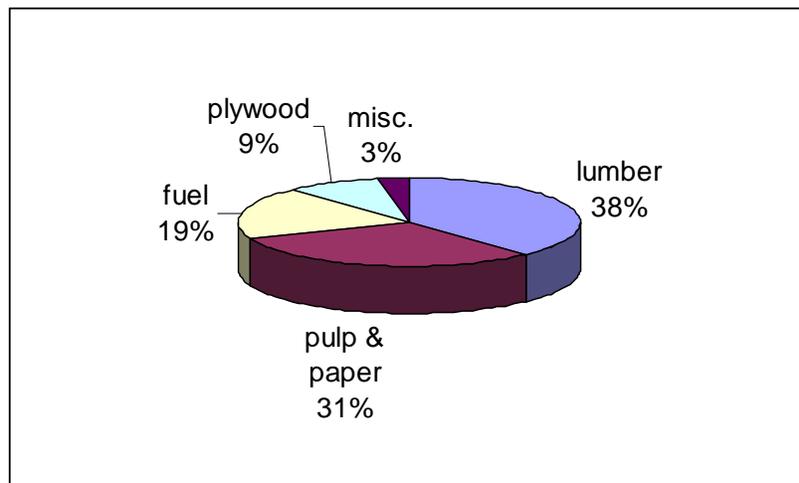
The US imports lumber from several countries, with the largest fraction coming from Canada. The quantity imported to the US from Canada is approximately 17 billion cubic feet per year. It is predicted that the quantity of imported lumber from Chile, New Zealand, Brazil, and Mexico will increase considerably. However, we need to understand that majority of fibrous raw material supplies, around 60%, comes from inside the US. The leading national lumber producers are in many cases identical to the leading pulp and paper producers, including Weyerhaeuser Co., Georgia Pacific Co., and International Paper Co. We do not have any exact statistics on the import and export of lumber specifically for pulp and paper production.

Table 6 and the graph that follows summarize the relationship between wood growth rate and cost per ton in Sweden, Canada, US, Chile, New Zealand, and Brazil. We notice that except in the case of New Zealand, the cost per ton declines as the yield per hectare increases.

Table 6: Comparison of relative softwood growth rate and cost

Country	Ton/ha	10 US Dollar/ton
Sweden	1.8	14.2
Canada	2.7	7.9
US	4.9	6.6
Chile	8.3	3.8
New Zealand	8.5	7.6
Brazil	6.1	4.2

(Source: Smook A. Gray, *Handbook for pulp and paper technologists*, 2nd Ed., Angus

Wilde Publication, Vancouver, 1992, pp. 186-193)

Figure 4: Comparison of relative softwood growth rate and cost
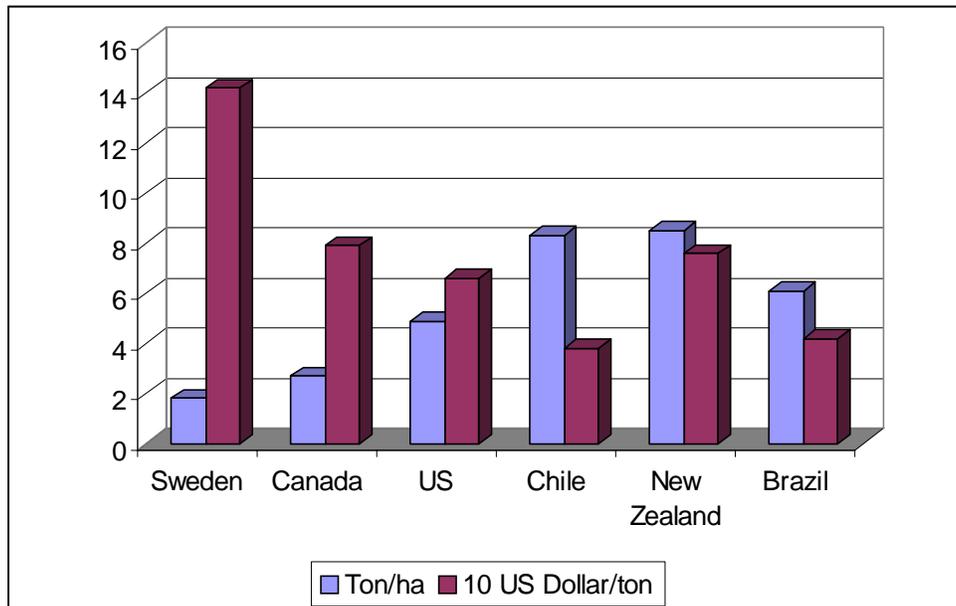
Pulp production

According to Pulp and Paper International Annual Review, there are 27 large pulp producing countries around the world. US trades with these countries and the total value

of imports is US$ 2.4 billion and the corresponding figure for exports is US$ 2.9 billion. The trend of pulp import and export for the last 7 years is as follows.

Figure 5: US import and export pulp 1992 – 2003
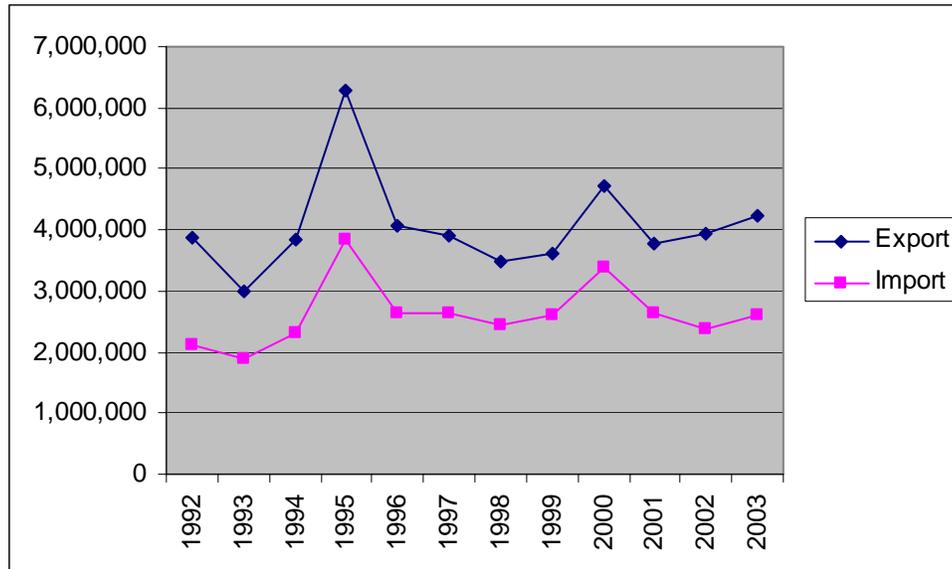
US import and export pulp 1992-2003(Source: Trade Stats Express)

The pulp production stage of the supply chain also has global characteristics. The value of US import and export of pulp are significant compared with total import and export of all paper products.

Based on research on global pulp mill production, the profitability of a pulp mill depends on two major aspects: production costs and quantity of production. Pulp mill will focus on maximizing the production yield when demand and sales price are strong. However, the focus will change to cost control when the pulp market is weak.

Smook, in his paper (1992) shows us that the overall cost of pulp production is mainly determined by five different cost categories: the unit cost of capital, pulpwood, energy and chemicals, labor, and transportation. He observes that those costs vary significantly from country to country and from manufacturing site to manufacturing site.

This can be illustrated in Table 6 below which provides comparisons for bleached kraft market pulp costs from one company in four different countries: Chile, Western Canada, Sweden, and US.

Figure 6: Cost proportion at four different pulp mill locations
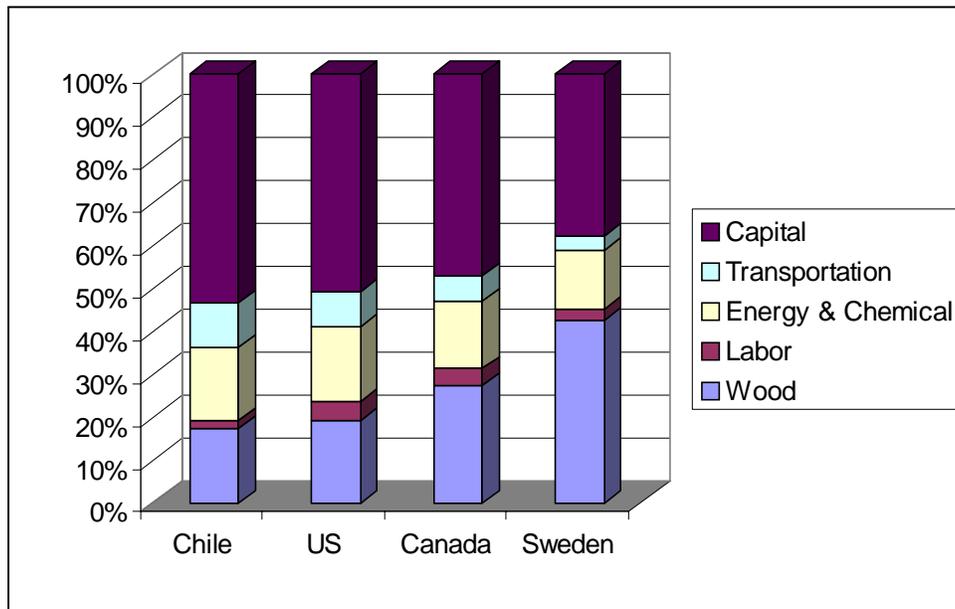
(Source: Smook A. Gray, *Handbook for pulp and paper technologists*, 2nd Ed., Angus Wilde Publication, Vancouver, 1992, pp. 186-193)

Paper production

Total paper and paperboard exports were approximately US$ 10.7 billion in 1998. However, US imported paper and paperboard worth US$ 7.1 billion in the same year. According to Trade Stats Express 2003, the top five export destination countries are Canada (37%), Mexico (20%), Japan (5%), China (4%), and United Kingdom (2%). The top five sources of imports are Canada (59%), China (7%), Finland (5.5%), Mexico (4.1%), and Germany (4%). The total import and export to and from US by region are

presented in Table 7. Based on the above import and export data, this segment of the supply chain is also global in its operations.

Table 7: US paper and paperboard import and export composition, 2003

	Import	Export
NAFTA	63.9%	57.5%
Latin America	1.8%	9.5%
Europe	18.6%	10.16%
Japan and China	10.3%	9.88%
Other Asia Countries	5.2%	10.41%
The rest of the world	0.03%	2.4%

(Source: Trade Stats Express)

Converting operation

Our focus is on containerboard in this part of the analysis. Packaging paperboard is also an internationally traded commodity. Total volume of imports and exports is approximately 60 million tons per year. The distribution of packaging paperboard imports and exports from 1992 to 1998 is shown in figure 7.

Figure 7: Packaging & paperboard imports and exports 1992 - 1998
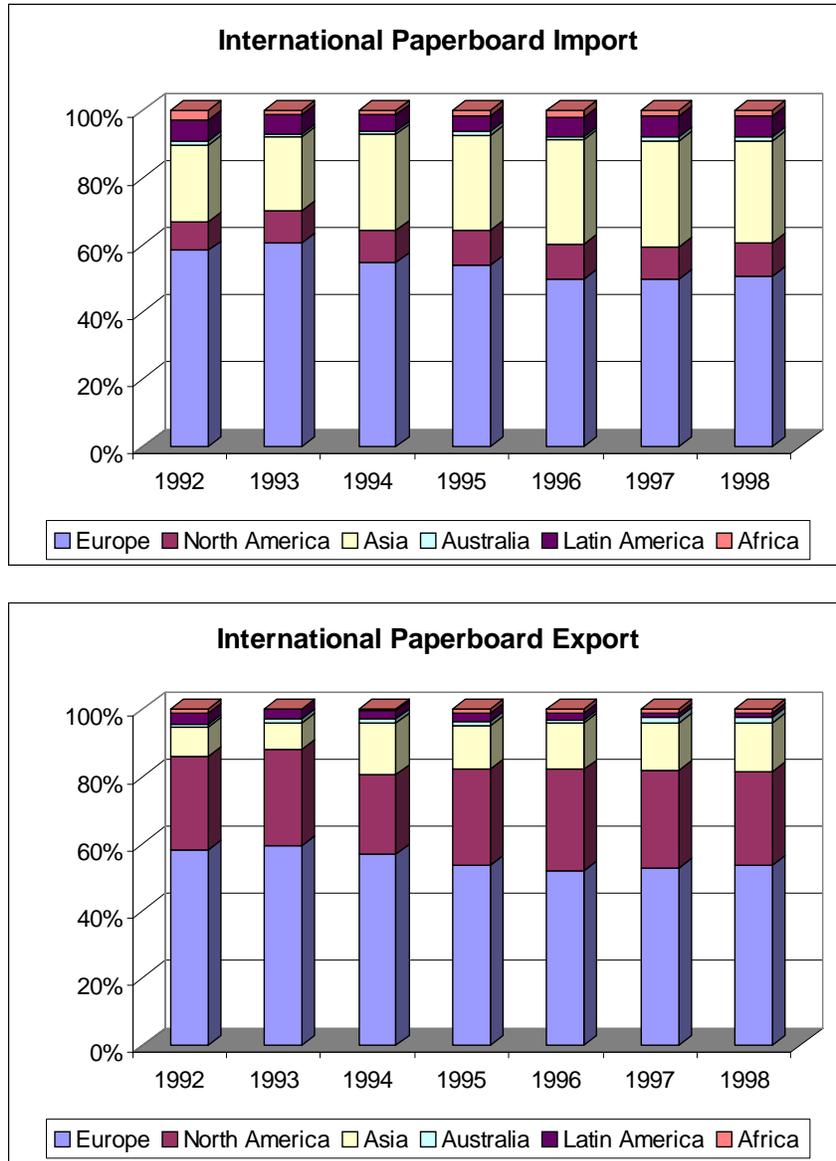
(Source: PPI, *International Fact and Price Book 2000*)

Vertical integration is another aspect of this industry that influences global supply chain design and management. Smook (1992) states that a large integrated wood industry can obtain saving in some operational costs. He further states that the cost for power stations, material handling, water treatment, and administration overhead can be reduced in the vertical integrated wood industry. Integration of wood processing unit with pulp production facilities will reduce the cost of wood handling and recycling. Furthermore, integration of pulp production facilities and paper making process will reduce pulp processing, packaging, and transportation costs.

All the top papermakers are vertically integrated companies and all of them are impacted by global factors since they have many manufacturing facilities around the world and are engaged in export and import activities. Table 10 gives us a brief sketch of the global transactions that these firms undertake.

Table 8: Some Top International Papermakers and their Global Activities

Corporation	Import raw material	Global pulp mills	Global paper mills	Export products	Head quarter
Stora Enso	Y	Y	Y	Y	Finland
International Paper Co.	Y	Y	Y	Y	USA
Smurfit - Stone	NA	Y	Y	Y	France
UPM - Kymmene	Y	Y	Y	Y	Finland
Oji Paper	Y	N	N	Y	Japan
Georgia Pacific	Y	Y	Y	Y	USA
Weyerhaeuser	NA	Y	Y	Y	USA
SCA	NA	Y	Y	Y	Sweden
Nippon Paper	Y	N	N	Y	Japan

We do not have data about the interactions within a corporation but based on the literature, we expect that transfer price will play an important role in the international paper trade.

In this section, we have tried to make a case for why the industry should be cognizant of global factors in configuring and managing their supply chains. The

evidence presented in this section highlights the increasing global nature of this industry. In the next section we review the academic literature on factors that are likely to impact the design of a global supply chain system.

4. Review of global factors impacting the design of a global supply chain system

Many worldwide companies have their own facilities located in different countries around the world and also import and export from third parties. These global transactions could potentially involve varying degrees of exchange rate risk, trade barriers, transfer pricing decisions, transportation cost allocation, local content regulations, and different tax systems. In this section we present the related literature and develop a set of global factors that impact the design of a global supply chain system. We identify three broad categories of global factors namely global factors closely related to pricing strategy such as exchange rate risks and transfer pricing; import export systems including the impact of trade policies on tariff and non-tariff barriers; and local regulations such as local content requirements and income tax regulations.

a. Pricing Strategy and Exchange Rate Risk

Kouvelis, Kostas, and Vikas (2001) provide a relation among selling price, local competitor's price, production cost, competition level, and exchange rate of local currency. They claim that selling price depends on the competition level in a particular country. If the competition level is very high, they set the selling price equal to the summation of average of local competitor's price and a constant margin. On the contrary, if the competition level is low, which is a monopoly market, the selling price is equal to the summation of total production cost and a constant margin.

Riitta and Toppinnen (1999) present a similar pricing strategy but for a specific pulp and paper corporation in Europe. For this particular corporation, they assume that exporter maintains the demand in a particular country by maintaining the market share at this particular country. Due to the effort of maintaining market share, competition level

becomes a very important factor to be incorporated into the selling price strategy. They claim that for a competitive market, the selling price is equal to the average of local competitor's price. In contrast, for a location with no competitor, the selling price is equal to the summation of total production cost and the profit margin. Additionally, they also incorporate exchange rate risk as a global factor into their pricing strategy formulation.

The two papers above discuss pricing strategies that determine the selling price from a particular corporation's facility to a customer. We now consider the role of transfer pricing decisions in designing global supply chains. O'Connor (1997) defines a transfer price as the selling price from one division in a particular country to another division in a different country. Both divisions are part of the same corporation. For instance, a manufacturing division at country A sells its products to many sales divisions in several countries at possibly different transfer prices. Transfer pricing strategy depends not only on the total production cost but also on the tax regulations in the corresponding countries. Therefore, transfer price is also one of the global factors that influence the design of a global supply chain.

Goetschalckx and Vidal (2001) incorporate transfer price explicitly into their global supply chain model. They conclude that the effect of transfer price decision on taxable income and management performance is significant. Additionally, they also observe that the problem with transfer-pricing decisions becomes more complex because the global supply chain problem becomes nonlinear, and is very hard to solve to optimality. However, they also introduce an alternative efficient heuristic solution method.

Next, we consider the role of exchange rates in global supply chain modeling. Economic theory presumes changes in foreign exchange rates impact profitability and hence the value of domestic as well as multinational corporations (MNCs). Changes in exchange rates drive changes in cash flows and ultimately the value of the firm. Shapirio (1975) models the theoretical effects of changes in exchange rates on the value of import and export firms alike. Export firms will gain from a devaluation of the home currency as

their goods become more competitive while importers stand to lose. However, there is surprisingly little empirical evidence to support these theoretical predictions at the level of the corporation.

The empirical research on foreign exchange rate risk has produced mixed results. Jorion (1990) is the first study which empirically addresses the issue of the impact of exchange rate risk on the value of the US MNCs. Jorion (1990) finds little evidence for the individual firm exchange rate exposures of US MNCs over the period 1971-1987. He reports that only 15 of 287 US MNCs have foreign exchange exposure at the 5% percent level. The results show some evidence of some cross-sectional variation in exposure coefficients; he also finds this exposure to be related to the firm's ratio of foreign to total sales. Amihud (1994) finds no evidence of a significant exchange rate exposure for the 32 largest US exporting firms over the period 1982-1988. Bodnar and Gentry (1993) examine industry-level exposures and find that 20% to 35% of industries in Canada, Japan, and the United States have significant exchange rate exposure as measured by the coefficient on the foreign exchange variable. The authors hypothesize that the insignificant results are due to (1) the idea that industries undertake a variety of activities that have varied or offsetting exposures, or (2) firms may reduce their exposure through the use of financial derivatives.

Bodnar (1994) re-examines the relation between expected changes in the dollar and equity value. He concentrates on the possibility of problems in the research design of the previous efforts and the possibility of incorrect pricing arising from the modeling and estimating changes in the value of the dollar and the firm. This incorrect pricing may result in stock prices that take time to adjust to changes in foreign exchange rates. Their results are consistent with most previous work, although they do find that one-period lagged changes in the foreign exchange variable are significant in explaining the abnormal valuation of firms. This implies it takes time for the impact of exchange rate risk of firms to be realized in the data.

While early work focused primarily on US firms, later work has been expanded to include MNCs of other countries, the analysis of a particular industry, or both. Chaberlain et al. (1997) study the exchange rate exposure of US and Japanese banks from 1986 to 1993. They find that the stock prices of US firms move more with exchange rates than those of Japanese firms. Their results are similar to earlier findings with 30% of their sample yielding significant coefficients on exchange rate exposure. He and Ng (1998) find that 25% of a sample of Japanese MNCs stock returns has significant foreign exchange exposure from 1979 to 1983. Further Di Iorio and Faff (2000) find minimal evidence of significant exposure in an augmented market model in a study of the Australian equity market.

Dominguez and Tesar (2001) examine exchange rate exposure of eight (non-US) industrialized and emerging markets and find a significant number of firms exposed (up to 23%). In their study, exposure is captured as the coefficient on two common exchange rates as well as one firm-specific rate, the rate corresponding to the currency of the firm's major trading partner. Finally Ihrig (2001) follow a firm-specific approach using a foreign exchange rate index that is computed from firm's unique geographic operational network. Her study finds higher exposure for firms using firm-specific exchange rates. To the best of our knowledge, there is no study which addresses the impact of exchange rate changes on the companies in pulp and paper industry.

In order to better understand the volatility of currencies and the importance of incorporating exchange rates into a global supply chain model, Table 9 provides some descriptive statistics for dollar quarterly returns on the pound, deutschmark, and yen.[2] To

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[2] Quarterly observations are from 1973.1 to 1997.4. Percentage returns on the S&P composite index and its log dividend yield (Div) are from Datastream. Percentage exchange rate returns and deviation of exchange rate from fundamentals $(s_t - f_t)$ with $f_t = (m_t - m{*}_t) - (y_t - y{*}_t)$ are from the International Financial Statistics Cd-ROM. $(s_t - f_t)$ are normalized to have zero mean. m_t and $m{*}_t$ are the real money balances in US and the foreign countries respectively. y_t and $y{*}_t$ are the real income-GDP- in US and in the foreign countries respectively. The US dollar is the numeraire currency. UKP is the UK pound, DEM is the deutschemark, and Yen is the Japanese yen. All variables are measured in logarithms.

provide evidence on the relationship between the exchange rates and equity prices, the table also includes statistics for the Standard and Poor's composite stock price index returns. The volatility of a time-series is measured by its sample standard deviation. The main points that can be drawn from the table are as follows:

1. The volatility of exchange rate returns is virtually indistinguishable from stock return volatility.

2. The deviation of the exchange rates from the fundamentals displays substantial persistence (have high autocorrelations coefficients-not reported here-) and much less volatility than returns.

Table 9: Exchange Rate Volatility

	MEAN	STD. DEV.	MIN	MAX
Returns				
S&P	2.75	5.92	-13.34	18.31
UKP	0.41	5.50	-13.83	16.47
DEM	0.46	6.35	-15.74	15.74
YEN	0.73	6.08	-15.00	16.97
Deviations				
Div.	1.31	0.30	0.49	1.82
UKP	0	0.18	-0.46	0.47
DEM	0	0.31	-0.61	0.59
YEN	0	0.38	-0.85	0.50

b. Import export system

Integrated global supply chains transport materials from the sources of raw and recycled materials to the ultimate consumer through various facilities and transportation channels located in different countries. Trade barriers are important in that they restrict

or delay movement of products between countries, and hence add to the cost of doing business and increase the complexity of the global supply chains. Trade barriers in the paper industry include both tariff and non-tariff barriers. Tariffs on imports of pulp are extremely low and even zero in many cases. But tariff escalation is a problem, as tariffs increase on semi-finished and finished products.

In addition, as tariff barriers have come down, non-tariff barriers (NTBs) have become more prevalent. Examples of non-tariff barriers (NTBs) include import policy barriers, standards, testing, labeling and certification requirements, anti-dumping & countervailing measures, export subsidies and domestic support, phytosanitary regulations and government procurement and other regulatory restrictions. The goal of phytosanitary restrictions is to protect domestic forests against foreign pests and disease. Examples of other regulatory restrictions include certification programs (for example, eco labeling), and product standards that may restrict the entry of specific types of paper products into countries imposing these restrictions. There are also service trade barriers and lack of adequate protection to intellectual property rights. Government intervention polices include industry assistance, state ownership of forest resources, and government control of marketing, all of which may distort the competitiveness of the domestic industry and give local producers additional advantages in pricing and marketing. Export restrictions, such as export taxes and bans that are placed on raw materials, may distort trade by reducing the domestic price of raw materials and promoting value added production for export.

Earlier studies on the effects of tariffs and non-tariff barriers (NTBs) on trade flows have reported relatively small estimates of the impact of trade liberalization on imports; however, recent work by Leamer (1990a, 1990b), Harrigan (1993), and Trefler (1993) report significantly larger effects of trade protective measures. For example, Leamer's (1990a) finds that barriers reduced imports of the 14 industrial country importers by about 4%, and reports mixed results as to whether the estimated effects of NTBs are larger or smaller than tariff effects. His (1990b) counterfactual analysis using

the comparative advantage model finds that, on average, barriers suppress the imports of these 14 importers by 20%, roughly half due to tariff barriers and half due to NTBs, although there are considerable differences among importers.

The more recent studies by Harrigan (1993) and Trefler (1993) alter the framework of analysis either by incorporating the notion that tariff barriers are endogenous, or by taking into account some of the recent literature on alternative market structures. Trefler argues that the small estimates of the impact of trade liberalization found in many studies can be attributed to treating protection exogenously. For the United States, he estimates that the elimination of NTBs would increase the average import penetration for manufacturing industries by 1.65 percentage points from 13.8 percent to 15.4 percent. His analysis suggests that if all manufacturing tariffs were eliminated, industries with positive tariffs would experience an average rise in import penetration of 0.35 percentage points. Harrigan's model with monopolistic competition and exogenous treatment of NTBs concludes that in most 3-digit ISIC industries that tariff barriers do have a sizable impact. However, he reports relatively small effects for NTBs. Using a framework similar to Harrigan, Haveman, Nair-Reichert and Thursby (2003) find large effects of protection on imports. They use highly disaggregated data on trade flows at the 6-digit level to separate the aggregate effects of protection into reduction, diversion and compression effects and illustrate the heterogeneity in the effects of both tariff and non-tariff barriers. Their results are compatible with Harrigan's work that reports elasticities between –5 and –12 and suggest that the reduction and diversion coefficients in a significant number of sectors are larger in absolute value than the results reported by Harrigan.

Recent developments in the literature consider the impact of trade barriers on imports in the presence of fixed costs of trading. Feenstra (1992), Romer (1994) and Klenow and Rodriguez-Clare (1997) argue that when there are fixed costs of selling in a country, goods will be imported only if profits are large enough to cover these fixed costs. While tariffs, by themselves, reduce the profitability of importing, the presence of

fixed costs of trading compounds the effect of tariffs, and could result in substantially reduced or virtually no imports from some countries. The empirical results from Klenow and Rodriguez-Clare (1997) and Haveman, Nair-Reichert and Thursby (2000) lend support to the theory regarding the impact of trade barriers in the presence of fixed costs of trading. Additionally, Mayer (1999) argues that where exporting is costly and subject to economies of scale, there is a tendency to specialize in trading partners.

In addition, it is important to note that tariffs may be preferential in nature. Feernstra (1992) and Romer (1994) classify tariff barriers into three different types: by country, by product, and by country and product. They show that tariff barrier need not be a constant import tax for all trading partners around the world but can be a very specific barrier. For instance, based on USITC 2002 Tariff Database, the tariff for tissue exported from Normal Trade Relation (NTR) countries into United States is 0%, but the tariff from non-NTR countries, such as Iraq, Iran, North Korea, and Afghanistan, is 36%.

There is considerable effort towards reduction of trade barriers. However, while the US tariffs on paper and wood products have been practically eliminated, the industry faces excessively high tariffs in many foreign markets. Under the Uruguay Agreement, eight economies that include the US, the European Union, South Korea, Singapore, Canada, New Zealand, Japan, and Hong Kong have agreed to eliminate tariffs on paper and reduce tariff on wood by one-third by 2004. Asian markets have very high tariffs, about 40%. The Accelerated Tariff Liberalization (ATL) initiative by the WTO called for elimination of tariffs on all paper products by 2002 and wood products by 2004, but there has been very limited progress in getting the other 126 WTO members to committ to any schedule for tariff liberalization. In addition to the Uruguay Round, tariff concessions by India, and the negotiations regarding China's accession to the WTO provide enormous opportunities for trade, given the their very large populations, GDP growth and potential demand. Regional arrangements such as APEC, ASEAN, the Australia New Zealand Closer Economic Relations Trade Agreement (ANZCERTA), the Caribbean Community and Common Market (CARICOM), EU, MERCOSUR, and NAFTA all include reductions affecting the forest product sector.

The trade and environment debate has also assumed importance, as there are fears that environmental regulations may be used as non-tariff barriers. Among these, the most controversial issues is certification, with trade groups highlighting its trade-restrictive aspects, and environmentalists arguing for its environmental advantages. Trends in current negotiations and agreements point to future decreases in tariffs and trade barriers.

To summarize, the globalization of the paper industry, increase in regional imbalances in demand and supply, and the emphasis on reducing of tariffs, non-tariff barriers and other market access restrictions all provide additional opportunities for the US paper industry. The Asian economies are growing and facing increased demand for paper and paper products; however, it is unlikely that they will be able to meet this demand from their increased capacity, and in any case, they are also constrained by their domestic timber supplies. This will lead to greater Asian imports and the recycling of waste paper. The US and Canada will be able to exploit the opportunity to supply the Asian market because of their large supply of fiber. Europe will also be a competitor in Asian markets, using imported pulp from South America and Russia, and recovered paper from North America and Asia. All this points to the need for effectively configuring the global supply chains in the paper industry to exploit new markets, products, and sources of raw materials. For example, the United States has become net producer of recycled paper that is remanufactured overseas. As a consequence, the paper industry may be faced with major changes in their products, supply, production, distribution, and customers, as well as their trade and fiscal environment. These changes represent challenges, as well as opportunities, that may require reconfiguration of their supply chains.

Given the discussion above, we include tariff and non-tariff trade barriers as a part of the global factors impacting supply chains. These global factors can be incorporated explicitly as constraints into a global supply chain model. Several papers, for example, Haveman, Nair-Reichert, and Thursby (2003) include four types of non-tariff barriers: (1)

restriction on import prices, (2) quantity restriction, (3) quality restriction, and (4) threat, which can be included as additional constraints of a global supply chain model.

Besides the trade barriers, allocation of transportation cost is another global factor related to import export systems. In their paper, Canel and Khumawala (1997) include allocation of transportation cost into their model, but not as part of the decision process. Goetschalckx and Vidal (2001) continue the previous studies on allocation of transportation cost by incorporating this factor as one of the decision variables in their global supply chain model. Transportation costs can be divided into three categories: channel costs, carrier costs, and flow costs. Channel costs based on the fact if the transportation channel is used or note. Carrier costs are based on the number of carriers executing the transportation requests. Finally, flow costs are based on the weight or the volume of the materials transported. The total transportation cost then has to be allocated between the shipper and the receiver. Standard allocation schemes are specified by the Incoterms (International Commercial Terms). The selection of the Incoterms used impacts the cost allocation and profitability of shipper and receiver and is thus a global factor.

c. Local regulations

We discuss two local regulations that effect decisions by global corporations regarding the location of facilities and impact the global supply chain, namely local content requirements and income tax policies. In their paper, Arntzen, Brown, and Harrison (1995) define local content regulations as the minimum percentage of the total value of a product that is locally manufactured. This regulation is commonly applied in developing countries to protect their local industries. This protection policy is often applied to assembly industries where the percentage of local content can be explicitly calculated, but has not generally been widely applicable in the case of process industries.

Another global factor that is associated with local regulations is the local income tax, which is country specific and is often a corporate income tax bracket system. A global corporation needs to determine the corporate income tax system of the countries in

which it will operate. Goetschalckx and Vidal (2001) include the corporate income tax into the global supply chain model by assuming that an international corporation is generally taxed at the highest income bracket. This assumption makes the problem more tractable because the corporate income tax is now a constant percentage.

Researchers usually incorporate transfer pricing, exchange rate risk or some other factor individually in their analysis of global supply chains. We argue that it is necessary to adopt a comprehensive approach in considering global factors, so we can assess their true and joint impact on firm strategy and profitability. This literature review presents a set of global factors that impact the design of global supply chain systems.

5. Verbal Model for Global Supply Chain Systems

Having analyzed the global factors influencing the profitability of the supply chain, we will now incorporate these factors into the global supply chain model. We will start with a verbal formulation of the global supply chain system. The objective is to maximize the time-discounted net present value of the net cash flow or NPV(NCF).

Maximize   Net Income After Tax
= (1 - Tax)(Total Revenue - Total Cost)
= [1 - Tax] [(Selling Price * Total products sold) -
  (Fixed Cost + Variable Cost)]

= [1 - Tax] {
[Selling price (cost, exchange rate, market share, competition level) * Total products sold]
-    [(Exchange rate * Fixed facility cost * build-or-not-to-build decision on each facility)
+ (Exchange rate * Fixed contract cost * trading decision between countries)
+ (Exchange rate * Fixed production cost * make-or-not-to-make a product on each facility)]

-    [(Exchange rate * Variable production cost) * total products produced on each facility)
+ (Ad valorem tariff cost * exchange rate * total value of products imported)
+ ((1 + Duty on shipping) * exchange rate * shipping cost * total products shipped)

+ ((Holding cost) * exchange rate * total products hold in inventory for one period of time)]}

Subject to   Suppliers' capacity
Facilities' capacity
Transportation's capacity
Customer demand requirements
Bounds on quantity (quota) → Non-tariff barrier
Bounds on quality restriction → Non-tariff barrier
Conservation of flows
Taxes and duties constraints

The model can be validated based on general principles of validation and verification. However, to judge the impact of the application of the model, we require detailed data from corporations in the pulp and paper industry. Unfortunately, we have not been successful in our efforts to obtain this data. While being able to validate the model empirically would have added value to this research, we are optimistic that even in its current state, it will serve as a useful tool to highlight the importance of incorporating global factors as a way to maximize value in a global supply chain. Given the long permanence of strategic decisions, the design of supply chains should explicitly incorporate the uncertainty of the data. The stochastic nature of the data further complicates intuitive understanding of efficient global supply chain structures and organization.

6. Conclusion

Integrated global supply chains transform, hold, and transport materials from the raw and recycled material sources to the ultimate consumer through various facilities and transportation channels in different countries. By identifying clearly the global factors that impact supply chains and modeling the manner in which they can be included in a supply chain model, this research has contributed to the industry's understanding and management of their entire global supply chain.

The decision support methodology exists so that corporations can design and configure efficient global supply chains incorporating international trade and production

factors, such as tax and exchange rates, cross-boarder pricing, tariffs, profits repatriation, and goods and services procurement. Rapid changes in the global economy require firms continuously and quickly adjust their global supply chains. In the past, the relatively low value of products in the pulp and paper industry has created an implicit protection against global competition since economically justifiable transportation distances were small. But the decreased global transportation rates have opened up the possibility of global trade. The overwhelming capacity of empty transportation containers returning to Asia provides a significant opportunity for companies in the pulp and paper industry to expand their global customers and supply. Again the decision support technology exists to design efficient and robust global supply chains. The complexity of the global economy increases the financial penalties for making ad-hoc, business-as-usual decisions. In order to validate the methodology developed in this report we will need to develop partnerships with individual firms and collect detailed data from these industry partners. The survey instrument included in Appendix 'A' in this report, it is hoped, will facilitate future research in this direction.

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CORRUGATED CONTAINERS AND CONTAINERBOARD SURVEY

INFORMED CONSENT FORM

This survey is being conducted by the researchers listed below at the Georgia Institute of Technology as a part of a larger study titled "Configuration and Management of Globally Efficient Supply Chains." This research is funded by The Center for Paper Business and Industry Studies, an Alfred P. Sloan Foundation industry center, whose mission is to study the industry by direct observation and provide research results that are of high practical value to decision makers. The goal of this survey is to develop a better understanding of the factors that are considered to be important by practitioners for the design and management of efficient global supply chains in the pulp and paper industry.

Your participation is completely voluntary and access to your responses will be restricted to the researchers listed below. All information collected will be used to generate aggregate statistics not attributable to any specific firm or individual responding to the questionnaire. The aggregate results of this survey will be made available to you upon completion of the research project. If you have any questions about this research or questionnaire, please contact the researchers at the addresses given below.

Before you respond to this survey, please make sure that you read this consent form. If you understand this form and consent to participate, sign the consent form. If you do not understand this statement, or do not consent to participate, simply stop here and destroy the questionnaire.

I understand this statement and grant my informed consent.

Signature:_____ Date:

PLEASE RETURN THE SURVEY TO:

Usha Nair-Reichert, School of Economics, Georgia Institute of Technology, Atlanta, GA 30332-0615. Email: usha.nair@econ.gatech.edu, Fax: 404-894-1890 **or** Ms. Charley Burney at the Center for Paper Business and Industry Studies, Email: charley.burney@cpbis.gatech.edu, Fax: 404-385-2414.

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(1.) Company Name

_____

(2.) Company Address

_____
                  (Street)   (City)   (State)
    (Zip)

(3.) Title or Function of Person Responding

_____

(4.) Did you seek input from other individuals in completing this survey?   Yes / No
If yes, please list their titles / functions below:

(5.) What are the quantities of the primary products sold by your company? **[Please use thousand short tons (mst) for board grades and thousand square feet (msf) for sheets and containers for this question and all future questions concerning quantity.]** *[Note questions 5 and 6 are for categorizing your firm's responses only]*

Product	*Quantity*	*Product*	*Quantity*
Linerboard (msf)		**Sheets (msf)**	
Medium (mst)		**Corrugated containers (mst)**	

(6.) What percentage of your mill capacity is used to produce the following grades?

Grade	**% of capacity used to produce grade**	**Grade**	**% of capacity used to produce grade**
Corrugating medium -- 100% recycle		Mottled white and white top linerboard	
Corrugating medium -- virgin		Clay-coated linerboard	
Unbleached linerboard -- 100 % recycled		Solid Bleached linerboard	
Unbleached linerboard - - virgin		Other Products (such as sack kraft paper)	

(7.) Do you consider your supply chain to be purely domestic in operation or are there global components? Please describe the supply chain for your main product, and identify all the stages in your supply chain.

(8.) Please complete the following table by listing your overall annual production (short tons or 1000 square feet as appropriate) and revenues, by product, by country. **(If information regarding gross revenue is not available, please indicate what percentage each product contributes to total revenue.)**

Product	Country where product produced	Quantity produced (st or msf)	Annual gross revenue for each product (mm $)
Corrugating medium -- 100% recycle			
Corrugating medium -- virgin			
Unbleached linerboard -- 100 % recycled			
Unbleached linerboard --virgin			
Mottled white and white top linerboard			
Clay-coated linerboard			
Solid Bleached linerboard			
Other Products (such as sack kraft paper)			
Sheets			
Corrugated containers			

(9.) What percentage of your products sold in the U.S. market is purchased from other suppliers (e.g. ratio of short tons or 1000 square feet purchased from other U.S. producers to overall short tons or 1000 square feet sold in the U.S.)?

Product	% purchased from other U.S. suppliers	% purchased from other foreign suppliers
Corrugating medium -- 100% recycle		
Corrugating medium -- virgin		
Unbleached linerboard -- 100 % recycled		
Unbleached linerboard -- virgin		
Mottled white and white top linerboard		
Clay-coated linerboard		
Solid Bleached linerboard		
Other Products (such as sack kraft paper)		
Sheets		
Corrugated containers		

(10.) What percentage of your products is made and sold in the U.S. only? **(If information regarding revenue is not available, please indicate what percentage each product contributes to total revenue.)**

Product	% made in the U.S.	% sold in U.S.	Revenue (mm $)
Corrugating medium -- 100% recycle			
Corrugating medium -- virgin			
Unbleached linerboard -- 100 % recycled			
Unbleached linerboard -- virgin			
Mottled white and white top linerboard			
Clay-coated linerboard			
Solid Bleached linerboard			
Other Products (such as sack kraft paper)			
Sheets			
Corrugated containers			

(11.) Please indicate the quantity of product that your company produces in the U.S. and exports to other countries, the countries of export, and the revenue from exports by product**. (If information regarding export revenue is not available, please indicate what percentage the exports of each product contribute to total revenue.)**

Product	Quantity (mst or msf)	Country exported to	Export revenue / % of total revenue obtained from this product
Corrugating medium -- 100% recycle			
Corrugating medium -- virgin			
Unbleached linerboard -- 100 % recycled			
Unbleached linerboard -- virgin			
Mottled white and white top linerboard			
Clay-coated linerboard			
Solid Bleached linerboard			
Other Products (such as sack kraft paper)			
Sheets			
Corrugated containers			

(12.) Please indicate if the following key inputs for your production in the U.S. are obtained domestically, imported from other countries, or if you use both domestic and imported inputs.

Type of Input	Only domestic inputs used (Yes/No)	Only imported inputs used (Yes/No)	Both domestic and imported inputs used (Yes/No)
Virgin Fiber			
Recycled Fiber			
Newsprint			
Chemicals			
Energy			
Other			

If you have selected Other, please list the other inputs:
_____

_____
_____

_____
_____

(13.) Please indicate in the table below the annual percentage of the key input materials imported from other countries and used by your company in the U.S. (e.g. calculated as the ratio of the quantity of imported virgin fiber to total quantity of virgin fiber used in production), the country from where it was imported; and the percentage of the cost of imported input (e.g. calculated as ratio of the cost of imported virgin fiber to the total cost of virgin fiber in production). Please make a separate entry for each country from which an input is imported.

Type of input	Quantity of input used (in metric tons)	What % of the input used is imported	Country imported from	Cost of the imported input as a % of the total cost of that input in production

(14.) Please indicate on a scale of 1 to 5 how trading agreements have affected your business.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

Type of Trade Agreement	Degree of importance of the trade agreement	Type of Trade Agreement	Degree of importance of the trade agreement
NAFTA		APEC	
U.S.- Canada Free Trade Agreement		World Trade Organization and GATT trade negotiations	
European Union		U.S. Chile Free Trade Agreement	
Other (specify)		Other (specify)	

(15.) Please indicate on a scale of 1 to 5 the relative importance of the potential Free Trade of the Americas Agreement for your business: _____

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

(16.) Please indicate whether the following tariffs are a major factor in your business strategy.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

Type of the tariff*	Degree of the importance of the tariff	Top 5 countries where this type of tariff affects your business
Specific tariff		
Ad valorem tariff		
Preferential tariff		
Export tariff		

* Specific tariff -- i.e. $25 dollars per pound of paper; Ad valorem tariff -- i.e. 10% tax per unit of paper; Preferential tariff -- i.e. specific tax is applied because your product came from a certain region; Export tariff -- i.e. tax on products destined for non-US markets.

(17.) Please indicate on a scale of 1 to 5 the relative importance of the following factors in your business strategy.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

Type of factor*	Relative importance of the factor	Top 5 countries where this type of factor affects your business strategy
Import quotas		
Exchange rate fluctuations		
Voluntary export restraints		
Government regulations		
Corporate image		
Other		

*Some explanations: Import quota - i.e. certain % of the product will be allowed in the foreign market; Voluntary export restraints - i.e. a country "voluntarily" refrains from exporting into a foreign market; and Corporate image as a domestic company – i.e. maintaining local employment, domestic corporate income taxes, etc.

(18.) Please indicate on a scale of 1 to 5 the relative importance of controlling the following factors as objectives in your corporation:
[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

[   ] Domestic Market Share   [   ] Global Sales Level
[   ] Global Market Share   [   ] Domestic control of the final products
[   ] Domestic Sales Level   [   ] Global control of the final products

(19.) Please indicate on a scale of 1 to 5 the relative importance of the following factors in optimizing your corporation's strategic planning – especially as pertaining to global markets' issues/positioning.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

Type of factor	Relative importance of the factor	Top 5 countries where this type of factor affects your strategic planning
Duties and tariffs		
Transportation cost		
Local demand satisfaction		
Time to market		

Minimize risk (uncertainty and impact of catastrophic events)		
Production cost		
Income taxes		
Availability of raw materials and other resources (water, electricity)		
Environmental concerns and regulations		
Logistics infrastructure (roads, railways, ports)		
Availability of labor (observing skill levels and unionization)		
Exchange rate risks		

(20.) Please indicate on a scale of 1 to 5 the rank of relative importance of the following issues as factors in deciding transfer prices for your products – especially as pertaining to global markets issues/positioning.
[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

[   ] Total production cost   [   ] Local Market share
[   ] Local average sales price   [   ] Exchange rate risk
[   ] Local tax regulation

(21.) Please indicate on a scale of 1 to 5 the relative importance of the following issues as factors in deciding transportation costs for your product distribution – especially as pertaining to global markets issues/positioning.
[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

[   ] Fixed cost on the choice of transportation mode
[   ] Transportation variable cost
[   ] Cost of legal documents preparation (Bill of Lading, Letter of Credit, etc.)
[   ] Unit volume or unit weight of the products
[   ] Transportation risk (damage, accident, etc.)

(22). What is your primary mechanism for selling your products abroad?

[   ] Brokerage / trading houses   [   ] Internet
[   ] Direct sales force   [   ] Overseas offices
[   ] Other (please specify) _____

(23.) Please indicate below the importance of your company's knowledge about global markets in the sale and delivery of your products abroad.

[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

(24.) Please indicate below the importance of the sources from which you acquire your knowledge about your markets and customers abroad.

a.   direct feedback from customer
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

b.   information supplied by brokerage / trading houses
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

c.   feedback from company sales force
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

d.   information gathered over the internet
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

e.   information from trade journals, association newsletters etc.
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

(25.) Does your corporate treasury function impact the way in which you conduct your business abroad?
[   ] No affect
[   ] Small Influence
[   ] Moderately Influential

[   ] Highly Influential
[   ] Overriding Influence

(26.) Please list the hedging tools that your company uses on a regular basis – especially as pertaining to global markets issues/positioning.

a.

_____
_____

b.

_____
_____

c.

_____
_____

(27.) Please indicate on a scale of 1 to 5 the relative importance of the following risks, as factors to construct a long term planning for your corporation – especially as pertaining to global markets issues/positioning.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

[   ] Demand uncertainty
[   ] Exchange rate risk
[   ] Uncertainty in production capacity
[   ] Changes of operational costs
[   ] Temporary production discontinuity due to unpredictable catastrophe

(28.) Please indicate on a scale of 1 to 5 the relative importance of and use of decision support tools in your firm's understanding and dealing with global markets issues/considerations.

[With 1 being not important, 2 - of small importance, 3 - somewhat important, 4 - significant importance, and 5 - overriding importance.]

[   ] Supply Chain Model(s) purchased from outside vendors
[   ] Internally Designed and Built Supply Chain Model(s)
[   ] Exchange Rate Model Tools
[   ] Logistics Tracking Tools
[   ] Risk Management Tools
[   ] Materials Tracking Tools

We thank you for your participation.