

US PULP AND PAPER INDUSTRY REVIEW 1970-2000

REPORT ON DATA &
PRELIMINARY RESEARCH QUESTIONS

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SCHOOL OF ECONOMICS • GEORGIA INSTITUTE OF TECHNOLOGY

U,S, Pulp and Paper Industry, Report on Data and Preliminary Research Issues.

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I. Introduction

The primary purpose of this report is to provide an exploratory view on the state of the US pulp and paper industry during 1970-2000 with a particular emphasis on the paperboard market. The report makes extensive use of publicly available data on the industry and identifies a number of potential research topics covering market concentration, supply and demand structure, price movement of pulp and paper products, and related government regulations. Part I of the review discusses demand and supply factors in the containerboard market—the largest product market in the US paperboard segment, Part II examines evolving market structure of the three main segments of the industry—pulp, paper, and paperboard, and Part III identifies governmental regulations that impact the US pulp and paper market in its entirety.

I.1 Product Definition: Industry

The two-digit SIC (Standard Industry Classification) code, SIC 26, corresponding to the pulp and paper industry contains three sub-sectors that are grouped together according to their final products: pulp, paper, and paperboard or SIC 2611, 2621, and 2631, respectively.

The paperboard sector, SIC 2631, includes various heavyweight grades of paper used for manufacturing shipping containers, boxes, and cartons for packaging of durable and non-durable consumer products. Paperboard products are further classified into: (a) containerboard, (b) boxboard, and (c) industrial converted paperboard with containerboard forming the largest product category.

I.2 Containerboard Market

I.2.A Demand Overview

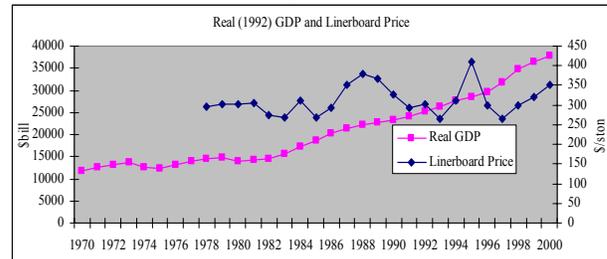
Production and distribution of both durable and non-durable goods is made possible by timely availability of packaging. Hence, location and production decisions of containerboard and paperboard makers are dictated by the demand conditions of the overall US manufacturing sector. In this report, we overview the following demand forces that affect containerboard market: (1) domestic economy, (2) global dynamics, and (3) import and substitute product competition.

1) Domestic Economic Trends: GDP, Unemployment Rate

Total production, as reflected by the national GDP, kept growing continuously throughout the 1980's and 1990's. The rates of growth were slightly lower in the years of recessions: 1980-1981, 1990-1991, and 2000-2002. Stable economic growth may have a time trend effect on real prices of individual products. For the

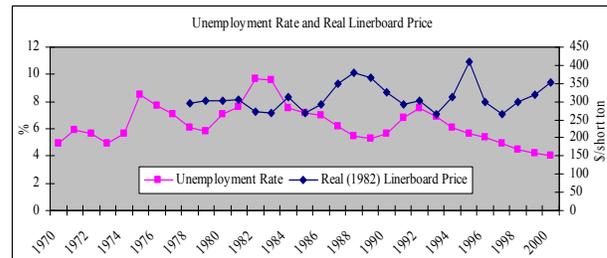
containerboard sector, unbleached kraft linerboard is the most representative product category comprising over 45 percent of the total sector. Figure 1 demonstrates that linerboard prices do not show a clear time trend.

Figure 1



National unemployment is an accurate indicator of business cycles. In Figure 2 the unemployment rate rises during the economic recessions of 1970-1971, 1973-1975, 1979-1988, 1989-1992 and is in reverse relationship with the real linerboard prices during 1980-1981, 1982-1983, 1984-1991, 1993-1995, and 1997-2000.

Figure 2



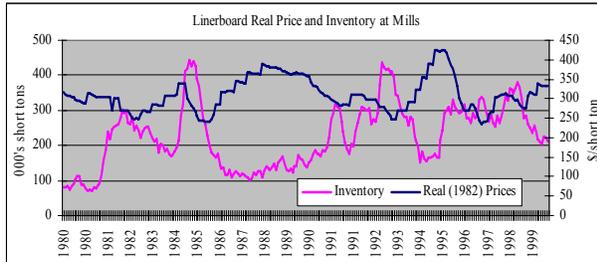
2) Linerboard Demand and Inventory

Historically, linerboard producers have been concerned with excessive inventory build-ups resultant from weak demand. The downturn in the global linerboard demand has been attributed to Europe's slowdown and Asian crisis. Starting with 2000 however, global demand for linerboard helped decrease inventory levels. Additionally, producers are settling down on the notion that inventories can be managed by the way of taking massive downtimes. In 2001, linerboard capacity utilization was only 86 percent,¹ leading up to 4.5 million tons of downtime. Producers believe that this is the key for fending off weak demand and maintaining stable inventory levels.

¹ Greg Rudder, Noel Deking, Kathryn Mackenzie, Bryan Smith, Rae Ann Rockhill, Bruno Navarro, "Turning Point Ahead for Paper Industry, Market Downturn Appears to Be at End," Pulp and Paper, August 2002.

Additionally, recent litigation cases of a group of linerboard producers, discussed in greater detail later in the report, suggest that the antitrust authorities may have found robust relationship between linerboard prices and levels of inventory. In Figure 3 linerboard prices and inventory levels at paperboard mills appear to be in reverse relationship.

Figure 3



3) Containerboard Capacity

■ US and World Containerboard Capacity

The beginning of 2000 has seen an increase in the world containerboard production by three percent. The largest countries producing containerboard are: the US (17.7 million metric tons (mt)),² Japan (4.7 million mt), China (4.18 million mt), Germany (1.9 million mt), and France (1.69 million mt). The US share of world linerboard capacity was estimated at 42 percent in 1998, but was expected to drop to 41.5 percent in 1999 and 2000 due to newly added capacity in Asia and Europe, and permanent shutdowns of a number large US mills. Additionally, large portions of new linerboard capacity were either based on recycling sources or exported from Asia.³

■ Increases in Paperboard Production Capacity

According to the American Forest and Paper Association (AFPA), total paperboard capacity to produce increased from 28 million short tons (st) in 1970 to 55 million st in 2000. The increase of over 50 percent is attributed to (1) additions of new capacity and (2) efficiency gains.

Additions of new capacity were especially pronounced during 1973-1990, 1987-1990 and 1994-1996 (Figure 3). Over the period of 1970 to 2000, the US capacity to produce paperboard has been steadily increasing with just slightly higher rates of growth between 1993 and 1996. During those years 14 new

² 1 metric ton = 1.102 short tons.

³ Grade Center: Industry Structure: Linerboard available at: http://www.paperloop.com/newsinfo/gradecenters/linerboard/industry_structure_key.shtml.

containerboard machines have been installed amounting to 3 additional million tons/year of capacity.

New capital expenditures related to environmental regulations have less than smooth pattern of growth. Figure 4 shows that sharp increases in capacity tend to occur during the years of active legislature and are followed by similarly sharp drops.

Figure 4

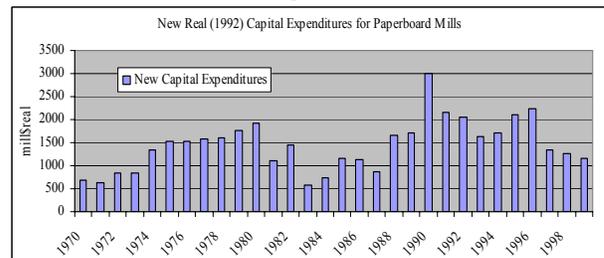
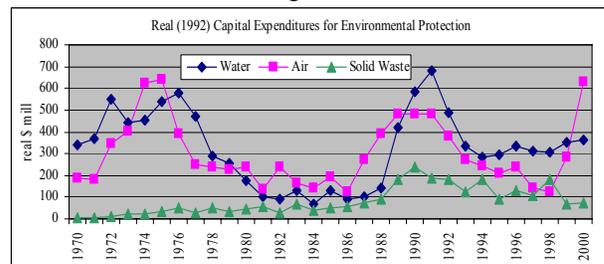


Figure 5



One of the impacts of the environmental regulations is an increase in the overall paperboard production efficiency rising from improvements in papermaking technology. The improved watering and pressing equipment allowed paper machine to increase their productivity by 10-20 percent. Such operating efficiency improvements are not seen throughout all paperboard mills as US tax policies do not provide necessary incentives to keep adding on new technology investments. Additionally, the change in freight regulations allows for the same number of boxes be made with 10-15 percent less of fiber.

4) Global Dynamics

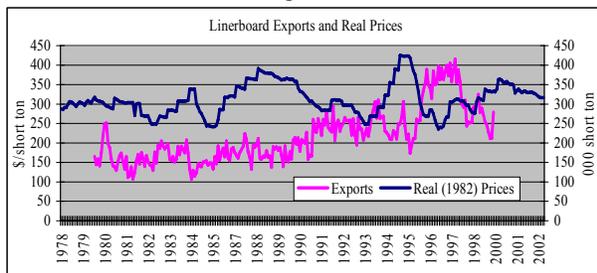
■ Exports

With many manufacturing plants and converting box plants moving to developing countries, containerboard market has become much more global. Box converters located offshore enjoy the ability to order containerboard from anywhere in the world and containerboard producers face increasing pressures from foreign competition in export markets.

The US is the largest exporter of kraft linerboard with about 10 percent of annual linerboard production

sent abroad. According to the industry experts, although exports represent only a small fraction of total containerboard production, around 5 to 15 percent, they dictate the magnitude of profit margins the industry can enjoy. The 10 percent of total linerboard production sent to exports represent 95 percent of total paperboard shipments for export. Historically, linerboard exports grew steadily from 165 thousands st to 266 thousands st in 1999 (Figure 6). 1997 has seen an unprecedented surge in the US linerboard exports overseas. Consequently, the exports have declined from 3.2 million tons in 1999 to 2.78 million tons in 2000; this is a relatively short time span for a 0.5 million tons decline. Prices for linerboard exports have slumped under the pressure of fluctuating exchange rates and domestic price decreases.

Figure 6



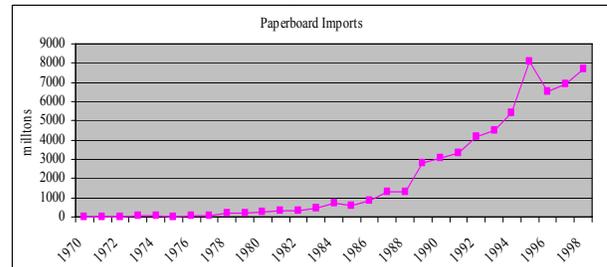
Exchange rate fluctuations can determine the volatility of margins: at times of an overvalued US dollar, linerboard prices can not be maintained at competitive levels. Thereby, weak exports also can be explained by comparatively lower offshore prices for linerboard. For example, in November of 2001, the difference between 42lb kraft linerboard in the US and Ecuador was \$120/ton, with Ecuador being the fourth largest export market for kraft linerboard.

Imports

Foreign competition in the domestic markets puts additional pressure on the US linerboard producers. Figure 7 shows a dramatic increase in the volume of paperboard imports from 10 thousand st in 1970 to approximately 1,983 thousand st in 2000. Additionally, experts believe that one should also count the inflows of prepackaged goods from Asia, which previously have been packaged primarily in the US (such as toys and sporting goods). Omitting these numbers causes the discrepancy between accounting for stand-alone paperboard imports and paperboard in the boxed form with a product inside. National Paperbox Association (NPA) cites that in 2002 about \$15 million of US rigid box production has been lost to the Asian imports, yet this number accounts for only stand-alone box imports. The total rigid box inflows, including prepackaged

goods, could be as high as \$50 million. According to the International Trade Commission, imports in corrugated containers have increased from \$8.2 million in 1996 to \$24.1 million in 2002.⁴

Figure 7



Substitutes

There are three product groups that compete with the unbleached kraft liner as its substitutes: (1) domestic and imported returnable plastic containers (RPCs), (2) foreign-made test liners competing with the US linerboard in export markets, and (3) the lower quality test liner.

Returnable Plastic Containers

In recent years, the paper industry as a whole has experienced increasingly intense competition from a wide range of plastic products, starting with plastic grocery bags to milk containers. According to industry specialists, RPCs present a serious threat to corrugated boxes and paperboard containers.

RPCs are foldable, stackable, interlocking, reusable, standard-sized, and finally, display-ready boxes that are especially popular in Europe and considered to be most useful for produce suppliers. As such, plastic containers represent a new and more efficient form of supply chain management: they are passed from user to user with the provider collecting them at the end delivery point for inspection, cleaning, repairing and recycling, or re-using. The process involves high-tech, often internet-based logistical coordination. RPCs are widely accepted in Europe due to the governmental regulations requiring retailers to cut their solid wastes to landfills by 50 percent. This is believed to be as the most compelling factor for slow adaptation of RPCs to the US market. Another reason for RPCs slow penetration into the US is the resistance on the part of suppliers to technological improvements in logistics.

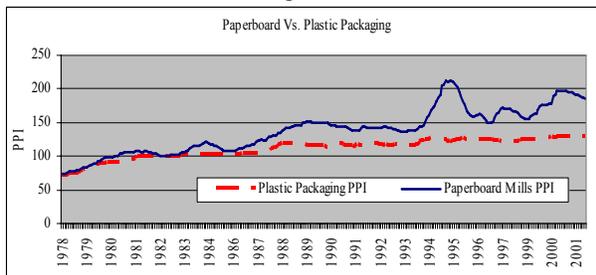
Despite the slow adaptation of plastic containers, a number of major US companies already ship bulk of

⁴ Jackie Schultz, (2003), "Comrades or Competitors?" Packaging on Line, April 1, Available at: <http://www.packaging-online.com>

their products in RPCs. For example, Wal-Mart ships about 70 percent of its produce to retailers in RPCs. According to Wal-Mart managers, the paperboard industry is inconsiderate of the bigger view the supply chain system, which prevents them coming up with products that would adequately compete with RPCs. Additionally, it is remarked that there is a possibility that the two products (corrugated containers and RPCs) are complementary: "...RPCs are good for grapes and corrugated are good for lettuce."⁵

There are no easy proxies that can be used to measure RPCs' prices. The PPIs for plastic packaging including and excluding film exhibit no clear pattern of interrelationship between plastic packaging and paperboard PPIs.

Figure 8



Recycled Paperboard

It is possible that relatively cheaper board products substitute unbleached kraft linerboard when its prices increase. Unbleached kraft linerboard is made with no less than 80 percent of virgin pulp.⁶ In contrast, recycled paperboard uses less than 80, usually 60, percent of virgin pulp. Historically, recycled liner has been viewed as an inferior product to kraft liner. However, technological advancements allow for producing 100 percent recycled linerboard that is comparable with kraft linerboard in most performance characteristics.

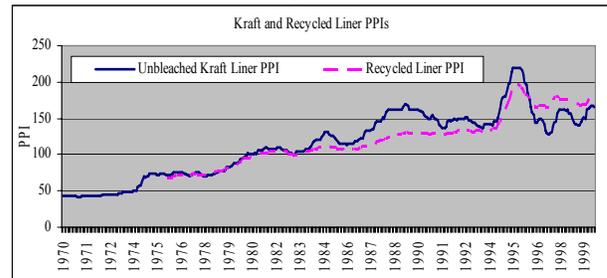
The pattern of kraft and recycled liner prices shows that recycled paperboard prices have been consistently lower than linerboard prices up to 1995, the peak year for both product prices, and starting with 1996 recycled board has been indexed higher than linerboard (Figure 9). Additionally, experts acknowledge that recycled

⁵ Mark Arzuomanian, "Wal-Mart: PRCs and Corrugated Boxes Can Coexist," Official Board Markets, Volume 77, Number 40, October 6, 2001.

⁶ Schedule B, Vol.1 of the US Department of Commerce defines "virgin pulp" as "fibers obtained by the chemical sulfate or soda processes."

linerboard mills have a manufacturing cost advantage at times when the price for their raw material, old corrugated containers (OCC), drops. Historically the price for OCC has been low allowing recycled board producers give significant discounts to their customers and increase competitive pressures on kraft linerboard.⁷

Figure 9

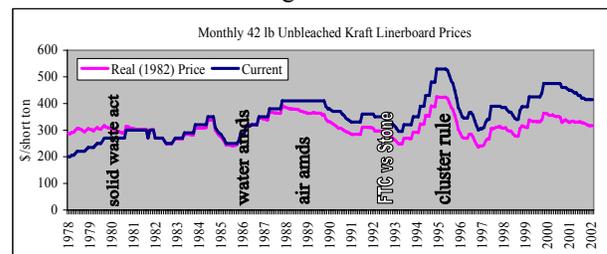


I.2.B Linerboard Prices

1) Historical Pattern

The development of the 42lb unbleached kraft linerboard prices from 1970 to 2000 is noted with the five general declines. The price drops happened during the years of 1981-1982, 1984-1985, 1989-1991 and 1992-1993, 1995-1997, and 2000-2002, or the periods of the general economic recessions. Additionally, environmental regulations appear to influence prices as well. The three major real price increases overlap with the active legislature (Figure 10).

Figure 10

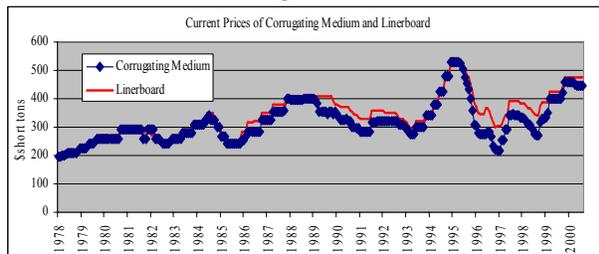


The record high real price is registered in June 1995 as 487.58/ton. Prices continued rising from the beginning of 1999 up to the end of 2000 getting to the second historical high of \$475.00/ton. In February and March of 2000, linerboard producers implemented a price increase of \$50.00/ton for kraft linerboard. Starting with January of 2001, prices have been sliding downward.

⁷ Greg Rudder, Noel Deking, Kathryn Mackenzie. Bryan Smith, Rae Ann Rockhill, Bruno Navarro, "Inventory Levels, Fiscal Stimulus Offer Hope for Mid-2002 Price Recovery," Pulp and Paper, August 2002.

According to the *North-American Factbook* (NAFB), prices of linerboard are almost always affected by prices of corrugating medium. Experts note that medium price changes are always followed by changes in linerboard prices. Although, graphically such pattern can not be easily discerned, there are a number of instances when corrugating price changes precede the changes in linerboard prices (Figure 11). US corrugating medium market is deemed to be more regionalized and competitive than the linerboard market. According to the concentration ratio of top four producers, CR4, the US corrugating medium market is a lot more concentrated than the linerboard market: for 2000, the CR4 for corrugating medium is 63 percent vs. 28 percent for linerboard. Additionally, it is more volatile due to much lower amounts of required inventory at box plants and greater reliance of box-makers on just-in-time inventory.

Figure 11



2) Margins and Costs

Paperboard producers, on average, recognize a 15 percent margin of a selling price as the minimum level. Yet, there are big differences in the factors determining price margins—productivity, financial leverage, and operating costs—from company to company. More efficient firms are able to exercise higher margin levels. Traditionally, companies attempt to manipulate operating costs. Fixed costs are usually 30-40 percent of total production costs and are insensitive to production/operating rates. These costs include different capital and administrative expenses such as depreciation, interest, insurance, administrative expenses, and R&D. The majority of variable costs cover firms' expenditures on raw materials, labor, and energy. The highest cost is for fiber or pulp, with the second largest as labor and the third place is divided between energy and delivery costs. For containerboard, prices are also determined largely by boxing plants, which have to be able to pass on price increases to their customers.

3) Pricing Strategies

The pricing of both external and internal (in case of integrated box producers) transactions is based on published prices in company newsletters, trade journals, and industry consulting groups. Generally, small degree

of discounting is not viewed as the cause of price falls; it is not widely spread and is used only by small producers that can not afford taking market-related downtime. However, in order to keep their mills operating during the periods of weak demand, paperboard producers can involve in incremental pricing and accepting spot orders at price levels that cover only variable costs. Once, a price cut occurs, there is a strong incentive for others to follow suit. Hence, incremental pricing is viewed as a dangerous practice as it can speedily depress prices in the overall markets.⁸

II. Paperboard/Linerboard Market Structure

The 1990's have been marked with large number of corporate mergers among paperboard producers. Due to these mergers, the structure of the US linerboard industry has become more concentrated. In 2001, the top five linerboard producers—Smurfit Stone Company (SSCC), International Paper (IP), Georgia-Pacific Corp. (GP), Weyerhaeuser (Weyco), and Inland Paperboard and Packaging Co.—managed over 60 percent of the total U.S. linerboard capacity.⁹ Despite the large share of the five leading linerboard companies, it is important to note that 45 percent of new capacity is formed by (small) producers whose capacity ranking is below 15 (there are 50 linerboard producers in the USA in total).¹⁰

A. Concentration Ratios

1) Data Used for Concentration Ratios

There are two sources of data used to analyze pulp and paper in general and paperboard market in particular. The first one is the most commonly used *Census of Manufacturers*, which publishes concentration ratios based on collected data on shipments of top four producers in the industry for every five years (hereinafter

⁸ From interviews with the industry expert panel.

⁹ Pulp and Paper North-American Factbook, 1999-2000, Miller Freeman Inc., San Francisco, CA. These numbers should be considered with care. Although the numbers do not include Canadian capacity (as in Pulp and Paper and NAFB top capacity reports), they combine the following linerboard grades: unbleached kraft linerboard, bleached linerboard, as well as recycled linerboard. The typical Standard Industry Classification (SIC) system treats the three linerboard grades separately by giving them the following SIC numbers: 26311 for unbleached kraft linerboard, 26312 for bleached linerboard, and 26314 for recycled paperboard. For comparison in the Census of Manufacturers the concentration ratio of top four producers (CR4) for paperboard, that combines all linerboard grades as well as corrugated medium, was 28 percent in 1982 and 33.6 percent in 1997.

¹⁰ "Paper and Forest Products: Consolidation: The Holy Ground?," Equity Research, New York: J.P Morgan Securities Inc., March 20, 1997.

“Census CR4”). For the purposes for this analysis, the five-year data are linearly interpolated to the annual series. The Census CR4s are calculated at the 4-digit level of Standard Industrial Classification (SIC) code. In this review we look at the three SIC industry sectors: pulp with SIC 2611, paper with SIC 2621, and paperboard with SIC 2631, with an in-depth examination of the last one.

The second source of data, the Forest Product Laboratory (FPL) data set, contains annual capacity information broken down to individual paper and paperboard grades, thereby allowing for a more detailed CR4 analyses. The FPL data is the annual panel data of more than 15,000 annual mill counts (for 500 mills for 30 years), collected by the Forest Products Laboratory of the US Department of Agriculture, Madison Wisconsin. Capacity estimates by mill and process type have been collected from industry directories, corporate reports, trade journal articles, and other sources.^{11, 12} The FPL data contains capacity information for eight paper categories: newsprint, four writing and printing paper categories,¹³ tissue and sanitary paper products, kraft packaging;¹⁴ four paperboard grades: linerboard, corrugating medium, solid bleached board, other recycled paperboard; and market pulp that is used for papermaking. For the purposes of this review we will focus on the four paperboard product groups.

2) Concentration Ratios of Top Four Producers (CR4)

¹¹ For more detailed data description refer to “United States Paper, Paperboard, and Market Pulp Capacity Trends by Process and Location, 1970-2000,” report compiled by the Forest Products Laboratory at Wisconsin, Madison under auspices of the USDA. The report can be found at: <http://www.fpl.fs.fed.us/documnts/fplrp/fplrp602.pdf>.

¹² Additionally, for the purposes of this and further analyses, individual company records were verified with the *Lockwood Post Directory* for the purposes of identifying the structure of corporate ownership of the pulp and paper firms.

¹³ The four major writing and printing paper categories are: coated and uncoated free sheet, and coated and uncoated groundwood. “Groundwood” is an outdated term that refers to the compositional context of a paper grade. Free sheet and groundwood have less than 10 and more than 10 percent of mechanical pulp fiber respectively.

¹⁴ Kraft packaging includes only unbleached kraft and constitutes for the most part grocery bag and sack paper, shipping sack paper, and a relatively small proportion of unbleached kraft wrapping paper.

According to the Census of Manufacturers, the pulp industry has the highest concentration of the top four pulp producers of almost 60 percent in 1997 (Figure 12). In contrast, paper and paperboard producers have low CR4—around 30 percent throughout all three decades (Figure 12). The FPL data provide a similar look at the three sector concentration (Figure 13).¹⁵

Figure 12

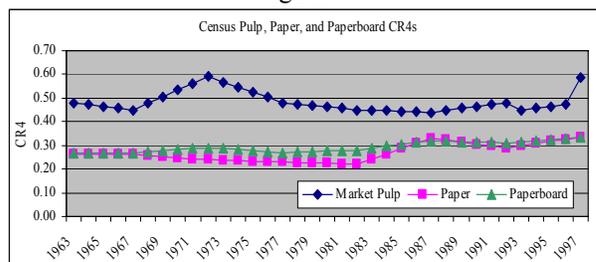


Figure 13

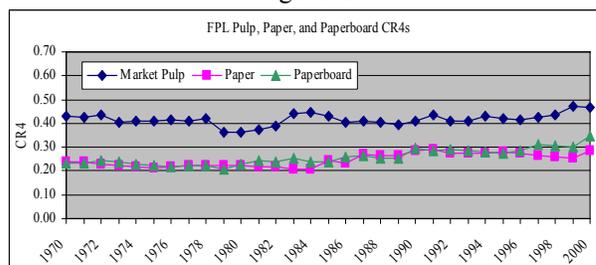
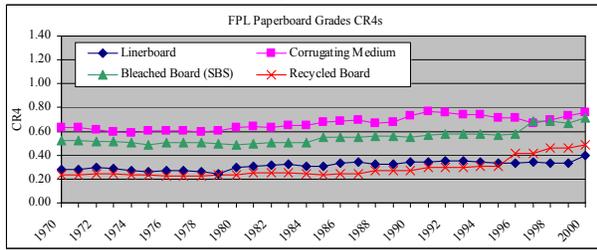


Figure 14 uses FPL CR4s for individual paperboard grades: linerboard, corrugated medium, bleached and recycled board. According to the graph, the highest concentration is in corrugating medium—its CR4 is about 80 percent in 2000. US SBS CR4 is in the low 50s in the 1970’s growing to 80 percent in 2000. Linerboard CR4 is fairly low and is in the range of 40 percent throughout the 1990’s.

¹⁵ This information will be used in further analysis of price cost margins and market concentration. There have been recognized a number of problems in ownership coding of the FPL data. As mentioned earlier, the data is at the mill level, carrying a unique mill identification code. Company ownership is recognized in the Company Name field. Besides such minor problems as misspellings, there are a number of mis-identified companies. The typical misidentification rose from the actual ownership change that was not properly reflected in the data. For example, the FPL lists Stone Container as an individually standing entity for the years 1999 and 2000, where in fact, it has been merged with Jefferson Smurfit in 1998 carrying the resultant company name of Smurfit-Stone. Both entries (Stone Container and Smurfit-Stone) appear among the top 10 capacities for both 1999 and 2000.

Figure 14



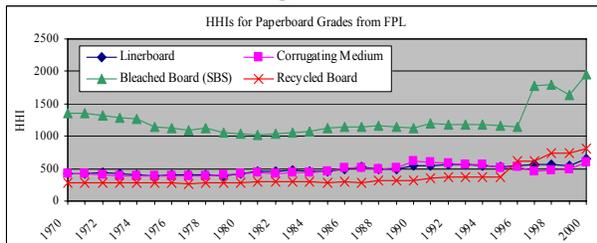
3) **HHIs**

A more academic measure of industry concentration is the Herfindahl-Hirschman Index (HHI). According to the Antitrust Division of Department of Justice, the spectrum of market concentration, as measured by the HHI, is divided into three ranges that can be broadly characterized as ‘unconcentrated’ (HHI below 1,000), ‘moderately concentrated’ (HHI between 1,000 and 1,800), and ‘highly concentrated’ (HHI above 1,800).¹⁶

The HHI adds up the square of the market share for each producer in a grade and makes the cross-industry comparison (between different paper grades) easier. In this regard, many prefer HHI to other concentration ratios because HHI incorporates information on all players in the market. The level of detail and scope of the FPL data allows for accurate HHI calculation for various grades and groupings of pulp and paper product categories.

Similar to CR4s, the FPL HHIs shows that only pulp exhibits relatively high industry concentration throughout the three decades. Paper and paperboard segments are much less concentrated with HHIs in low 500’s. Additionally, paperboard industry appears to be the most fragmented paper industries. Among the paperboard grades, only bleached board, or SBS, reaches out to the high 1,800-HHI points towards the end of the 1990’s. However, SBS holds only about 13 percent of total paperboard capacity (with the high of 15 percent in 1970 and low 12 percent in 1990).

Figure 15



¹⁶ Horizontal Mergers Guidelines, U.S. Department of Justice and the Federal Trade Commission, revised: April 8, 1997 available at: www.usdoj/atr/public/guidelines/.

B. Mergers

1) New Strategies: Downtime and Mergers

At the onset of the 1980’s and 1990’s paper companies have accumulated hefty capacity in the anticipation of booming exports to Asia. However, by the end of the 1990’s these expectations still did not materialize and prices plunged down forcing managers to eliminate extra capacity. In order to sustain prices, industry has moved from inventory streamlining and aggressive sales promotions towards downtime management. Taking downtime and shutting mills has become the main tool to maintain the level of production what would, in turn, keep inventories liquid.

In addition, in order to increase and/or upgrade their capacity levels, paper and paperboard producers are now opting to merge with existing producers instead of building new mills. Buying new capacity is perceived to be cheaper than building new capacity. Moreover, once two companies merge they have greater leverage to shut down older and less profitable mills while maintaining or even increasing their productive capacity overall. Finally, merging firms can enjoy increased financial flexibility and additional efficiencies can be gained by sharing overhead costs such as R&D and administrative expenses.

The “disappointment” with Asian exports in the 1990’s was characteristic to all of the US manufacturing, and the merger wave rushed throughout the whole economy. Yet, containerboard industry was seen as the champion in mastering the corporate merging strategy in fending off over-capacity. In 1998, right after the 1997 Asian downfall, Jefferson Smurfit acquired Stone Container, the biggest linerboard producer, and then St. Laurent Paperboard.¹⁷ In 1999, Weyerhaeuser acquired McMillan-Blodel, and International Paper bought Union Camp. The three mega-companies—Smurfit-Stone, Weyerhaeuser and International Paper—now account for more than 35 percent of linerboard and corrugated box production, and all three have shut down their older mills.¹⁸

The question whether mergers are an effective tool of stabilizing prices remains controversial. On the one hand, in the article dated by November 2000, financial analysts have expressed that mergers in containerboard

¹⁷ As the result of these mergers, Smurfit-Stone became one of the top paperboard producers.

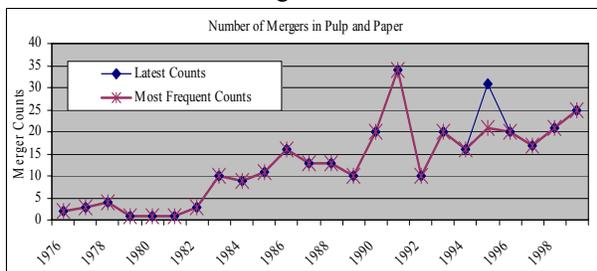
¹⁸ Louis Uchitelle, “Who’s Afraid Now That Big Is No Longer Bad?,” New York Times, November 5, 2000, available at: <http://www.som.yale.edu/faculty/zc25/finance-core/articles/AlliedSignal-Honeywell-GE.htm>.

industry helped maintain prices at stable and rather low levels.¹⁹ On the other hand, two years later, paper industry analysts are citing that mergers and shutdowns in 1998 were conducive to the price hike in 1999-2000 to \$400's per ton from \$300's in 1998.²⁰

2) Number of Mergers in Pulp and Paper

Figure 16 presents the number of mergers counted using the North-American Factbook's (NAFB) list of mergers and acquisitions in paper and allied products industry. The NAFB publishes a varying list of mergers from year to year, therefore, two counts are included: the most recent and frequent counts for any specific year. The data are available from 1976 onwards. The results show that the process of mergers and acquisitions intensified in 1983-1986 with 16 consolidations in 1986, and then peaked up to 34 mergers in 1991. Additionally, the latest counts indicate 1995 as the year of heightened consolidation activity. It is important to note here that 1995 is also a year of sharp price increases for all of the paper industry.

Figure 16

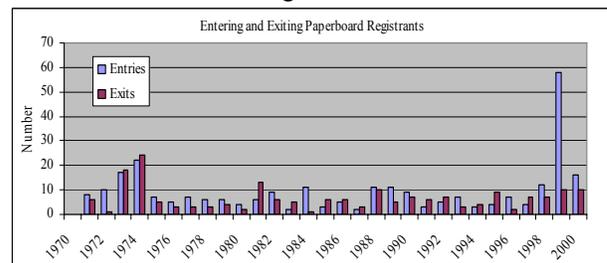


3) Entries and Exits in Paperboard

Structural industry activity for paperboard is measured by counting the number of entering and exiting firms into the paperboard sector. The data were obtained from the annual Standards and Poor (S&P) Register of Corporations, which lists the legal entities registered in the US under SIC 2631, Paperboard Mills, and indicates the location of their incorporation. The annual lists were

compared in order to identify existing or entering corporate entities and the location of incorporation indicated whether they were of US or foreign origin. The results demonstrate that the greatest number of entries and exits were in 1972-1974, 1981, 1984, 1988-1989, and 1998-2000 (Figure 17). The years of high entry/exit activity generally correspond to the years of economic recessions. Alternatively, the early 1970's, the first years of environmental regulations that had direct impact on the paperboard industry, also exhibit higher levels of entries and exits in the industry.

Figure 17



According to the S&P Register of Corporations (Figure 16), in 1999 there were 58 US-registered paperboard entities. One possible explanation to such a drastic increase is the gradual but markedly growing share of foreign paperboard entities towards 2000. Throughout the early 1970's, the majority of foreign registrants were Canadian and the total number of foreign entities amounted to only 24. In 2000, the total count of foreign entities rose to 86, which makes foreign registrants almost at par with the 94 US-based paperboard corporate entities. Such corporate shifts in the US and global market could be explained by the economic recessions in Europe and Asia in the 1990's as well as the soaring US stock market.

4) Vertical Integration with Pulp Mills

According to the Annual Survey of Manufacturers, the number of paperboard mills integrated with the pulp mills rose during mid 1970's and 1990's.²¹ The peak number of integrated mills was in 1977, growing from 63 in 1963 to 82 in 1977. In 1997, there were 67 integrated paperboard mills.

The number of mills that chose to keep their operations as non-integrated went from 208 in 1963 to 137 in 1987. In 1997, there were 150 nonintegrated mills. Despite this trend, the proportions between the two types of mill operations have remained stable over the 20 years—integrated mills ranged from around 20

¹⁹ Louis Uchitelle, "Who's Afraid Now That Big Is No Longer Bad?," New York Times, November 5, 2000, available at: <http://www.som.yale.edu/faculty/zc25/finance-core/articles/AlliedSignal-Honeywell-GE.htm>.

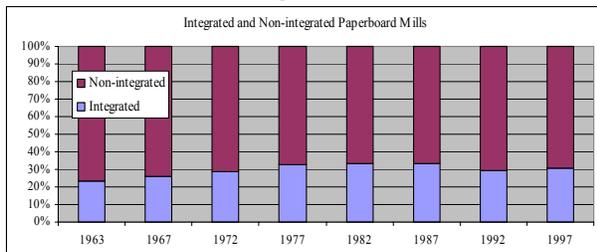
Linerboard has risen in price to \$475 a ton, from \$340 in 1998. That is still below the peak of \$525 in 1995, but the mergers and the shutdown of excess capacity have stabilized prices.

²⁰ Greg Rudder, Noel Deking, Kathryn Mackenzie, Bryan Smith, Rae Ann Rockhill, Bruno Navarro, "Inventory Levels, Fiscal Stimulus Offer Hope for Mid-2002 Price Recovery," Pulp and Paper, August 2002.

²¹ Census of Manufacturers defines establishments as individual plant units, distinguished from and not related to company ownership.

percent to 30 percent to the total number of mills (Figure 18).

Figure 18



5) Vertical Integration with Corrugated Plants

According to the NAFB, only 25 to 30 percent of the US containerboard production are available to the open market, or independent boxing converters and non-US customers. The rest 70 to 75 percent of the primary market goes directly to the integrated box plants or is from the company's paperboard mill to its own boxing plant. About 65-70 percent of the open market share goes to the estimated 800 US independent corrugated converters and sheet plants. The rest is exported offshore. In this light, containerboard market is fairly integrated not only at the lower end of producing its own pulp, but also at the end of manufacturing boxing/packaging products. Among the top ten containerboard producers, Weyco and Willamette are the two most integrated companies with 107 and 102 percent of integration respectively. Over 100 percent integration in this case means that the two companies are net buyers of containerboard as they produce less containerboard than they consume.²² Yet, unlike with the classification of pulp mills' production, containerboard is not differentiated as 'market' vs. 'non-market' capacity.²³

6) The Top Five

According to the *Pulp and Paper*, the top five paper companies in the US are Smurfit-Stone Container Corporation (SSCC), International Paper (IP), Weyerhaeuser, Georgia-Pacific (GP), and Inland Paperboard. Within this group, SSCC is the largest US linerboard producer with the capacity of 4.97 million tons per year, followed by the IP with 4.09 million tons per year, Weyerhaeuser with 3.01 million tons per year,

²² Data is of 1999 from the NAFB.

²³ In most industry sources, only market pulp capacity is reported. 'Market pulp' is the pulp that is available for purchase in the market; the rest is consumed by companies' own integrated paper or paperboard plants. According to the FPL Report, only 15 percent of total US pulp production is considered 'market' pulp.

and GP with 2.75 million tons per year. In 2000, SSCC's total pulp and paper capacity was 7.24 million tons per year or 8 percent of world capacity and 20 percent of the North-American capacity.

III. Government Regulation

A. Environmental Regulations

The first environmental acts have been introduced during the late 1960's—early 1970's. The main laws affecting the paper and pulp industry are regulations concerning air and water pollution, and the disposal of solid wastes. The Clean Air Act (Air Quality Act of 1967) requires paper and pulp companies to install the best available technology possible in the attempt to preserve and not to harm the quality of air resources. Such technology is referred to as the maximum achievable control technology (MACT). The following mills are subject to the Air regulations: dissolving kraft, bleached papergrade kraft/soda, unbleached kraft, dissolving sulfite, paper-grade sulfite, and semichemical mills.

In addition to this list, the following processes are subject to the regulation under the Clean Water Act (Federal Water Pollution Control Act Amendments of 1972): mechanical pulp, nonwood chemical, secondary fiber deink, secondary fiber nondeink, fine and lightweight papers from purchased pulp, and the categories of tissue, filter, nonwoven, and paperboard from purchased pulp. Mills are required to control and limit the amounts of pollutants discharged in waters. The controls should be technology-based and employ the best available technology (BAT).

The third main component of the environmental regulations affecting the industry is the Solid Waste Disposal Act of 1980 (Resource Conservation and Recovery Act) has the most effect on day-to-day operations of paper and pulp mills (the original Solid Waste Disposal Act was enacted in 1965). Dioxin, chlorine and chlorine derivatives are considered hazardous waste substances and have to be disposed according to the federal requirements.

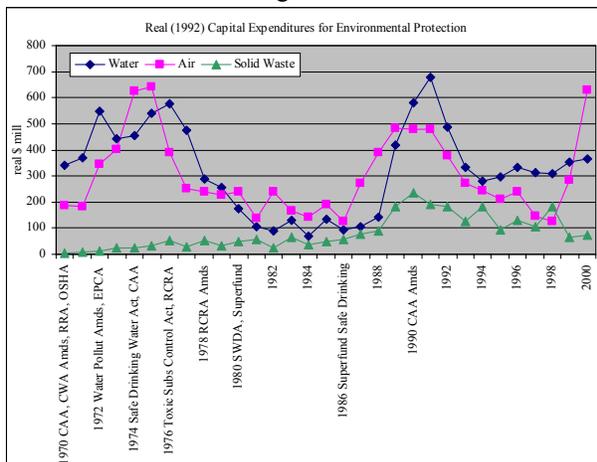
Additionally, starting with 1995, pulp and paper companies located in the eight states bordering the shores of the Great Lakes are asked to control the release of bioaccumulative industrial chemicals, pesticides, and metals that are believed to produce a broad range of health risks for humans and wildlife. There are about 40 pulp and paper mills affected by this initiative representing such companies as Georgia-Pacific, Smurfit-Stone, Potlatch, Mead, and Fort James. The AFPA anticipates that compliance with the Great Lakes

Initiative (GLI) will cost \$1.25 billion in new capital expenditures, and \$43 million in recurring annual costs.

Finally, the Cluster Rule of 1993 is designed to put together Water and Air regulations and provide for a consistent, non-exclusionary body of rules. The regulations are staged in three phases with different deadlines. Mills are expected to install the maximum achievable control technology (MACT) that would cost the industry about \$1.8 billion, according to the Environmental Protection Agency, whereas the AFPA estimates that the costs will be up to \$2.6 billion plus the operating costs of \$273 million.

Historically, the environmental legislature has had a profound effect on the paper and pulp companies (P&P). The total paper and pulp industry capital expenditures for environmental purposes have been highly unstable with steep increases in the years of active legislature as well as a few years after the legislative changes (Figure 19).

Figure 19



B. Shipping Regulations

In 1991, the National Railroad Freight Committee and the National Classification Committee of the Motor Carrier industry have adopted proposals to Rule 41 and Item 222, respectively, to allow box makers an option to use either minimum bursting strength specifications or minimum edge crush specifications. These changes have allowed the weight of boxes and the containerboard to be reduced by 10-15 percent. Lower weight requirements, decrease from 42lb to 37lb, and enable manufacturers to produce more paperboard (in terms of square feet) with the same capacity level. Therefore, both capacity and productivity of paper machines are increased by 10-15 percent.

C. Economic Litigation

In the 1980's and 1990's there have been three main litigation processes against linerboard producers involved: Champion International Corp., Georgia-Pacific Corporation, and Stone Container Corporation. In 2000, two separate cases involving Stone Container were combined into one class-action suit against seven (out of nine) largest containerboard producers in North America.

In 1984-1986, Champion faced charges by the Federal Trade Commission (FTC) as the result of its August 1984 acquisition of the stock of St. Regis Corporation for approximately \$1.2 billion. The FTC claimed that the acquisition of St. Regis would reduce competition in the West Coast linerboard market. As of March 1986, Champion entered into the consent agreement with the commission not to acquire for 10 years any interest in any company involved in manufacturing linerboard in the West Coast market without prior FTC approval.

In March of 1996, the US Department of Justice (DOJ) waged civil action against Georgia-Pacific Corporation (GP). The DOJ alleged that the proposed acquisition of Domtar Inc. by GP threatened to raise prices and harm consumers of gypsum board in the Northeast regions in violation of Section 7 of the Clayton Act. As the result of the acquisition, the new entity would have 90 percent of gypsum board capacity in the Northeast. In the outcome, Georgia-Pacific entered into a consent decree with the DOJ requiring it to divest two of its wallboard plants in the Northeast.

The third case of litigation started off as a complaint filed by the FTC in 1998. The FTC alleged that the Stone Container Corporation involved in the price-fixing behavior in 1993. According to the FTC, in January 1993 Stone announced a \$30.00 price increase for linerboard. In March 1993, the company was forced to withdraw the price increase as other companies did not follow suit.

Shortly after this, seven lawsuits were filed against Stone Container: three by purchasers of corrugated sheets in the Northern District of Illinois and four by purchasers of corrugated boxes in the Eastern District of Pennsylvania. Plaintiffs alleged that Stone developed a plan (by conducting a telephone survey of major US linerboard producers asking competitors how much linerboard was available at what price) and decided to take downtime at its plants, to reduce its production by approximately 187,000 tons and to purchase 100,000 tons of linerboard inventory from competitors. The reduction in output was the largest voluntary reduction in

the history of the US linerboard production. According to the allegations, such actions on the part of Stone constituted an invitation to its competitors to join in a coordinated price increase.

In May 1999, two class actions have been filed in the Eastern District of Pennsylvania against multiple parties. Both complaints allege that other producers of corrugating sheets were 'invited' by Stone and accepted its 'invitation' to restrict the production of linerboard and artificially raise prices, resulting in an antitrust conspiracy in violation of the Sherman Act. In 2000, the two complaints were combined into one class-action suit that now involves seven (out of nine) largest containerboard producers in North America. The companies are: Gaylord Container, Georgia-Pacific, Inland Paperboard and Packaging, International Paper and former Union Camp (now part of the IP), former Stone Container and Smurfit Jefferson (now Smurfit-Stone), formerly Tenneco Packaging (now Packaging Corporation of America), and Weyerhaeuser. The plaintiffs, independent box companies, seek repayment of the money they paid for linerboard and boxes from the beginning of October 1993 through the end of November 1995. They believe that linerboard producers have increased prices for linerboard, therefore pushing up the prices for boxes. In 2002, a US appellate court in Pennsylvania has held that in the proceedings the companies are combined and are subject to the same outcome. Currently, the ruling is pending.²⁴

Data Sources:

- Annual Census of Manufacturers.
- Bureau of Labor Statistics.
- Department of Justice.
- Federal Trade Commission.
- Food and Agriculture Organization of the United Nations, The FAO Corporate Document Repository.
- North-American Fact Book 2001, 1999-2000.
- Paperloop.com.
- Pulp and Paper Week.
- Standard & Poor Register of Corporations.
- Statistics for Time Series Analysis, Monthly Production of Containerboard and Related Series: 1980-1999 (2000), The American Forest and Paper Association, Containerboard Group.
- 2001 Statistics, Paper, Paperboard and Wood Pulp, American Forest and Paper Association.

²⁴ Order and Memorandum of the United States District Court for the Eastern District of Pennsylvania, available at: <http://www.paed.uscourts.gov/documents/opinions/00D0769P.HTM>.