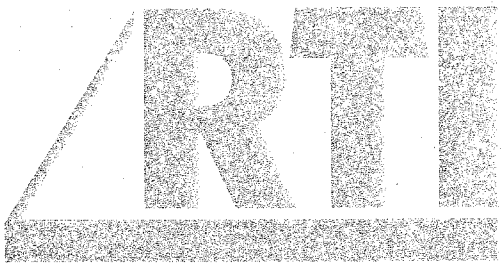

RESEARCH TRIANGLE INSTITUTE

April 1993

Economic Analysis of Air Pollution Regulations: Pulp and Paper Industry

Draft Report

Prepared for

Scott Mathias
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Cost and Economic Impact Section
Research Triangle Park, NC 27711

EPA Contract Number 68-D1-0143

RTI Project Number 35U-5428-26 DR

POST OFFICE BOX 12194 RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709-2194

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This report contains portions of the economic impact analysis report that are related to the industry profile.

The major outputs of this model are market-level adjustments in price and quantity for all affected products as well as facility-level adjustments in production, including product-line or facility closures. We estimated impacts on foreign trade through comparing baseline and with-regulation levels of exports and imports of affected products. We used the market adjustments in price and quantity to calculate the changes in the aggregate economic welfare using applied welfare economics principles. The aggregate measures of economic welfare include consumer and producer surplus changes as well as the change in the total benefits of consumption and total costs of production.

In addition, we also computed the changes in employment attributable to the change in output from mills. The change in output results from both changes in production at the affected facilities and facility and product-line closures. We computed worker dislocation costs given the industry employment losses based on the method outlined in Anderson and Chandran.[2]

A.2 FEATURES OF THE PULP AND PAPER INDUSTRY

For this analysis, a paper or paperboard product is formed by two processes: pulping-bleaching and papermaking. As seen in Figure A-1, pulpwood is the raw material input into the pulping process, which results in pulp that may or may not be bleached depending on its final end use. Chemical pulping and bleaching processes and secondary wastewater treatment are the three major processes the regulations will affect. Air and water pollutants resulting specifically from wood preparation or papermaking processes are not addressed by the regulations or this analysis; however, this analysis is capable of including these activities.

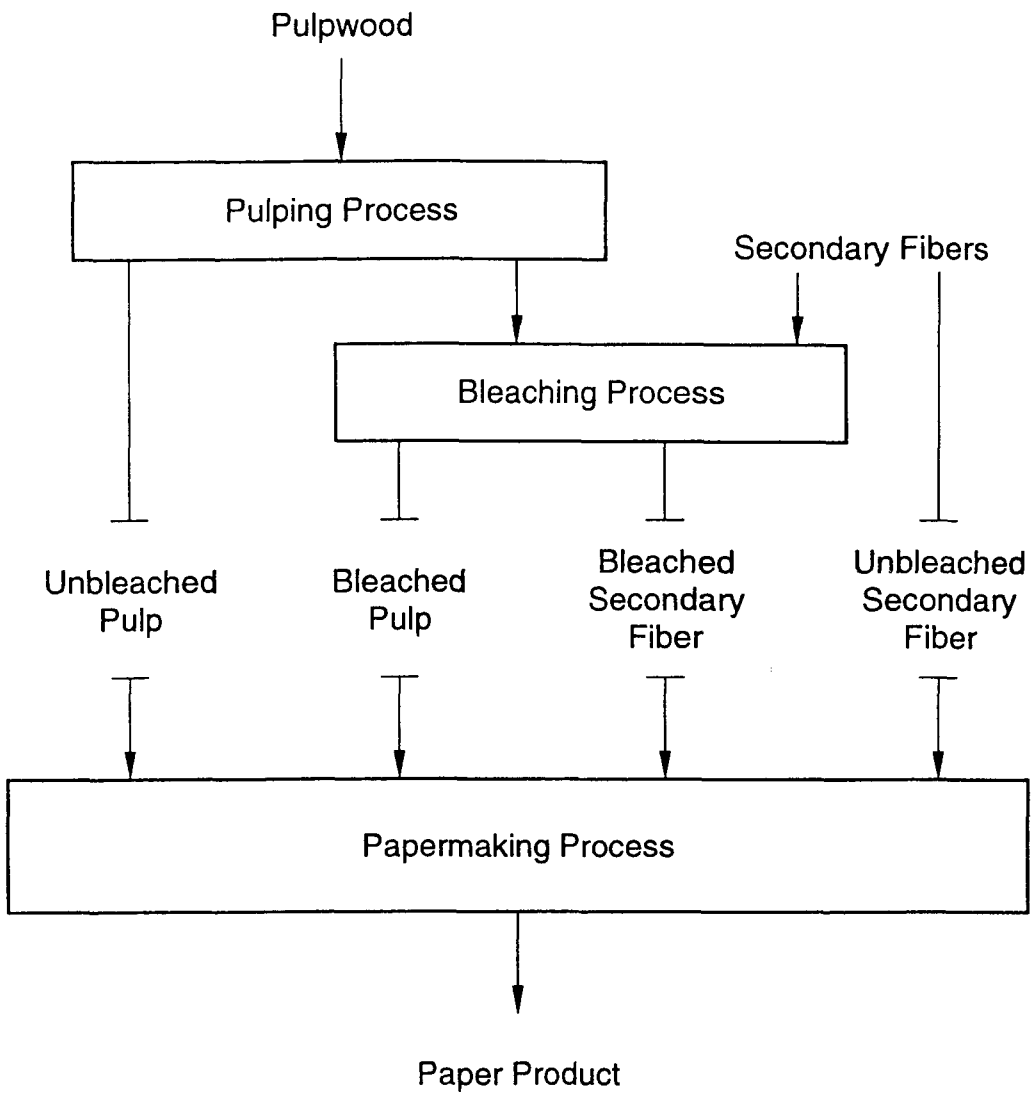

Figure A-1. Paper production process

A.2.1 Pulp Production Processes

Pulp can be manufactured by a variety of processes that separate the wood into its cell components. Important pulping processes are

- chemical;
- semichemical;
- mechanical;

- thermomechanical, chemimechanical, and chemithermomechanical; and
- bleaching and brightening.

Each process imbues the final product with special characteristics according to the relative balance of the components remaining in the pulp. The characteristics affect the quality of the pulp, thus dictating its end use and, in turn, influence the quality of the paper or board produced. In addition, pulps may or may not undergo a further bleaching or brightening process after manufacturing.

A.2.1.1 Chemical Pulping Method. Chemical pulping methods involve a chemical reaction between the lignin and the active chemicals in the pulping liquor. Kraft (or sulfate) and sulfite are two chemical processes that use different chemicals and produce pulps with slightly different characteristics. Kraft pulping first cooks the chips in a mixture of sodium hydroxide and sodium sulfide (white liquor); the procedure is halted before the pulp is completely delignified. The mixture is then separated into vapor, liquid, and pulp. Next the pulp is washed and may be bleached. Finally, chemical and by-product recovery is employed to convert used chemicals, tall oil, and turpentine into reusable inputs or products. Both hardwoods and softwoods can be used in the kraft process, and it produces a very strong pulp that can be combined with weaker pulps.

The sulfite pulping process is similar to the kraft process in that both processes use sulfur-based chemicals to remove lignin from the wood. The difference between sulfite and kraft pulping is that the alkaline white liquor is replaced with an acidic liquor made of sulfurous acid and the bisulfate ion. Fiber furnishes used in this process include softwoods such as spruce, fir, and hemlock. The primary

advantage of the sulfite method is that it produces a pulp with a lower residual lignin content. As a result, sulfite pulp is easier to bleach and requires fewer bleaching steps, making it better suited for papermaking applications. However, the lower residual lignin content causes sulfite pulp to be weaker than kraft pulp because the chemical recovery stage of the sulfite process is less thorough than that of the kraft process.

The economic feasibility of chemical recovery is ultimately determined by the cost of the initial compounds. Calcium (limestone)-based reactions do not generally involve recovery phases because the cost of recovery exceeds the cost of purchasing new calcium. On the other hand, magnesium-based reactions are followed by recovery because magnesium recovery is less costly than acquiring fresh magnesium.

A.2.1.2 Semichemical Method. Semichemical pulping combines aspects of chemical and mechanical treatment to pulp hardwoods. Chips are first softened and partially delignified by using chemicals and steam and then pulped by mechanical action. The primary method of semichemical pulping is the neutral sulfite method. In this method, wood chips are cooked in a neutral solution of sodium sulfite and either sodium carbonate or sodium hydroxide. The extent of chemical delignification is determined by the length of cooking and chemical concentration. After partial chemical delignification, the furnish is then subjected to further nonpressurized mechanical delignification.

A.2.1.3 Mechanical Methods. Mechanical pulping involves either shredding unchipped pulpwood with a grindstone or fiberizing wood chips with a specially designed refiner. Mechanical pulping is used primarily for softwoods, although variations of the mechanical process have been devised to

allow mechanical pulping of hardwoods. The mechanical pulping process simply rips loose the bond that lignin creates, but the lignin remains attached to the cellulosic fibers. As a result, mechanical pulp is highly opaque, making it suitable for uses such as newsprint. However, mechanical pulp produces low strength paper that yellows easily, and the process is highly energy intensive. Two variations of mechanical pulping are commonly used: stone groundwood and refiner groundwood.

The stone groundwood process mechanically grinds bolts of lumber (uniformly sized, debarked logs) against a grinding stone to separate fiber from lignin. The stone is then cleaned with water to recover the pulp, the resulting slurry is screened to remove oversized pieces, and finally water is removed. The stone groundwood method produces short strands of pulp, which accounts for the pulp's weakness. Refiner processing replaces the grinding stone with a pair of discs and is designed to generate longer, stronger strands of pulp fiber. Grooved discs spinning against each other in opposite directions effectively shred the pulp instead of grinding it. The main disadvantage of refiner pulping is that it produces a darker pulp that is more difficult to bleach than stone groundwood pulp.

A.2.1.4 Thermomechanical, Chemimechanical, and Chemi-thermomechanical Pulping Processes. Thermomechanical pulping is a fourth pulping process. In this method, steam is used to soften the fibers before shredding. The chips are presteamed or refined in one or more stages of pressurized refining or followed by atmospheric refining. Following the brief cooking process, the pulp is mechanically defibrated in refiners. Thermomechanical pulping, which produces pulp of low strength but higher than the groundwood and refiner mechanical processes, is used for products such as newsprint, publication papers, and fiberboard.

Another pulping process is chemimechanical pulping, which produces a pulp of slightly higher strength than thermomechanical pulping. The method allows hardwoods to be pulped mechanically by first subjecting the wood to a chemical softening stage. Two major processes are used: the chemigroundwood process and the cold soda process. Chemigroundwood processing cooks bolts of timber in an alkaline sulfite solution prior to mechanical grinding. The sulfite solution softens the fiber to make it more responsive to the grinding stone. Cold soda chemimechanical processing uses a caustic soda to soften wood chips at room temperature. The chips are then pulped by the mechanical refiner method. Chemimechanical pulping is similar to semichemical pulping, but the semichemical pulping process employs a chemical stage to partially delignify the furnish, whereas the chemimechanical method relies exclusively on mechanical delignification. Chemical treatment in the chemimechanical process is only a means of preparing the furnish for mechanical delignification; the semichemical process supplements mechanical delignification with chemical delignification.

Chemi-thermomechanical pulping employs chemicals and heat to break down the chips, followed by mechanical defibration. The wood is cooked in a chemical liquor of sodium sulfite and sodium carbonates at elevated temperatures to prepare it for defibration. Some paper products produced from this type of pulp are newsprint, tissue, and board.

A.2.1.5 Bleaching and Brightening. Bleaching may be an additional process added to any of the pulping methods described above. Bleaching is a means of whitening pulp and involves further delignification as well as alteration of chromophoric compounds present in the pulp fiber. Bleaching

permanently alters the pulp by removing lignin. Thus, in addition to whitening the pulp, bleaching increases the longevity of whiteness and retards discoloring in the final product. The main disadvantage associated with bleaching is that lignin removal weakens the pulp. The bleaching process can be either single stage or multi-stage, depending on the desired color of the final product. The following five procedures are generally used in bleaching: chlorine, chlorine dioxide, hypochlorite, peroxide, and ozone. The order in which the steps occur varies and is determined by the degree of delignification required, the wood type, and the pulping process used.

As Figure A-1 shows, secondary fibers may also be used as inputs to the bleaching process and papermaking process. Secondary fibers are any type of fiber obtained from wastepapers and other used, reclaimable fiber sources.

Brightening, the alternative and the complement to bleaching, involves altering only the chromophoric compounds present in the pulp. No delignification occurs. As a result, the brightening process is less damaging to the strength of the pulp, but the whiteness of the pulp lasts only temporarily, and exposure to the sun yellows brightened pulps easily.

A.2.2 Paper Production Processes

The papermaking process uses pulp as an input to produce paper and paperboard products. The process begins with refining, which mechanically cuts and macerates pulp to convert raw fiber into a form suitable for papermaking. Pulps also may be mixed with other pulp types to enhance strength or other characteristics. Additives to impart certain characteristics may be added, and then the stock, or furnish, is pumped to the paper machine.

Three basic steps occur in paper and paperboard production:

1. A web of fiber is formed from a fiber and water suspension on a paper machine wire.
2. Water is pressed out of the web.
3. The remaining water is driven off by heat.

A variety of machines make paper, but the two most common are the fourdrinier and cylinder machines. The fourdrinier machine typically is used for manufacturing a variety of paper grades and lightweight bonds and the cylinder machine for multi-ply paperboard or building board grades.

Each paper or paperboard product may be made using some combination of bleached or unbleached pulps and secondary fiber depending on the desired characteristics of the final product. These combinations are very closely related--the pulpwood input (hardwood or softwood) requires a particular pulping process that results in a certain type of pulp, which may or may not require bleaching to obtain the brightness required for the final product. For example, the "recipe" for uncoated free sheet might call for 80 percent kraft pulp (from the kraft pulping process) and 20 percent groundwood pulp (from the mechanical pulping process) with each type of pulp bleached with a particular bleaching sequence.

A.2.3 Producers

The pulp and paper industry is characterized by both nonintegrated and vertically integrated mills. Vertically integrated mills rely mostly on their own production of pulp to produce paper and paperboard products, while nonintegrated mills include pulp mills that produce market pulp as well as paper mills that purchase market pulp to produce paper and

paperboard products. Mills producing low-value products are usually integrated, and mills making specialized, high-value products are usually nonintegrated. Those vertically integrated mills without enough internally produced pulp are also demanders of market pulp; those mills that produce an excess supply of pulp are suppliers of market pulp.

A mill is defined as a single physical entity with a unique geographic location that includes one or several production lines. A mill may have several parallel decision-making units in place at once, reflecting the decision-maker's choice to produce multiple outputs. For this study, three types of mills exist for producing pulp and paper: pulp mills, paper mills, and integrated facilities. Their total number and distinguishing characteristics are as follows:

- Pulp mills (28)--mills engaging solely in the production of pulp to be sold on the pulp market for use as an input in the production process of a paper or paperboard product. Pulp mills include mills producing pulp from both virgin fiber as well as secondary fibers such as recycled paper, rags, linters (cottonseed fiber fuzz), and straw.
- Paper mills (303)--mills producing paper and paperboard products from market-purchased pulp produced from pulp mills and integrated mills. Paper mills include makers of all paper and paperboard products in the National Census that do not produce their own pulp on-site but may repulp secondary fiber as an input to production.
- Integrated mills (235)--mills producing not only final products but also the pulp required to manufacture these products. Also included are mills that have some production lines devoted to paper production and others devoted to market pulp production (a mill that

is both a pulp mill and a paper mill but that does not use the pulp produced on-site as an input to the on-site paper production).[3]

This categorization of mills divides them only according to whether they engage in market activities to meet their input needs; it does not discriminate according to facility size. Hence, this definition does not imply that an integrated facility is necessarily larger than a pulp facility; however, in reality the integrated mill may dwarf the pulp mill. This characterization refers to each mill's evaluation of the relative costs of purchasing or manufacturing their input; integrated mills produce their input rather than purchase it, whereas nonintegrated facilities rely on the market to meet their input demand.

A.2.4 Products and Markets

The analysis described in the following sections accounts for all marketable commodities involved in producing pulp and paper. The first marketable product is pulp, either bleached or unbleached, and the second marketable product is the final paper or paperboard product. An additional marketable commodity is secondary fiber. All of these products are consumed and produced domestically, as well as traded internationally. Therefore, domestic producers export some pulp and paper products to other countries, and foreign producers supply their pulp and paper products to U.S. markets. This section includes tables and figures on value, quantity, and price trends over the past decade for aggregate products (i.e., market pulp, paper, and paperboard).

Domestic quantity and value shipped for pulp products from 1981 to 1989 are shown in Table A-1 (see Figures A-2 and A-3). In 1989, the domestic shipments of pulp products were valued at $7.4 billion, which was an increase of 115 percent

TABLE A-1. U.S. PRODUCTION OF PULP: 1981-1989[4, 5, 6, 7, 8]

Year	Quantity Shipped Short Tons	Value Shipped (10^3)	Price/Ton
1981	8,259,272	3,424,840	414.67
1982	8,581,831	3,238,794	377.40
1983	9,359,292	3,252,707	347.54
1984	9,927,473	4,001,373	403.06
1985	9,952,129	3,686,080	370.38
1986	11,132,855	4,017,736	360.89
1987	11,575,838	5,135,618	443.65
1988	11,553,220	6,494,338	562.12
1989	11,423,483	7,369,559	645.12

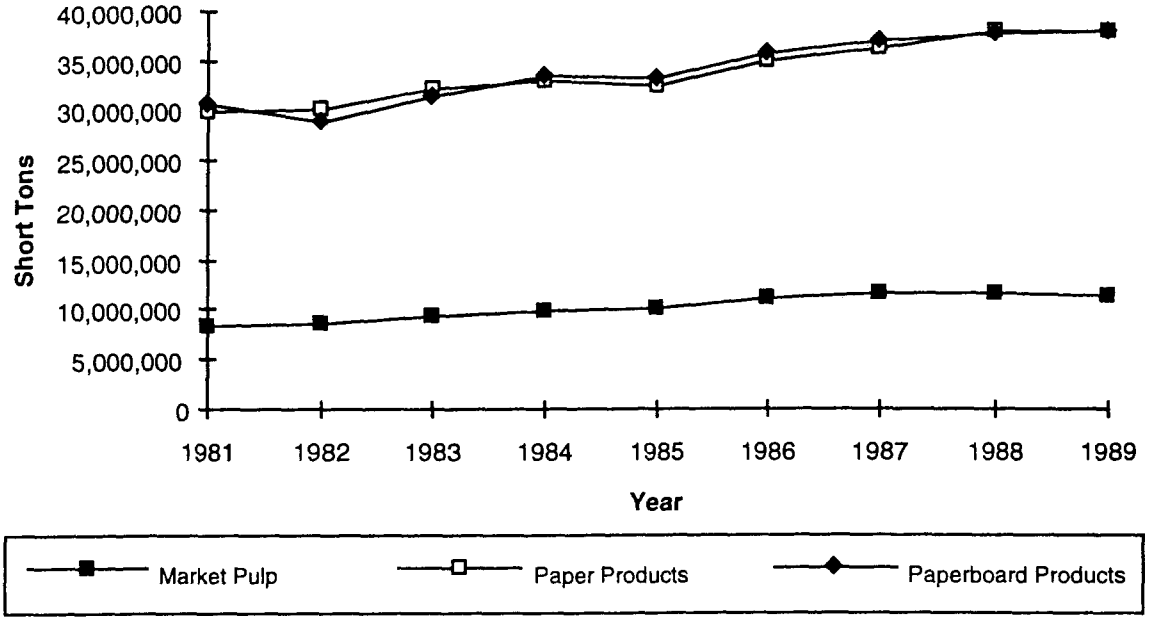

Figure A-2. U.S. quantities shipped of pulp, paper, and paperboard products: 1989

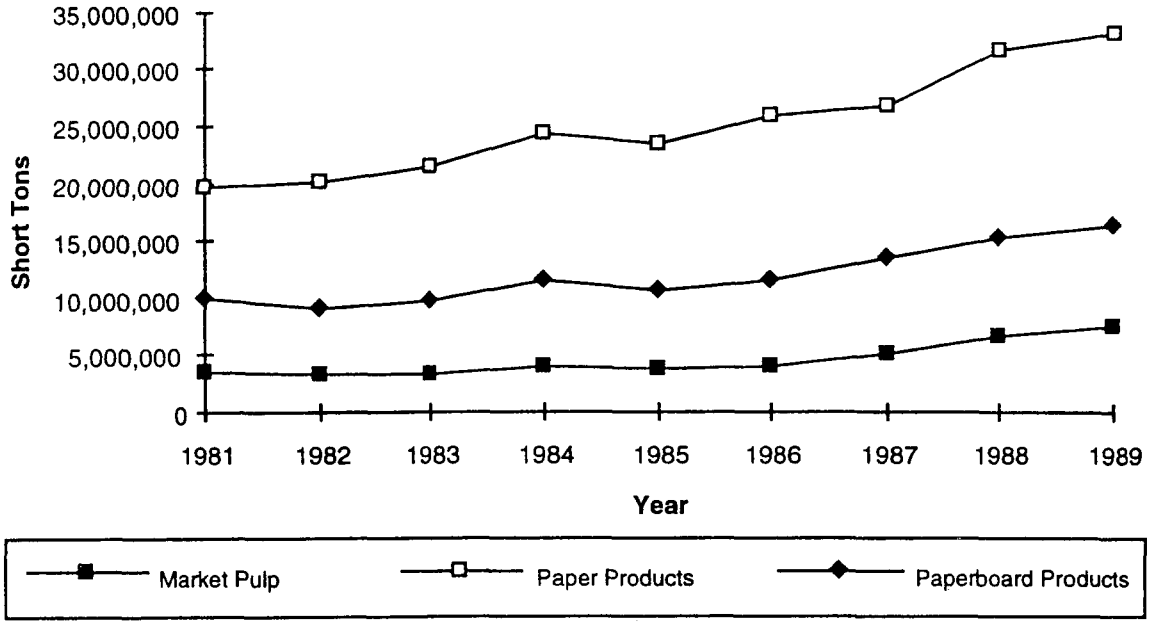

Figure A-3. U.S. value of shipments of pulp, paper, and paperboard products: 1981-1989

over the pulp shipment value in 1981. As shown in Table A-1 and Figure A-2, the quantity of pulp shipped grew fairly steadily over the 9-year period, reaching 11.4 million tons in 1989. The average price for pulp per ton was approximately $645 (see Table A-1). Aggregate prices per ton for pulp, paper, and paperboard products are shown in Figure A-4. Special Alpha and dissolving woodpulp products had the highest estimated price per ton at $735.33. Bleached sulfate pulps were close to average for all pulps with a price of $646 per ton. Lower end pulps included unbleached sulfate, $384 per ton, and unbleached secondary fiber, $417 per ton.

Table A-2 shows domestic quantity and value shipped for paper products from 1981 to 1989 (see also Figures A-2 and A-3). Total paper products in 1989 were valued at $33.3 billion; printing and writing paper products were valued at $23.3 billion, and packaging and industrial converting paper products were valued at $3.9 billion. In 1989, value of

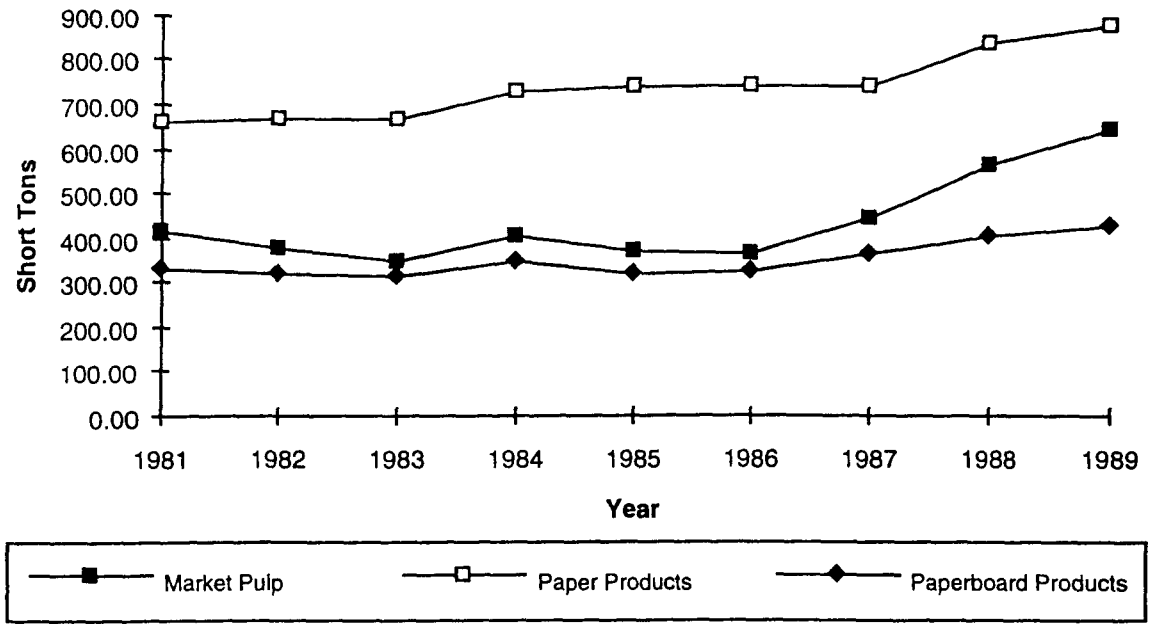

Figure A-4. Price per ton for U.S. pulp, paper, and paperboard products: 1981-1989

shipments increased almost 70 percent over 1981. The largest increase in growth was in the printing and writing papers sector, which increased almost 75 percent in 1989 over 1981. Shipments of paper products in 1989 totaled 38.1 million tons. The average prices of paper products per ton from 1981 to 1989 are compared with average prices for pulp and paperboard products in Figure A-4. The average estimated price per ton for paper products was $875 (Table A-2). Printing and writing and packaging and industrial paper products had lower average values per ton: $837 and $824, respectively. The two market segments had a lower average price per ton than the total paper market throughout the 9-year period. Individual products with a higher price per ton than the average included cotton fiber writing paper, $2,040; special industrial paper, $1,718; and glassine, greaseproof, and vegetable parchment, $1,359. The lowest priced paper product was newsprint at $490

TABLE A-2. U.S. PRODUCTION OF PAPER PRODUCTS: 1981-1989[9, 10, 11, 12, 13]

Year	Quantity Shipped Short Tons	Value Shipped (10^3)	Price/Ton
Total Paper Products			
1981	29,815,913	19,607,188	657.61
1982	30,150,893	20,157,769	668.56
1983	32,205,274	21,399,481	664.47
1984	32,989,205	24,271,824	728.72
1985	32,317,371	23,550,366	739.62
1986	34,859,400	25,782,800	739.62
1987	36,133,517	26,835,126	742.67
1988	38,005,856	31,719,331	834.59
1989	38,073,553	33,302,931	874.70
Printing and Writing Paper			
1981	20,790,643	13,339,811	641.63
1982	20,986,247	13,553,318	645.82
1983	22,662,033	14,504,942	640.05
1984	23,924,514	17,135,025	708.58
1985	23,514,596	16,661,865	694.42
1986	25,448,416	17,671,871	694.42
1987	26,799,576	19,090,537	712.34
1988	27,948,521	22,833,368	816.98
1989	27,878,961	23,334,857	837.01
Packaging and Industrial Converting Paper			
1981	4,994,353	2,717,212	544.06
1982	4,873,388	2,766,858	567.75
1983	5,096,948	2,917,972	572.49
1984	4,975,517	3,118,102	605.40
1985	4,686,169	2,836,997	624.29
1986	4,642,574	2,898,312	624.29
1987	4,437,607	3,173,890	715.23
1988	4,874,730	3,746,612	768.58
1989	4,743,575	3,910,349	824.35

per ton. Other paper products valued less than $700 per ton included unbleached kraft packaging paper, shipping sack, and uncoated groundwood paper.

Table A-3 shows quantity and value shipped for paperboard products from 1981 to 1989 (see Figures A-2 and A-3). Total shipments of paperboard were almost $16.3 billion, which represents an increase of 63 percent over the 1981 value. As Figure A-2 and Table A-3 illustrate, quantities shipped of paperboard dipped in 1982 and 1985 slightly but otherwise rose steadily over the 1981 to 1989 period, reaching 38 million tons in 1989. Paperboard products had a price per ton less than that of paper products in 1989 at an average of $427 per ton (Table A-3 and Figure A-4). The lower value per ton for paperboard products is illustrated by the fact that in 1989 paperboard products accounted for approximately half (38 million tons) of all paper and paperboard products shipped but accounted for only 33 percent of the value shipped. All of the bleached packaging and industrial paperboard products had a higher than average price per ton. The highest average prices per ton for individual products were molded pulp products, $1,196; folding carton boxboard, $721; and milk carton board, $719. Hardboard and insulating board had the lowest price per ton with $337 and $338, respectively.

A.2.5 Foreign Trade

In 1989, the United States was a net importer of total pulp, paper, and paperboard products. Imports in 1989 totaled $10.2 billion. The majority of U.S. pulp imports come from Canada and secondly Latin America. The top three countries exporting paper and paperboard products to the U.S. are Canada, Finland, and Sweden. In 1989 the U.S. exported approximately $6.6 billion in pulp, paper, and paperboard products. The two largest importing countries of U.S. pulp

TABLE A-3. U.S. PRODUCTION OF PAPERBOARD PRODUCTS: 1981-1989[14, 15, 16, 17, 18]

Year	Quantity Shipped Short Tons	Value Shipped (10^3)	Price/Ton
1981	30,566,254	9,993,099	326.93
1982	28,912,522	9,138,993	316.09
1983	31,470,079	9,738,689	309.46
1984	33,514,510	11,572,125	345.29
1985	33,030,693	10,562,943	319.79
1986	35,613,237	11,452,177	321.57
1987	36,989,614	13,531,922	365.83
1988	37,762,521	15,235,749	403.46
1989	38,047,313	16,256,939	427.28

products are Japan and Germany. Major importers of U.S. paper and paperboard products are Canada, Japan, and the U.K.[19]

As shown in Table A-4 and Figure A-5, the U.S. was a net exporter of pulp products in 1989 and had been since 1986. In 1989, exports totaled $3.6 billion, approximately 48 percent of the domestic value of shipments. Imports were 41 percent of the domestic value of shipments and totaled almost $3.0 billion. Total quantities of pulp exported and imported were about 6.4 and 5 million tons, respectively. Bleached and semi-bleached sulphate and soda woodpulp were the pulp products imported and exported in the greatest amount. [20]

The U.S. was a net importer of paper products in 1989, as it was for the eight years prior to 1989 (see Table A-5 and Figure A-6). Exports represent 3.6 percent of the domestic value of shipments whereas imports represent 20.7 percent. Imports to the U.S. were mainly from the printing and writing paper segment; newsprint was the number one imported paper product. Imports of printing and writing paper were over 27

TABLE A-4. FOREIGN TRADE OF MARKET PULP: 1981-1989[21, 22]

Year	Export Quantity Short Tons	Export Value (10^3)	Export Price/Ton	Import Quantity Short Tons	Import Value (10^3)	Import Price/ Tons
1981	3,809,545	1,746,506	458.46	4,086,698	1,764,287	431.71
1982	3,499,208	1,486,885	424.92	3,655,786	1,493,241	408.46
1983	3,746,826	1,431,827	382.14	4,093,436	1,472,478	359.72
1984	3,678,468	1,565,493	425.58	4,490,081	1,844,766	410.85
1985	3,902,326	1,425,560	365.31	4,465,746	1,520,907	340.57
1986	4,615,769	2,073,541	449.23	4,581,760	1,601,378	349.51
1987	5,071,332	2,350,742	463.54	4,850,238	2,069,394	426.66
1988	5,729,859	3,026,445	528.19	5,038,158	2,663,424	528.65
1989	6,353,213	3,613,114	568.71	5,004,366	2,980,197	595.52

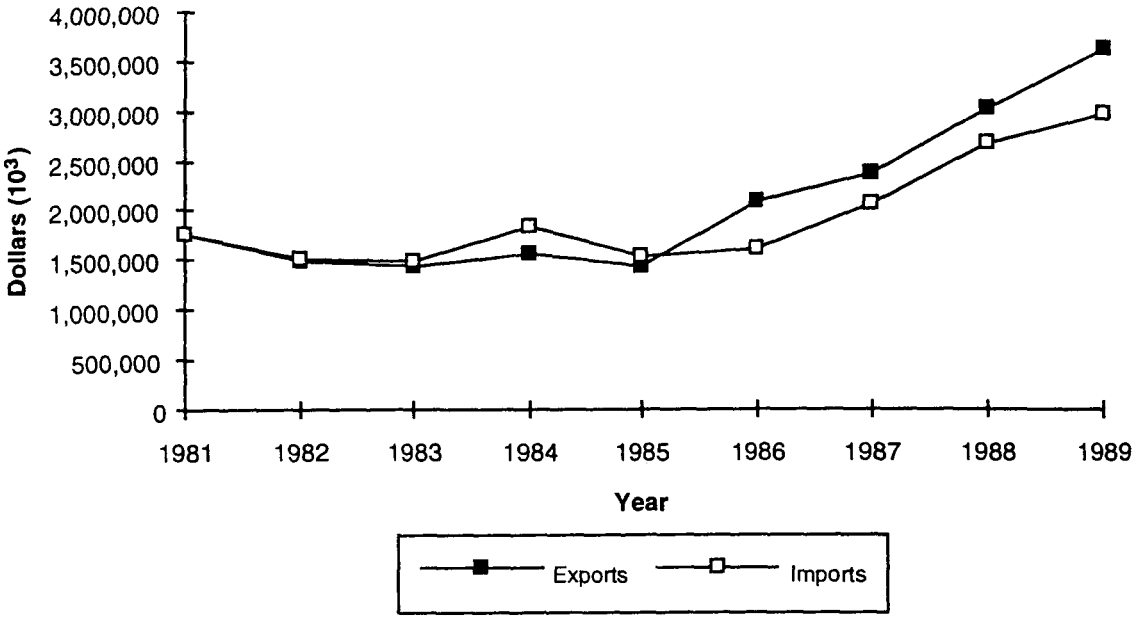

Figure A-5. U.S. foreign trade of market pulp: 1981-1989

TABLE A-5. FOREIGN TRADE OF PAPER PRODUCTS: 1981-1989[23, 24]

Year	Export Quantity Short Tons	Export Value (10^3)	Export Price/ Ton	Import Quantity Short Tons	Import Value (10^3)	Import Price/ Tons
Total Paper Products						
1981	1,008,409	846,775	839.71	7,716,284	3,247,846	420.91
1982	840,445	679,069	807.99	7,381,252	3,226,307	437.09
1983	773,760	599,557	774.86	8,189,498	3,428,868	418.69
1984	810,933	632,493	779.96	10,113,718	4,592,641	454.10
1985	779,000	594,337	762.95	10,637,427	4,906,913	461.29
1986	883,768	642,728	727.26	10,925,453	5,051,916	462.40
1987	921,419	776,226	842.42	11,765,207	5,768,703	490.32
1988	1,102,489	988,031	896.18	12,063,790	6,799,044	563.59
1989	1,465,752	1,233,526	841.57	11,814,260	6,900,798	584.11
Printing and Writing Paper						
1981	653,777	494,310	756.08	7,615,656	3,171,894	416.50
1982	554,274	325,423	587.12	7,294,771	3,157,203	432.80
1983	496,690	325,423	655.18	8,070,359	3,344,950	414.47
1984	509,723	353,889	694.28	9,937,922	4,469,714	449.76
1985	517,211	333,223	644.27	10,409,435	4,754,971	456.79
1986	582,909	379,825	651.60	10,616,810	4,862,153	457.97
1987	588,865	452,732	768.82	11,396,765	5,533,785	485.56
1988	714,503	608,521	851.67	11,661,032	6,518,760	559.02
1989	1,102,998	822,549	745.74	11,286,377	6,375,753	564.91
Packaging and Industrial Converting Paper						
1981	354,632	352,464	993.89	100,628	75,954	754.80
1982	286,171	296,971	1,037.74	86,481	69,104	799.07
1983	277,370	274,134	988.33	119,138	83,919	704.38
1984	301,210	278,604	924.95	175,796	122,927	699.26
1985	261,789	261,114	997.42	227,992	151,942	666.44
1986	300,859	262,903	873.84	308,643	189,763	614.83
1987	332,554	323,494	972.76	368,442	234,918	637.60
1988	387,986	379,510	978.15	402,758	280,284	695.91
1989	362,754	410,977	1,132.94	527,883	525,045	994.62

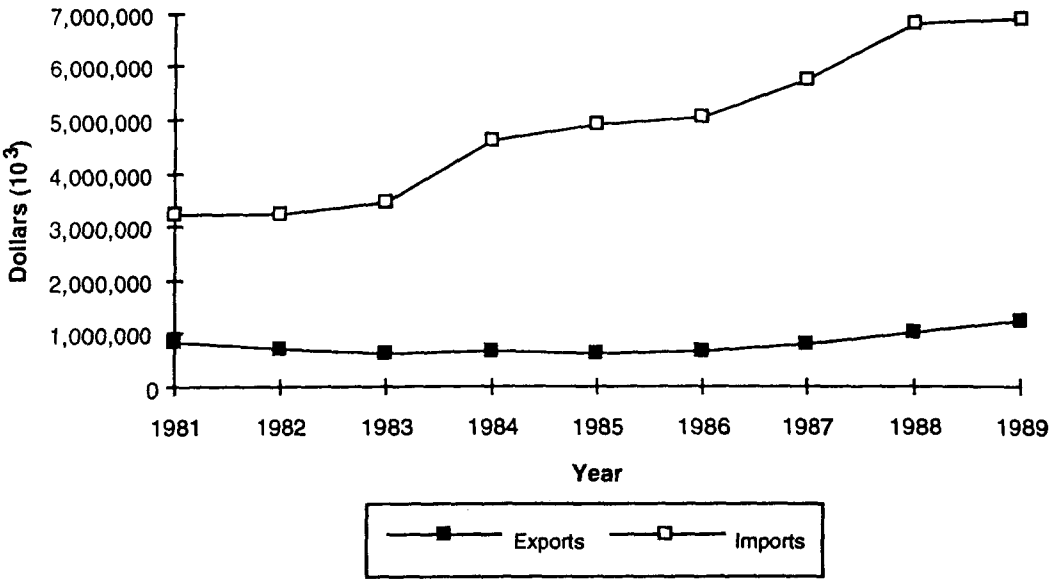

Figure A-6. U.S. foreign trade of paper products: 1981-1989

percent of the domestic value of printing and writing paper shipped. In 1989, major imports in the printing and writing group were newsprint and uncoated groundwood paper. Exports were led in this segment by newsprint and clay coated printing papers. In the packaging and industrial segment, imports were led by the glassine, greaseproof, and vegetable parchment product group. Shipping sack was the product exported in the largest quantity.[25]

Exports and imports of paperboard products for 1981 to 1989 are shown in Table A-6 and Figure A-7. As with pulp, the U.S. is a net exporter of these products, exporting $1.7 billion, or about 10 percent of the value of pulp shipments in 1989. Imports were $3.3 million, or less than 2 percent of the value of total pulp shipments. However, by 1989 imports increased by a greater percentage than exports over 1981 values. The total quantity exported in 1989 was almost 3.8 million tons: the main products were milk carton board and linerboard. Imports totaled 723,000 tons and were led by construction paper, unbleached kraft packaging and paperboard, recycled paperboard, and semichemical paperboard.[26]

TABLE A-6. FOREIGN TRADE OF PAPERBOARD PRODUCTS: 1981-1989[27, 28]

Year	Export Quantity Short Tons	Export Value (10^3)	Export Price/Ton	Import Quantity Short Tons	Import Value (10^3)	Import Price/ Tons
1981	3,025,579	1,233,162	407.58	528,658	114,041	215.72
1982	2,829,968	1,075,284	379.96	536,165	117,898	219.89
1983	3,210,777	1,118,478	348.35	645,069	153,424	237.84
1984	3,008,283	1,157,019	384.61	742,272	189,989	255.96
1985	2,801,547	991,898	354.05	600,667	167,600	279.02
1986	3,276,516	1,211,020	369.61	621,093	195,211	314.30
1987	3,657,633	1,504,195	411.25	670,279	226,419	337.80
1988	3,774,075	1,713,375	453.99	663,456	238,584	359.61
1989	3,793,982	1,749,159	461.04	723,211	330,851	457.48

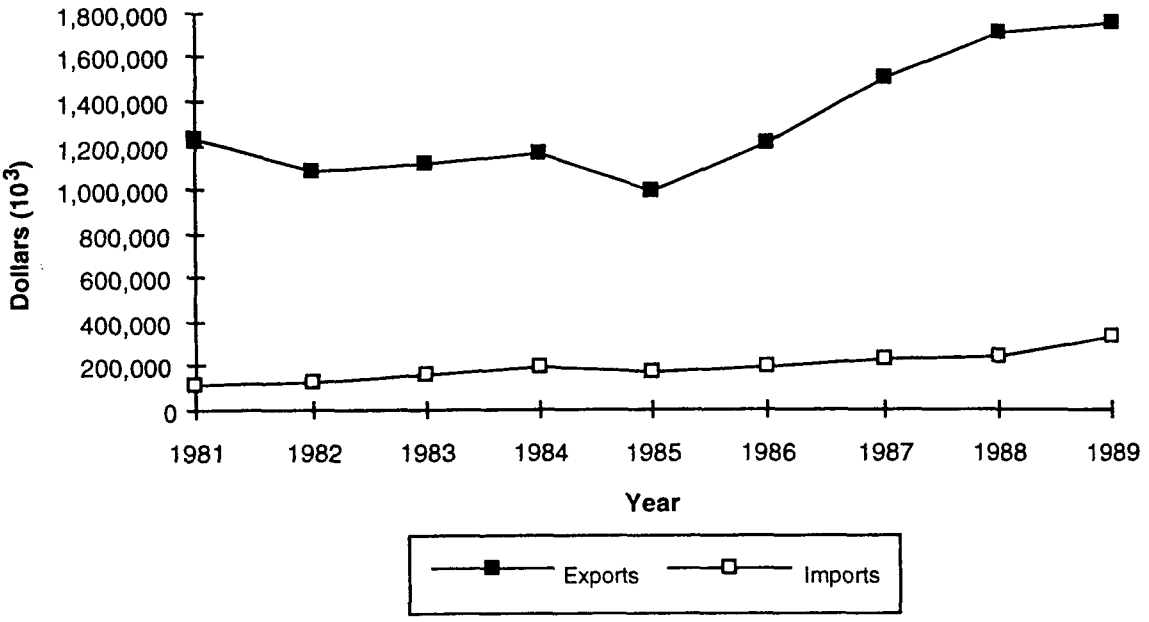

Figure A-7. U.S. foreign trade of paperboard products: 1981-1989.

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