Taking note of the paper industry

Consumer participation in recycling, improvements in technology, increased consumption of paper products, and liberalization of international trade together have had an enormous influence on employment in paper-related industries

Cynthia Engel

Paper is an indispensable component in the production, packaging, and delivery of a wide variety of products used daily by most Americans. For many it begins with breakfast. Most of us would be lost without our newspaper, coffee filters, napkins, cereal boxes, and milk and juice cartons. In some cases, our entire breakfast is baked, sold, reheated, and served in its original paperboard box.

Americans consume more paper than do the citizens of most countries. Compared with the 1994 world average of 97 pounds, the U.S. per capita consumption of paper is more than 700 pounds, approximately 2 pounds per person per day. Per capita consumption of paper products in the United States has grown 43 percent since 1980.[1]

Steady increases in paper consumption have had divergent impacts on employment in manufacturing production, in wholesale trade distribution, and in recycling collection. Employment in paper manufacturing, which historically has been volatile, has fluctuated less in recent years. Employment gains have been elusive, however, and 16,000 jobs have been lost, on net, since 1990.[2] At the same time, employment in recycling collection and paper distribution reflects a steady and increasing rate of growth. Increases in these jobs in recent history have far outweighed employment declines in paper manufacturing.

Employment is driven in part by changing regulations and consumer demands. New government regulations and an environmentally conscious population have required industry to use more recycled waste and to produce fewer contaminants in production. These changes have led to costly, but necessary, investments in new equipment. Improvements have been implemented with state-of-the-art technology, resulting in less labor-intensive employment. While increased productivity within paper manufacturing has allowed output to grow even in times when employment has not, recycling and exports have buoyed employment in the paper-related industries.

This article examines the changing market for paper, including the demand for recycled products and exports, and its effect on employment trends.

Types of paper

Paper manufacturers produce both paper and paperboard products. The designation "paper industry" generally refers to the production of both products. Paperboard is used to make items for the packaging of products, such as cardboard boxes, shipping containers for produce, and appliance containers. "Paper" may also identify the subgroup of products that excludes paperboard, such as newspaper, catalog paper, bond paper, tissue paper, and computer paper. In this article, the term will be used to identify the broader group, including both paper and paperboard products.

Paper products are classified according to content. Products with recycled content contain various amounts of recycled paper, with the balance

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made up of mill scraps, which often include virgin fiber. Other paper products contain only virgin fiber. To extract the cellulose, which makes up less than half of wood fiber,[3] lignin and other substances are removed. The remaining cellulose is then bleached, beaten, and rinsed, resulting in a pulp to be used for papermaking.

Recycling plants must purchase wastepaper rather than wood, repulp the fiber, and feed the pulp into an ink removal system. At this point, both virgin and recovered pulp go through the same processes.[4] The labor requirements for producing recycled fiber are similar to those for producing virgin fiber, although total costs of recycling are approximately 20 percent less.[5] Production using recycled paper takes less energy than production using virgin paper.[6]

The profitability of recycled products has caused some companies to replace pulp mills with deinking plants and to expand their use of recovered paper in existing mills. Companies are increasing domestic recycling capacity, as worldwide demand for recovered paper is expected to rise to 150 million tons by the year 2000, up from 110 million tons in 1993.[7]

Where the jobs are

Paper-related employment is scattered among several industry categories. The largest block of workers is involved in the manufacture of paper and allied products,[8] which employs 681,000, down slightly from its peak employment of 697,000 in 1990. The second-largest category of paper-related employment is in the paper and paper products component of wholesale trade, where 259,000 are employed in the distribution of paper products. Not included in the 259,000 are another 130,000 jobs in recycling activities undertaken by scrap material brokers and dealers, also found in wholesale trade. While a significant portion of these jobs are directly tied to paper recycling, others support metal or other material recycling. Scrap material brokers contract with those who actually collect wastepaper; these companies are primarily found in the refuse component of sanitary services (some portion of 156,000 jobs). This list does not exhaust all the remaining jobs that are hidden among the various categories of the Standard Industrial Classification structure: those employed in government transportation services, and those who produce the new equipment, chemicals, and processes to be used in the mills. However, when adding up an abbreviated list of categories, we find well over 1 million jobs supporting the consumption and production of paper in the United States.

Employment trends vary widely

Paper manufacturing. Employment has exhibited significant volatility in paper manufacturing over the last 20 years, with less fluctuation occurring recently. The growth in global markets, combined with production processes that require less human intervention, have contributed to greater stability in employment. Furthermore, the growth of exports has diversified the customer base of paper manufacturers.

As the following tabulation shows, recession-related reductions in the monthly industrial production index and employment in paper manufacturing reveal that recessions have become far less austere over the last two decades:

	Percent change in	
Recession	*Industrial production*	*Employment*
1973–75	–24	–12
1980	–6	–4
1981–82	–9	–6
1990–91	2	–2

In the 1973–75 recession, the industrial production index for paper dropped by 24 percent as employment dropped 12 percent, with employment losses regained by 1978. Subsequent recessions do not come close to the severity of this decline. Over the combined recessionary period in the early 1980s, production dropped by 8 percent, while employment fell by 7 percent. Employment recovered much more slowly than in the 1975 recession, taking twice as long to reach prerecession levels. In the 1990–91 recession, the production index increased, as export tonnage grew by 8 percent and employment fell by 2 percent. Fortunately, exports bolstered demand for producers, providing some protection from more dramatic losses.

Although production continues to follow the cyclical pattern of the economy, its vulnerability to domestic recession has been greatly reduced, and with this reduced vulnerability, employment has stabilized. (The declining nature of employment losses during recessions is shown in table 1.) Furthermore, as increasing amounts of capital are substituted for labor, employment declines in the current climate are not associated with reductions in demand.

While recessionary job losses occurred in paper and pulp mills, they were small compared with secular losses posted between 1990 and 1996. Postrecession losses did not reflect a reduction in demand; rather, they reflected technological improvements in the papermaking operation. Between the prerecession peak in 1990 and December of 1996, production increased by 12.6 percent, while employment declined by 1 percent. As computerization became more integral to production operations, mills became more capital-intensive and used less labor.

While manufacturing employment is declining overall, exports are adding jobs in paperboard containers and boxes, as exports of paperboard increased dramatically between 1990 and 1996. Employment also is increasing in wholesale trade and in sanitary services, outweighing losses in paper manufacturing. Employment trends in paper manufacturing have been more affected than those in other paper-related indus-

Table 1. Recession peaks and troughs in employment in paper manufacturing and related industries, 1973–96

[Numbers in thousands]

Industry	Standard Industrial Classification	Peak, March 1974	Trough, May 1975	Change	Peak, December 1979	Trough, July 1990	Change
Paper manufacturing	26	706	619	–87	698	673	–25
Pulp mills	261	15	13	–2	17	17	0
Paper mills	262	188	173	–15	181	177	–4
Paperboard mills	263	66	59	–7	66	64	–2
Paperboard containers	265	226	189	–37	212	200	–12
Miscellaneous converted paper	267	212	187	–25	223	215	–8
Paper distribution	511	116	115	–1	149	151	2
Scrap material distribution	5093		–	–	–	–	–
Sanitary services	495	39	39	0	49	50	1

	Standard Industrial Classsification	Peak, September 1981	Trough, December 1982	Change	Peak June 1990	Trough, June 1991	Change
Paper manufacturing	26	686	647	–39	698	685	–13
Pulp mills	261	17	15	–2	14	14	0
Paper mills	262	181	176	–5	180	180	0
Paperboard mills	263	64	60	–4	52	51	–1
Paperboard containers	265	202	188	–14	210	206	–4
Miscellaneous converted paper	267	222	209	–13	242	235	–7
Paper distribution	511	155	159	4	241	240	–1
Scrap material distribution	5093	–	77	–	111	110	–1
Sanitary services	495	52	53	1	114	122	8

	Standard Industrial Classification	Trough, June 1991	December 1996	Change
Paper manufacturing	26	685	679	–6
Pulp mills	261	14	12	–2
Paper mills	262	180	160	–20
Paperboard mills	263	51	49	–2
Paperboard containers	265	206	218	12
Miscellaneous converted paper	267	235	240	5
Paper distribution	511	240	261	21
Scrap material distribution	5093	110	129	19
Sanitary services	495	122	156	34

NOTE: Data are based on monthly, seasonally adjusted employment estimates, except in the cases of pulp mills and scrap material, in which employment does not display measurable seasonality. The peak and trough months used in this table are those specific to the paper manufacturing industry but related to official recessions.
Dash indicates data not available.

tries by changes in production methods and technology. In the other industries, jobs have increased steadily due to increases in recyclable consumption and in demand for paper products at retail outlets.

Paper-related wholesale trade. Unlike those in paper manufacturing, job levels in paper distribution have followed a relatively steady growth pattern. Employment in this category rose by 136 percent between 1972 and 1996, averaging annual growth of 6 percent. (See chart 1.) Since the last recession, employment grew by 9 percent in paper distribution, compared with 8 percent in wholesale trade, and 21,000 jobs were added between 1991 and 1996. Most of the growth occurred in the subcomponent, stationery and office supplies, which distributes computer paper, envelopes, business forms, and related supplies to an increasingly dispersed population.

Reflecting increased demand for recycled paper are jobs within the *scrap materials* subcomponent of wholesale trade.[9] Employment by establishments categorized under scrap and waste materials increased by 11 percent in 1995 as wastepaper prices soared, and maintained this gain in the weaker paper market of 1996. Between 1991 and 1996, employment rose a moderate 20 percent. (See chart 2.)

Sanitary services. Companies involved in the actual collection of scrap materials fall within the sanitary services industry. As recovery of recyclable materials has grown, so has employment in privately owned sanitary services collection. (Data are not available on employment in government-owned sanitary services, nor are specific data available on private sanitary service workers who are involved in paper recovery.) Employment growth was extremely rapid in the mid-80s, just as use of recycled paper became popular and was deemed a revenue-builder. Another growth spurt occurred between 1993 and 1995, when collection efforts were intensifying. The number of material recovery facilities (MRF) increased from 104 in

Chart 1. Employment in paper manufacturing and distribution, 1972–96

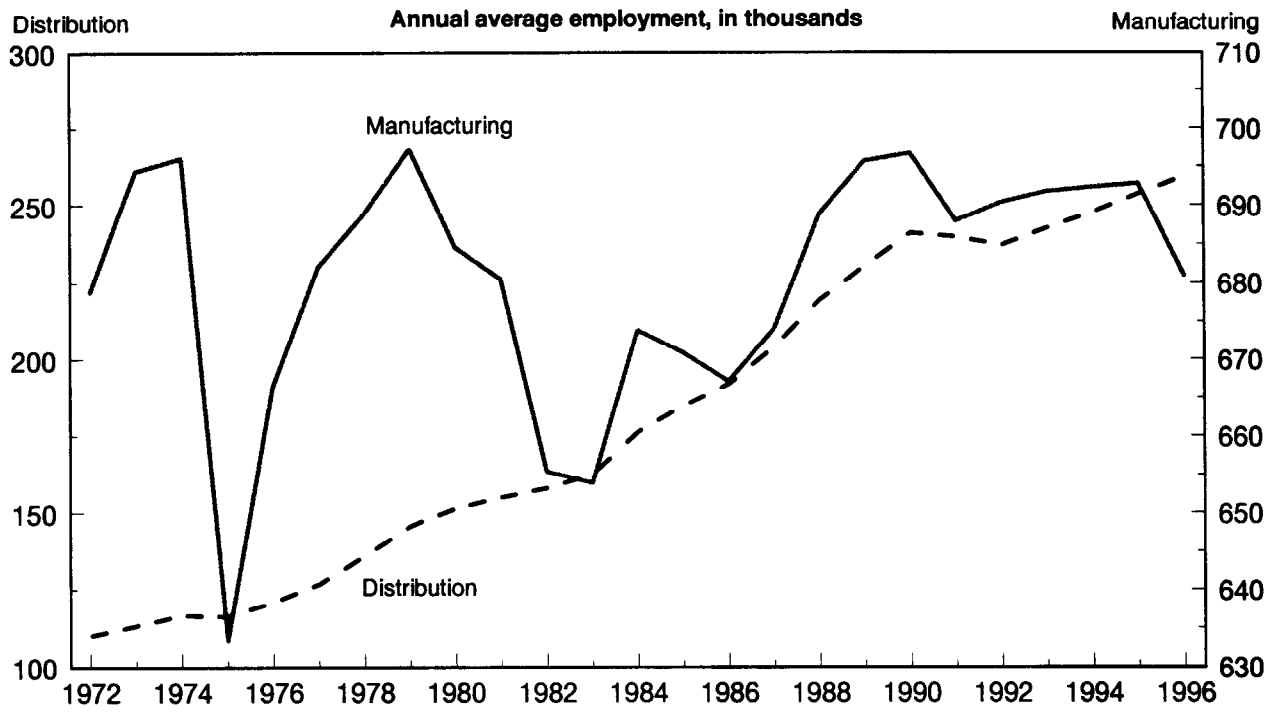
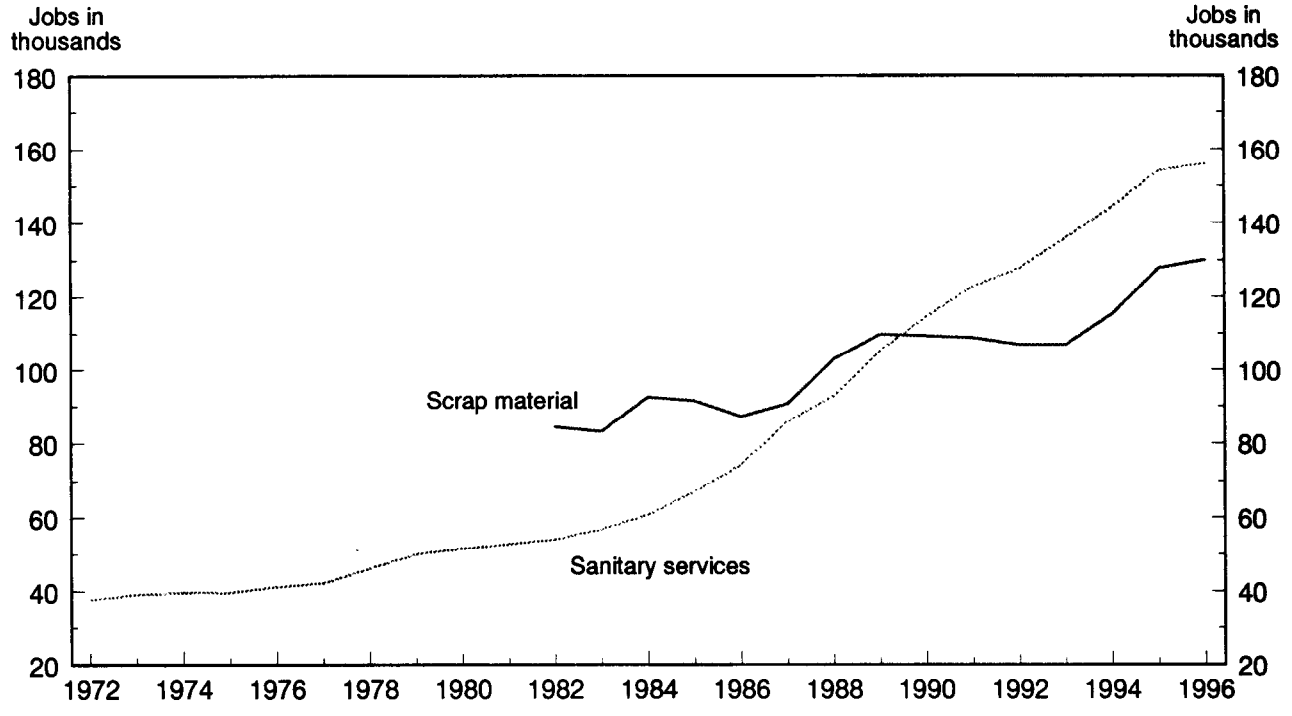


Chart 2. Employment in privately owned sanitary services and scrap material distribution, annual averages, 1972–96



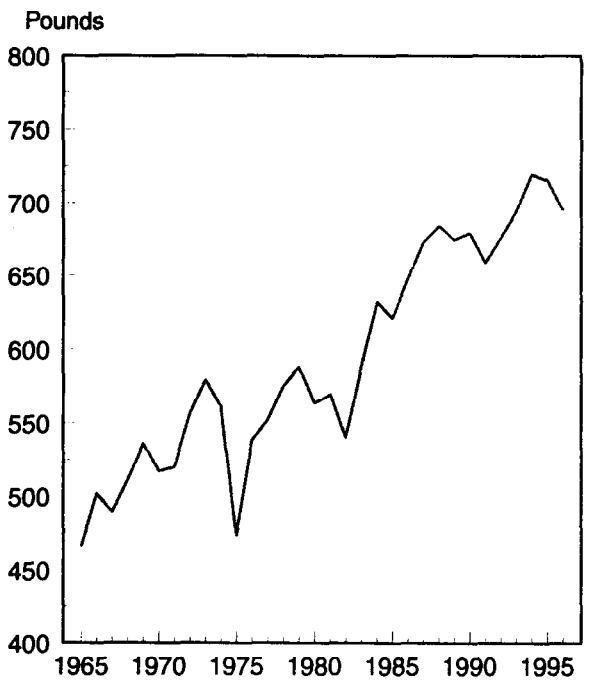
1991 to 386 in 1995.[10] Thirty-seven new projects are being planned for 1996–98, although they are smaller in size.[11] Because recycling facilities handle a variety of recyclable materials, the employment impact of paper recycling, as opposed to metal or plastic recycling, is unknown.

While material recovery facilities originally were concentrated in the Northeast, increasing paper demands have resulted in a nearly even distribution of these processing centers throughout the country.[12] Consequently, hiring is no longer restricted to urban environments. Municipal governments throughout the country are experiencing increased demands for haulers and sorters, especially as public ownership of processing facilities has increased since 1995.[13] Networks to collect, sort, and resell paper are continuing to expand.

Factors behind employment trends

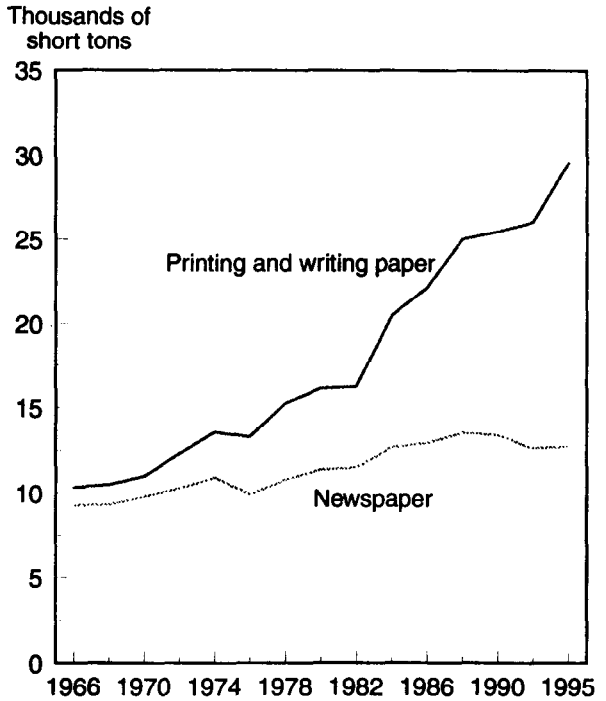
As we have seen, employment growth in paper manufacturing is cyclical, and has failed to return to previous peaks during recent recoveries. In contrast, the numbers of jobs in the other paper-related industries have grown in recent years. This section explores some factors behind these differing trends—the increasing demand for paper products in general, and for those with recycled content in particular, and productivity gains from new equipment installed, in part, to use wastepaper instead of wood and to meet new environmental standards.

Chart 3. **Per capita consumption of paper, 1965–96**



SOURCE: American Forest and Paper Association.

Chart 4. **Trends in the consumption of paper, 1966–95**



SOURCE: American Forest and Paper Association.

Changes in domestic demand for paper are primarily tied to changes in population and income growth. Increases in U.S. population and income were particularly strong between 1940 and 1970, followed by growth that was more subdued. While real economic growth has slowed, the information industry has transformed both our home and work lives, also stimulating greater per capita consumption of paper.

Growth in per capita consumption of paper has been averaging 2 percent a year over the last decade, with reductions in consumption coinciding with recessionary periods. (See chart 3.) Per capita consumption hit its peak in 1994, at 734.5 pounds, nearly 100 pounds more than in 1985. Consumption fell in 1995 and through 1996, as higher paper prices encouraged more efficient use. Between 1966 and 1996, consumption of paper (excluding paperboard) almost doubled.[14]

Growth linked to computers. Contrary to speculation that computers would transform the American workplace into a paperless environment, the opposite result has occurred. The increased availability of photocopiers, fax machines, and computers has resulted in a dramatic increase in the use of "office paper" over the last two decades. (See chart 4.) While the U.S. population grew 16 percent from 1972 to 1987, copier paper waste increased by 150 percent and other office paper waste by 87 percent.[15] This growing use is correlated with

tremendous growth in production output of printing and writing paper, the type of paper that is used in printers and fax machines. Since 1982, production of printing and writing paper has increased by 60 percent. While the use of electronic mail has displaced some paper usage, conventional wisdom among paper industry forecasters is that "for every ton of paper displaced by computers, there is more than one ton of new demand generated."[16]

Newspaper and book sales. While much of the growth in paper consumption is generated in the business sector, such as in direct-mail advertising, households also are large consumers, and many products are used by both home and office. Newspapers are a large consumption item for both, accounting for about 25 percent of all paper consumed in the United States (excluding paperboard).[17] Despite the growing popularity of the Internet, 1995 readership of daily newspapers outpaced levels recorded in the 1989–94 period, following a period of decline between 1970 and 1989.[18] The percent of American adults reading a Sunday newspaper also posted a record high in 1995, compared with the 1970–94 period. Clearly, newspapers are a popular medium, and newspaper advertising is more popular than any other form of advertising. Newspapers received 22.4 percent of all advertising dollars in 1995—more than broadcast TV and direct mail, with print-related advertising dominating over other media.[19]

Not only is newspaper circulation healthy, but book sales also are holding their own. Adults purchased 1 billion books in 1995, compared with 776 million in 1991, with most of the increase occurring between 1991 and 1994.[20] While most Americans report reading less, book sales have continued to grow. The Internet may be a substitute for some printed media, but its use also has encouraged sales, with books representing the commodity most frequently sold on the web after computer software. Not surprisingly, computer-related books are an increasing share of total sales, accounting for an additional 13 million books sold between 1991 and 1995.[21]

Furthermore, an increasing standard of living is associated with greater paper usage, as consumption of most products involves some paper content in packaging, labeling, and advertising. Increased consumption is not limited to our borders; as economies develop abroad, worldwide consumption of paper has increased.

A growing foreign market. The market for paper is growing throughout the world, causing U.S. paper exports to more than double between 1985 and 1996.[22] Growth in exports of recovered paper and printing and writing papers has been especially healthy.[23] Exports, in dollars, rose from 6 billion in 1991 to 10 billion in 1996, as tonnage increased by 45 percent. (See table 2.) This burgeoning demand has insulated paper industry workers from further layoffs.

Much of U.S. trade is with our partners in the North American Free Trade Agreement (NAFTA); 39 to 45 percent of our exports are sent to Canada and Mexico.[24] In 1994, the first full year after implementation of NAFTA, U.S. paper exports to those two countries increased by a combined 15.5 percent, on a tonnage basis. Exports to Mexico increased 33 percent between 1993 and 1996, and those to Canada, by 50 percent.[25] However, despite this rapid growth, the share of all paper exports sent to our NAFTA partners has remained relatively stable due to increased demand from other trading partners. Exports to the emerging markets—which are among the fastest growing economies—more than doubled between 1991 and 1996, and represented 8.4 percent of the total market for U.S. producers in 1996, nearly equal to paper exports to Japan. (See table 3.)

Exports that are correlated with economic growth abroad have stimulated expansion of the U.S. paper industry. More than 50 percent of the industry's growth between 1989 and 1995 was due to this factor.[26] Between 1990 and 1996, an average 11 percent of production was devoted to exports, compared with 6 percent in 1985. According to the American Forest and Paper Association, about 16 percent of total U.S. production went overseas in 1995, and approximately 42 percent of new capacity in the industry made products for export mar-

Table 2. Percent distribution of paper and paperboard exports to major markets, 1991–96

Percent of total exports]

Market	1991	1992	1993	1994	1995	1996
Canada	25.9	26.0	27.2	26.8	26.1	26.8
Mexico	13.2	15.7	16.6	17.8	13.2	17.8
Subtotal	39.1	41.6	43.8	44.6	39.3	44.6
Japan	8.5	8.4	9.2	8.8	9.4	8.4
Rest of world	52.4	49.9	47.0	46.6	51.3	47.0
Total exports, in thousands of dollars	$6,142,297	$6,525,643	$6,683,162	$7,711,798	$9,888,199	$10,233,752

SOURCE: U.S. Department of Commerce.

Table 3. Exports of paper and paperboard to emerging markets, 1991–96

[Thousands of dollars]

Market	1991	1992	1993	1994	1995	1996
Total	$377,280	$403,122	$382,598	$529,568	$842,337	$898,977
Korea	148,791	150,638	115,153	154,155	242,379	248,483
Taiwan	122,370	131,812	129,538	191,931	236,490	16,163
Brazil	55,679	64,265	70,416	105,266	197,137	245,409
Chile	40,767	40,966	43,436	55,812	99,576	101,857
Turkey	6,126	5,611	12,154	9,208	42,946	41,475
India	3,547	9,830	11,901	13,196	23,809	45,590

SOURCE: U.S. Department of Commerce.

kets.[27] Growth in exports has increased profits significantly for producers in the last couple of years, allowing them to pay down debt on extensive capital investments made in the late 80s and early 90s. New trade agreements are expected to further increase exports to other countries over the next decade.[28]

The factors explored thus far have addressed the demand for all types of paper products. However, undercurrents of a very different type also resulted in profound changes in the industry over last few decades: the demand that paper products be made, at least in part, with recycled materials was growing at the same time that the supply of wastepaper was exploding. Further, there became available new technology that reduced the cost of manufacturing from wastepaper below the cost of a wood-based process for many products. These developments set the stage for job growth in the collection and brokerage of wastepaper.

Recycling—a grassroots movement. Support for recycling arose from citizens' firm refusals to increase landfill space to contain waste. Environmentalists and waste managers recognized that the major source of landfill waste was paper products,[29] and pressured industry and government to support recycling. While industry had recognized recycled paper as a market niche, increasing demands by the public, coupled with the prospect of greater profits, ensured expansion of this new market.

As technology within paper plants was being replaced to meet cleaner air requirements, the quality of recycled paper products also was being improved, contributing to consumer acceptance of recycled goods. Manufacturers developed processes to incorporate more recycled content in paper while retaining its quality, almost doubling their use of recovered paper between 1985 and 1995.[30] Perhaps unnoticed by end-users, consumption of recycled products has soared. Use of recycled paperboard[31] is a prime example, having grown 40 percent since 1990 and accounting for 13 percent of paperboard consumption in 1995. Consumption of recycled products also has increased through private sector initiatives and alliances with nonprofit groups.[32] Government agencies are expanding their consumption of recycled products as well.

At every level of government, initiatives have increased the purchase of recycled paper. In 1986, only 13 States and few local governments had any "buy-recycled" policy. Currently, all 50 States, the District of Columbia, and more than 200 local governments have recycling initiatives in place. Most common are general policies favoring recycled products, set-asides or goals, or a stated price preference for recycled products. There are a few "recycled-only" programs.[33] At the Federal level, the President signed an executive order in 1993 requiring agencies to use recycled products, although minimum requirements on recycled content have been eased for some products. This directed consumption will continue to fuel more investments in research and development to further increase the quality of recycled products.

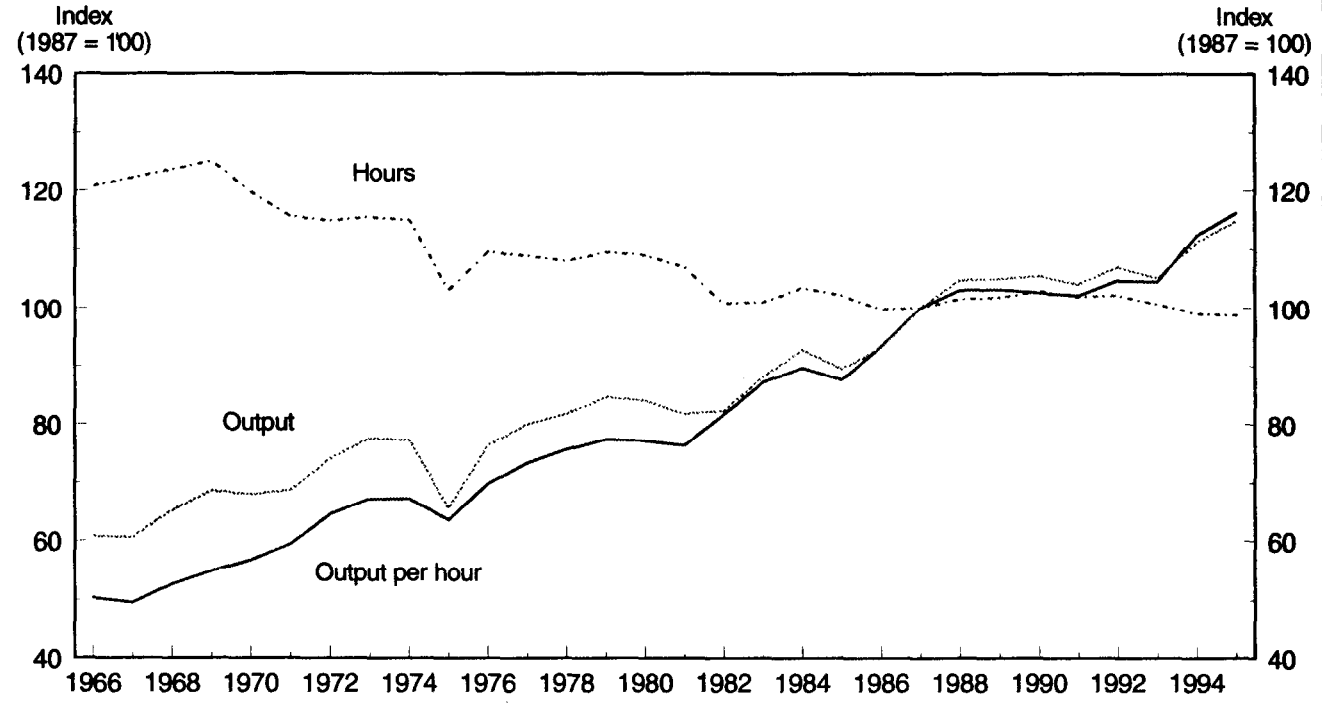
A larger, more reliable supply of materials also encourages manufacturers to incorporate recycled paper in production. While manufacturers routinely recycle waste from papermaking processes, consumers are more involved in supplying waste paper, driving the affordability of recycling systems. The incidence of paper recovery is rising, with an all-time high of 44.8 percent collected in 1996 and expectations of increasing recovery rates in the future.[34] According to an annual *BioCycle* survey,[35] the number of curbside recycling programs increased from about 1,000 in 1988 to 7,265 in 1994, serving about 41 percent of the population in the latter year.

Table 4. Paper manufacturing machines installed or rebuilt as a percent of 1995 capital stock, versus capital expenditures by paper and paperboard mills, 1983–95

Year	Total machines installed or rebuilt (percent)	Recycling machines installed or rebuilt (percent)	Expenditures for environmental protection at mills (millions of dollars)	Expenditures on new plant and equipment (millions of dollars)
1995	25	9	$619[1]	–
1994	26	8	721	$7,312
1993	18	5	737	7,950
1992	27	11	1,048	7,950
1991	36	3	1,343	9,009
1990	55	7	1,292	10,809
1989	49	9	1,039	10,067
1988	56	3	572	7,211
1987	31	4	403	5,753
1986	43	3	237	6,084
1985	38	4	342	6,273
1984	24	3	226	5,302
1983	20	3	327	4,987

[1] Data are preliminary.
NOTE: Dash indicates data not available.
SOURCE: Sample of the American Forest and Paper Association. Expenditure data are from the Census Bureau and from the National Council of the Paper Industry for Air and Stream Improvement.

Chart 5. **Indexes of output and hours in pulp, paper, and paperboard mills, 1966–95**



NOTE: Reflects the mills that manufacture the raw input for paper items produced by other components of paper manufacturing.

New equipment and productivity. The growth in the demand for paper has led to large gains in output and has prevented steep job losses in manufacturing following the introduction of less labor-intensive equipment. Expenditures on new plant and equipment by establishments involved in the manufacture of paper products peaked in 1990 and remain higher than expenditures in the 1980s, as capital improvements have increased over the last decade. (See table 4.) Measured in real terms, average dollar expenditures for new capital in the period 1989–94 also are slightly higher than in the prior 5-year period, with 1989 and 1990 standing out as the strongest years for new investments. Although the number of machines installed or rebuilt has been declining since 1988, there has been new growth in recycling equipment.[36] Because recycling mills can be installed on a smaller scale and at a lower capital cost per ton of output than can virgin pulp mills, these facilities could better support incremental expansions in the industry, especially following a period of capital stock replenishment.[37] Demands for a cleaner environment also have contributed to more rapid replacement of equipment in the industry, likely improving productive efficiency.

The increased use of recycling equipment also carries productive efficiencies, compared with the use of wood fiber. Most grades of recycled paper appear to use less energy in production and produce less air pollution, although some grades require more purchased electricity.[38] According to one study, recycling 1 ton of materials in a typical curbside recycling program can save at least $183 worth of electricity, after deducting the cost of transportation to collect the materials.[39] Many types of paper are produced less expensively using recycled content, while most use some virgin fiber.[40]

Furthermore, using recovered paper can provide more flexibility in production. Imbalances in the supply of wood pulp are easily corrected for if manufacturers have the ability to substitute recovered paper. While recovered paper has a limited number of "lives" and is used in small quantities in most products, it can be recycled 5 to 8 times. As a result, manufacturers are using more of this resource. Use of recycled paper is forecast to increase as mill capacity for recovered pulp more than doubles between 1994 and 1998.[41] Lower energy costs, lower raw material costs, and lower labor costs per ton of output have resulted in a more efficient industry.

An increasing amount of output was produced in mills, with hours worked declining, between 1966 and 1995. (See chart 5.) Thus, labor productivity, as measured by output per hour, more than doubled over this period; the gains were not steady, but followed business cycle movements. Productivity gains over the period in pulp, paper, and paperboard mills were

greater, on average (4.5 percent per year), than in paper industry components that used the output of these mills (folding paperboard boxes, 2.6 percent; corrugated solid fiber boxes, 3.8 percent; paper and plastic bags, 1.2 percent).

THE CONFLUENCE OF CONSUMER PARTICIPATION in recycling, improvements in technology, increased consumption of paper products, and liberalization of trade have had an enormous influence on employment in paper-related industries. Technological changes, while costly, have facilitated increased output of recycled products as improvements in efficiency and output quality are attained. □

Footnotes

[1] "1996 Statistics. Data through 1995" (American Forest and Paper Association, November 1996), p. 2.

[2] Employment data are from the Current Employment Statistics survey and appear in various issues of *Employment, Hours, and Earnings*. Data are expressed in annual averages unless otherwise noted.

[3] See *Paper Task Force Report* (at p. 172), a voluntary, private-sector initiative sponsored by the Environmental Defense Fund, which developed recommendations for purchasing paper that reduce environmental impact while meeting business needs.

[4] American Museum of Papermaking.

[5] *Technology and Labor in Pulp, Paper, Paperboard, and Selected Converted Industries*, Bulletin 2443 (Bureau of Labor Statistics, June 1994), p. 3.

[6] Using recycled newspapers from an average residential recycling program saved 11.4 million BTU per ton of material compared to using virgin materials, according to *The Role of Recycling in Integrated Solid Waste Management to the Year 2000* (Stamford, CT, Franklin Associates, Ltd. for Keep America Beautiful, Inc., September 1994), pp. 6–12, appendix I–49.

[7] "What's the Outlook for Paper?" *Biocycle*, June 96, pp. 78–80.

[8] SIC 261 manufactures pulp, SIC 262 manufactures paper, and SIC 263 produces paperboard. SIC 265 produces paperboard containers and boxes from purchased paperboard. SIC 267 produces various forms of converted paper products, such as sanitary paper products, paper and plastic bags, coated laminated paper, and others, from purchased paper and paperboard.

[9] Recycling is a large component of SIC 5093, but this category includes metals and minerals as well as other scrap materials.

[10] "MRF Growth was substantial in 1995," *World Wastes*, February 1996, p.6

[11] "Materials recovery facilities: A 1996 Update," *Biocycle*, August 1996, pp. 83–84

[12] *Ibid.*, p. 83.

[13] *Ibid.*, p. 84.

[14] "1996 Statistics. Data through 1995"; and monthly statistical summaries of the American Forest and Paper Association.

[15] *Source Reduction. It's a Bare Necessity*, (North Carolina Recycling Association and North Carolina Office of Waste Reduction, 1995), p. 46.

[16] *RISI Long-Term Pulp and Paper Review* (Bedford, MA, Resource Information Systems, Inc., July 1995), p. 52.

[17] According to "1996 Statistics," production of newsprint is also growing. In 1980, we produced approximately 40 percent of newsprint consumed, while today we are producing over one-half.

[18] More efficient use of paper by publishers may explain growing circulation coincident to reductions in the tonnage of newsprint consumed.

[19] According to data compiled by McCann-Erickson, a prominent research and information consulting firm in the advertising industry, the print-related share of advertising expenditures has ranged from 56.5 percent in 1980 to 57.2 percent in 1994.

[20] " In so Many Words; How Technology Reshapes the Reading Habit," *American Demographics*, March 1997. □

[21] *Ibid.*

[22] "1996 Statistics, " p. 2; and U.S. Department of Commerce, *National Trade Data Bank*.

[23] "Global Growth in U.S. Pulp and Paper Exports," *American Papermaker*, June 1995; and "1995 Statistics," p. 81.

[24] "'95 another banner year for exports," *Journal of Commerce Special Report*, Mar. 11, 1996.

[25] Measured by product value, not tons. Data are from U.S. Department of Commerce, *National Trade Data Bank*.

[26] "Exports Fuel Paper Firms' Sales," *Investors Business Daily*, Mar. 15, 1995, p. A3.

[27] "Global Growth in U.S. Pulp and Paper Exports," *American Papermaker*, June 1995, pp. 43–49.

[28] Market barriers should be gradually reduced over this period as the result of the General Agreement on Tariffs and Trade (most recently, the Uruguay Round), NAFTA, , and the USA-Japan Paper Agreement.

[29] According to the U.S. Environmental Protection Agency, paper and paper products accounted for 37.6 percent of landfill waste in 1993.

[30] See the 1995 and 1996 data summaries of the American Forest and Paper Association, p. 57.

[31] The most important uses for recycled paperboard are folding cartons, corrugated containers, paper tubes, wallboard facings, book covers and binders, and insulation board. See "Recycled paperboard: market pricing reacts to weaker demand and lower wastepaper costs," *Pulp and Paper*, vol. 70, no. 6, p. 13.

[32] The Environmental Defense Fund developed a task force including institutions such as Duke University, Johnson & Johnson, NationsBank Corporation, McDonald's, the Prudential Insurance Co., and Time, Inc., which together purchase more than $1 billion in printing and writing papers and share the common goal of finding ways to use environmentally preferable paper.

[33] "Buying Recycled: Investing Dollars to Close the Loop," *World Wastes*, January 1994, p. 38.

[34] "Banner Year for Paper Recovery at U.S. Mills," *Biocycle*, August 1997, p.11.

[35] Published since 1960, *Biocycle* is a prominent magazine on composting and recycling.

[36] "1995 Statistics. Data through 1994" (American Forest and Paper Association, September 1995), p. 66

[37] *Paper Task Force Report*.

[38] *Paper Task Force Report*, table A-1–A-5. Most grades show a significant savings in energy used in production compared to virgin manufacturing processes.

[39] According to "Advantage Recycle: Assessing the Full Costs and Benefits of Curbside Recycling," a report by the Environmental Defense Fund, 31 percent of the savings was attributable to newspaper versus other recyclable products.

[40] See *Paper Task Force Report*, ch. 3, p. 68. Refers to linerboard, corrugating medium, newsprint, specialty uncoated printing and writing paper, among others. However, unsorted office paper is an example of one type which is more costly to produce using recycled pulp.

[41] "What's the Outlook for Paper?" *Biocycle*, June 1996, vol. 37, no. 6, pp. 78–80.