



CFRA

Industry Surveys

Paper & Paper Packaging

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NEW THEMES



What's Changed: While corrugated box shipments remain strong, old corrugated container (OCC) prices declined more than 21% year-over-year due to weakening demand and oversupply. More on this on page 19.



What's Changed: After a quick recovery in the second half of 2021, lumber prices softened again. The quick reversal of lumber prices resulted from several factors – head to page 20 for details.



What's Changed: CFRA expects the housing market to start losing steam for the remainder of 2022 and 2023. Read about how it affects the Paper & Paper Packaging Industry from page 22 onwards.

EXECUTIVE SUMMARY

CFRA has a neutral outlook on the paper & forest products industry and the paper packaging sub-industry. Here are some of the key themes to watch for in 2022.

Housing Market Cools (and Lumber Prices Fall) Amid Surging Mortgage Rates

Affordability has been a major risk to the health of the housing market. The surge in mortgage rates has eliminated many American families (that were potential buyers) from the market. In the second quarter of 2022, strong demand, low inventory, and soaring interest rates by the Fed resulted in increased mortgage rates and plunged housing affordability (as measured by the NAHB/Wells Fargo Housing Opportunity Index) to its lowest level in a decade. Although housing starts in August 2022 remained flat, the residential building permits (a leading indicator) decreased year-over-year by 14%.

After a quick recovery in lumber prices in the second half of 2021, the downward trend took place yet again for lumber prices and continued through August 2022, where the price sank to \$484, a peak-to-trough decline of 64%.

Despite the recent slowdown in mortgage applications, CFRA thinks there is significant pent-up demand for new household formations as the millennial generation continues to transition to home ownership, which could drive a multiyear boom for home building, once the economy emerges from the current rate-tightening cycle. The health of the U.S. housing market is crucial to paper and forest product companies, and investors need to keep an eye on leading indicators, such as starts and permits.

An Evolving Consumer is a Boon for Paper Packaging

Major consumer trends (such as sustainability, convenience, and e-commerce) create new growth opportunities for the paper packaging sub-industry. CFRA expects the strong growth in e-commerce to be a long-term tailwind for box demand (and other paper packaging products). E-commerce is changing the packaging landscape, as companies must focus on the unboxing experience, counterfeiting measures, optimizing last-mile delivery, and product safety.

Paper is generally the preferred packaging material in e-commerce deliveries, and paperboard packaging is making inroads with sustainability, given that these products are mostly recyclable and compostable, as they utilize a significant amount of renewable wood fiber. Consumer disdain towards plastic packaging appears to be gaining momentum, and this will likely benefit paper packaging demand.

As demand increases for ready-to-eat food items, the packaging market must continue to innovate and provide better packaging material. CFRA expects this trend to provide modest growth opportunities in corrugated board packaging markets.

Evolving Market Segments Present New Growth Opportunities

Although graphic papers (such as newsprint) continue to face secular declines due to digitalization, the industry overall continues to grow, albeit at a slower pace than in previous decades. The industry has been proactive with machine conversions from uncoated freesheet to packaging and specialty papers. We expect consumer packaging and tissue demand to grow in line with global GDP. Industrial packaging and transportation end markets should continue to experience significant growth, driven mostly by demand from e-commerce. In 2021, North American corrugated products shipments increased 2.8% year-over-year, while the industry's production increased 5.6% year-over-year; containerboard export shipments increased 9.9% year-over-year.

PAPER & PAPER PACKAGING

Outlook: Neutral

BY THE NUMBERS

MARKET CAP BREAKDOWN*

RANK NO.	COMPANY NAME	MARKET CAP (\$ billion)
1	Weyerhaeuser	20.5
2	Amcor	15.9
3	Avery Dennison	13.3
4	International Paper	11.6
5	Packaging Corporation	10.6
	Others*	36.6

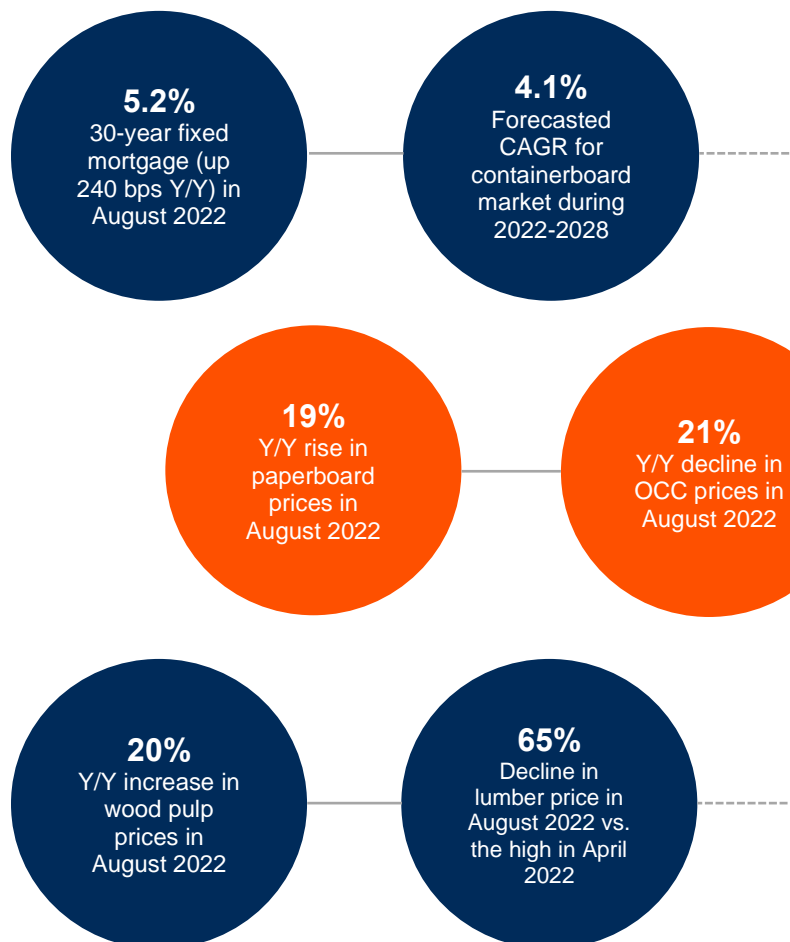
Market cap as of September 30, 2022.

Source: CFRA, S&P Global Market Intelligence.

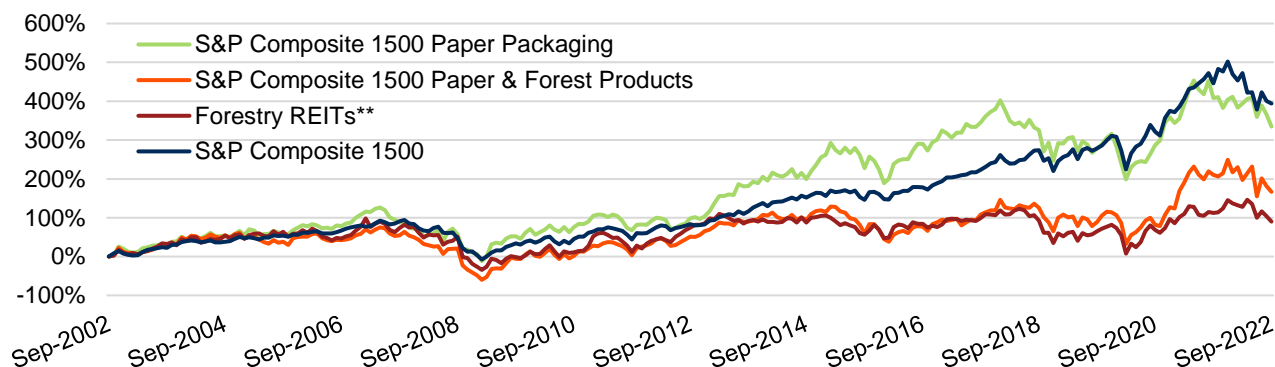
*Refer to the Comparative Company Analysis section of this survey for other companies in the industry.

ETF FOCUS

XLB Materials Select Sector SPDR	AUM (\$M) 5,717.0	Expense Ratio 0.12
WOOD iShares Global Timber & Forestry	AUM (\$M) 252.5	Expense Ratio 0.43
CUT Invesco MSCI Global Timber	AUM (\$M) 72.1	Expense Ratio 0.61



20 YEAR PRICE PERFORMANCE



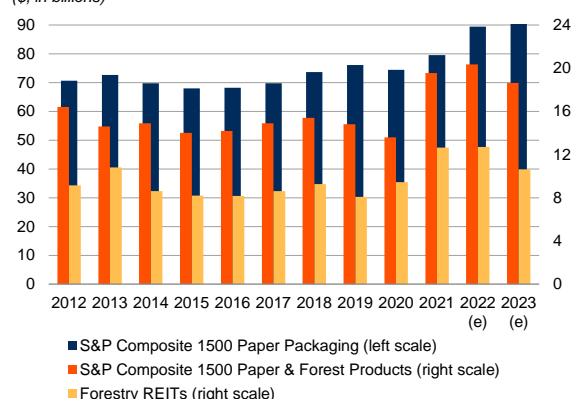
**Refer to Comparative Company Analysis table for the constituents of Forestry REITs

Source: CFRA, S&P Global Market Intelligence.

FINANCIAL METRICS

Revenue

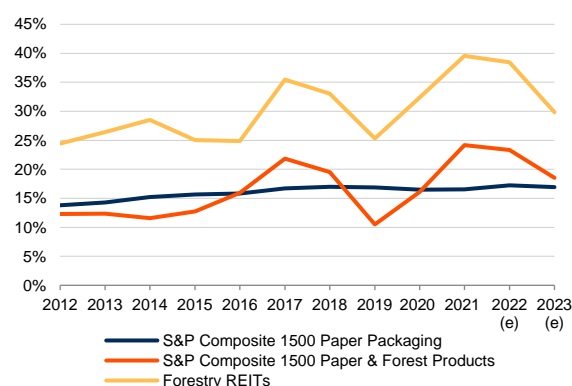
(\$, in billions)



Source: CFRA, S&P Global Market Intelligence.

- ◆ Revenue for Paper & Forest Products surged 24.7% in 2021 following a rebound in economic activity and an increase in pulp prices. We expect growth to stabilize in 2022 due to higher base comparisons in 2021 amid continued strength in volume and pricing for oriented strand board (OSB).
- ◆ Paper Packaging revenue rebounded with 6.9% growth in 2021 following the economic rebound. Demand for uncoated freesheet paper has mostly recovered due to increased demand from businesses and schools following the high vaccination rates worldwide. Strong demand for cardboard boxes should remain a tailwind in 2022 and 2023.
- ◆ Revenue for Forestry REITs grew 34.1% in 2021, driven primarily by stronger log prices and the strong housing market. We expect revenue growth to remain flat in 2022 before falling by 16.4% in 2023 as lumber prices start to decline. Soaring interest rates and fear of recession further exacerbate the housing market.

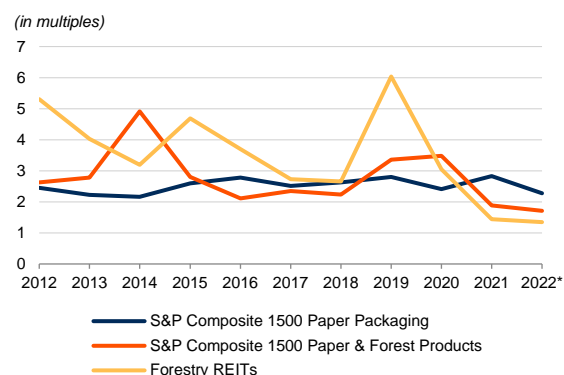
EBITDA Margin



Source: CFRA, S&P Global Market Intelligence.

- ◆ EBITDA margin for Paper & Forest Products increased to 24.2% in 2021, as higher sales and operating efficiency gains drove margin expansion. We expect EBITDA margin to contract by around 90 bps in 2022 before an even larger contraction of 480 bps in 2023 amid lingering inflation and shortages in raw materials.
- ◆ Paper Packaging's EBITDA margin remained flat in 2021 at 16.5%. We project the margin to expand by 70 bps in 2022 (from higher pricing and volume) before contracting by 30 bps in 2023.
- ◆ EBITDA margin for Forestry REITs increased to 39.6% in 2021 from 32.4% in 2020 due to higher revenue and rising demand for housing. We expect the margin to decrease to 38.5% in 2022 and 29.8% in 2023 as lower lumber prices shift from a tailwind to a headwind.

Net Debt-to-EBITDA



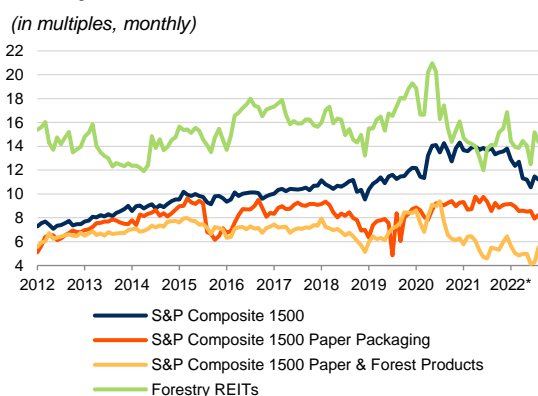
*Twelve months through Q2 2022.
Source: CFRA, S&P Global Market Intelligence.

- ◆ The financial leverage ratios of each relative sub-industry of the S&P Composite 1500 were as follows:

	<u>Q2</u> <u>2022</u>	<u>10-year</u> <u>average</u>
Paper & Forest Products	1.7x	2.8x
Paper Packaging	2.3x	2.5x
Forestry REITs	1.3x	3.3x

- ◆ CFRA expects balance sheets to remain strong in 2023 despite risks of a global recession, as most companies in these industries benefit from strong and stable cash flow.

Enterprise Value-to-Forward EBITDA Ratio

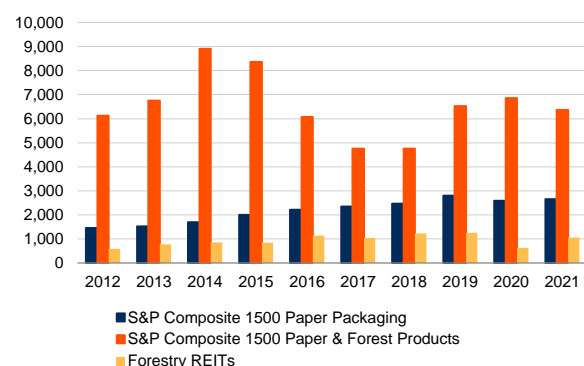


*Data through August.
Source: CFRA, S&P Global Market Intelligence.

- ◆ The EV/EBITDA multiple for the paper packaging sub-industry has recovered from a slump in 2018. However, this sub-industry traded at a discount of 24.3% to the S&P Composite 1500 in the second quarter of 2022.
- ◆ As of the second quarter of 2022, paper & forest products companies traded at a steep 58.4% discount to the S&P Composite 1500, as these companies' valuation has yet to recovery from the Covid-19 pandemic affecting markets with highly cyclical earnings streams.
- ◆ Forestry REITs are valued at a 23.9% premium to the S&P 1500. This sub-industry historically has traded at a large premium given its robust free cash flow generation and relative stability.

Total Dividends Paid

(\$, millions)

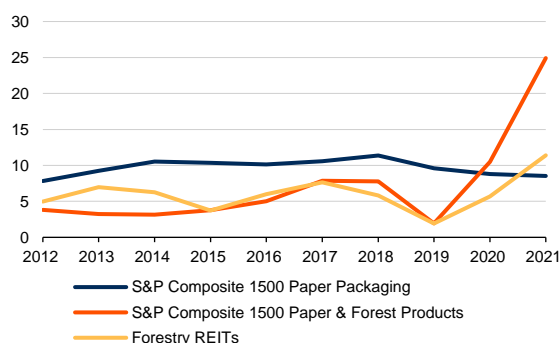


Source: CFRA, S&P Global Market Intelligence.

- ◆ Dividends per share for all three peer groups have grown at a strong pace from 2010 through 2019 but were met with an unexpected economic downturn brought by Covid-19, resulting in lower dividends paid in 2020 for both Paper Packaging and Forestry REITs and lower dividends in 2021 for Paper & Forest Products. The 10-year compound annual growth rate (CAGR) for each sub-industry were: Paper & Forest Products at 0.4%; Paper Packaging at 6.9%; and Forestry REITs at 6.6%.
- ◆ Dividend cuts in 2020 and 2021 were made proactively and in response to economic risk related to Covid-19.
- ◆ Dividend growth has regained momentum due to the economic rebound driven by the growing vaccine coverage. We expect modest dividend growth in 2022, followed by mostly flat dividends in 2023 amid ongoing inflation and risks of a recession.

Return on Capital (ROC)

(in percent)



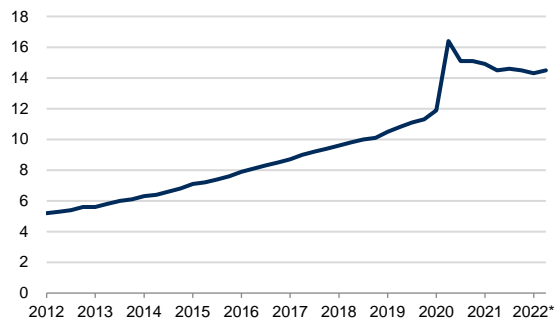
*Last twelve months through December 2021.
Source: CFRA, S&P Global Market Intelligence.

- ◆ The 10-year average ROC is highest in the Paper Packaging Index at 9.7%, followed by Paper and Forest Products (7.2%) and Forestry REITs (6.0%).
- ◆ Within the Paper & Forest Products sub-industry, Louisiana-Pacific Corporation saw the largest improvement in ROC (but it was volatile), contributing to the overall jump in industry ROC. Louisiana-Pacific's ROC increased to 70.1% in 2021 from 27.5% in 2020, driven mostly by the strong housing market and a significant increase in OSB pricing.
- ◆ Forestry REITs saw a sharp recovery in ROC to 11.4% in 2021, from 5.7% in 2020, mostly due to the strong increase in lumber prices. In 2022, however, we note that lumber prices have been decreasing, which will impair 2022 and 2023 ROC.

KEY INDUSTRY DRIVERS

E-commerce Retail Sales as a Percent of Total Sales

(in percent, seasonally adjusted, quarterly)

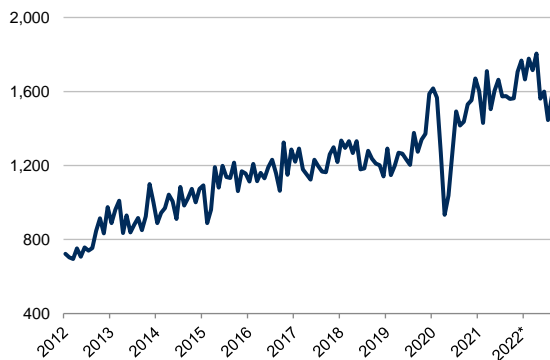


*Data through second quarter.
Source: U.S. Census Bureau.

- ◆ E-commerce retail sales growth continues to outpace total retail sales growth, a trend we see as sustainable for at least the next five years. U.S. retail e-commerce sales grew 23.9% in 2020 and experienced a peak in the second quarter of 2020. CFRA attributes this aggressive shift in shopping patterns to Covid-19-related lockdowns, where physical stores were forced to close, driving consumers to online shopping platforms.
- ◆ In the second quarter of 2022, the share of retail sales for e-commerce remained strong and significantly higher compared to the pre-pandemic levels despite the economy fully reopening. This shows that online shopping remains the shopping method of choice for many consumers.
- ◆ We see this trend continuing to drive growth in the containerboard and paper packaging market.

Housing Starts

(seasonally adjusted annual rate, in thousands)

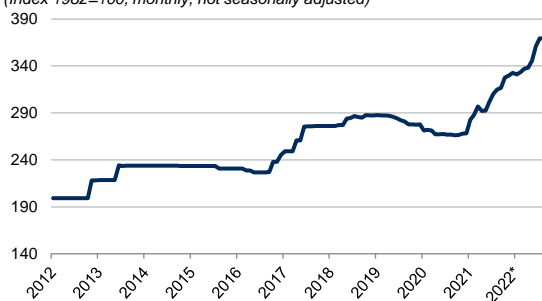


*Data through August.
Source: U.S. Census Bureau

- ◆ The housing market is an important source of demand for the forest products business.
- ◆ Before Covid-19, housing data indicated residential construction may start to break out of a prolonged slump. Although Covid-19 led to a decline in housing starts, U.S. housing demonstrated its resiliency, and housing starts bounced back quickly.
- ◆ U.S. residential starts remained flat in August 2022 compared to the prior year period, while building permits, a proxy for future construction, declined 14.4% year-over-year to 1.77 million, according to the Census Bureau.
- ◆ With mortgage rates soaring and house affordability worsening, we think the underlying demand for new household formation will slowly lose support. On top of that, fear of recession exacerbates the housing market condition.

Containerboard Producer Price Index (PPI)

(Index 1982=100, monthly, not seasonally adjusted)

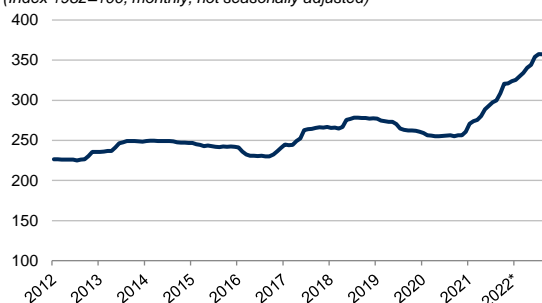


*Data through August.
Source: Bureau of Labor Statistics.

- ◆ Containerboard prices have surged since the pandemic. In August 2022, containerboard prices surged 17% compared to the same period in 2021. We forecast the containerboard market to grow at a CAGR of 4.1% during the 2022-2028 period to around \$198 billion.
- ◆ A key driver is the booming e-commerce market, leading to increased product shipments.
- ◆ Another key driver is the strong growth in demand for ready-to-eat and packaged foods.

Paperboard PPI

(Index 1982=100, monthly, not seasonally adjusted)



*Data through August.
Source: Bureau of Labor Statistics.

- ◆ In August 2022, paperboard prices rose by 19.1% year-over-year, as the price of pulp, a key raw material, surged 19% during the same period, reaching a new record high.
- ◆ The wood pulp inventories have gradually declined since 2021. On top of that, the Ukraine-Russia war has disrupted the supply of pulp, increasing the severity of supply shortages and propelling pulp prices up even more as demand remains strong.

Old Corrugated Containers (OCC) PPI

(Index Jun 2006=100, monthly, not seasonally adjusted)



*Data through August.
Source: Bureau of Labor Statistics.

- ◆ China, the largest importer of U.S. OCC exports, implemented strict import policies on recovered paper in 2018, which caused domestic and export prices for OCC to fall.
- ◆ After surging 138.9% year-over-year in October 2021, the OCC pricing has gradually declined since October 2021 peak and has weakened considerably in recent months. In August 2022, OCC pricing was down 21.2% year-over-year compared to the same period in 2021. The deterioration was mainly attributable to weakening demand and oversupply.

Wood Pulp PPI

(Index 1982=100, monthly, not seasonally adjusted)



*Data through August.
Source: Bureau of Labor Statistics.

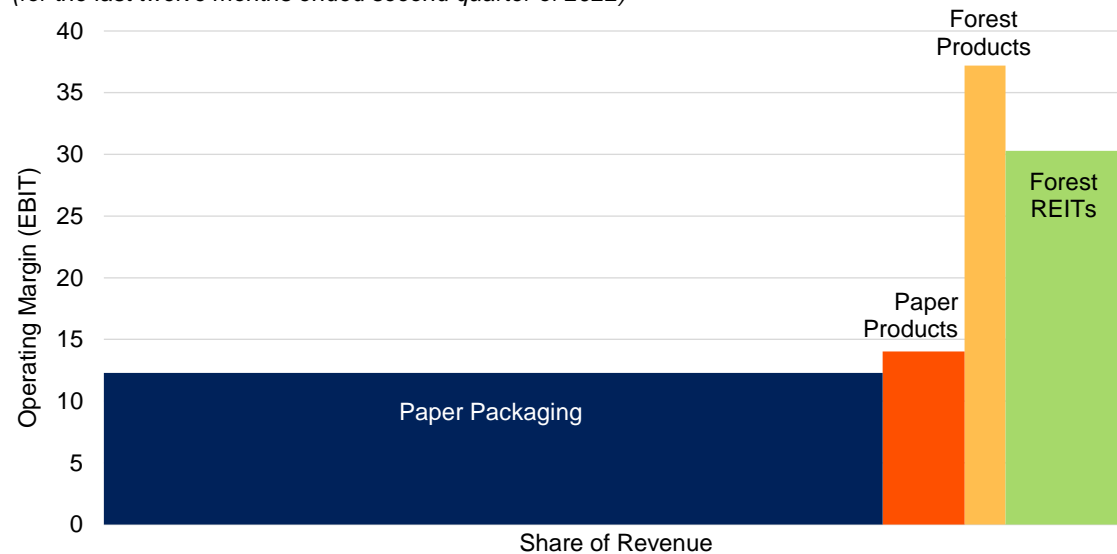
- ◆ Wood pulp prices rose 19.6% year-over-year in August 2022, reaching an all-time high, mostly due to supply disruptions, logistical bottlenecks, project delays, and restrictions on wood imports from Russia.
- ◆ During the first half of 2021, monthly price increases in pulp were significant and historic, as raw-material shortages coincided with higher demand for toilet paper and other tissue products.
- ◆ Chinese tariffs on U.S. pulp were cut in half from 10% to 5% in February 2020 as part of Phase One of the U.S.-China trade deal. This has supported the price of pulp, especially during the economic recovery following lockdowns in China.

INDUSTRY TRENDS

Competitive Environment

PROFIT-POOL MAP OF PAPER AND PAPER PACKAGING INDUSTRY GROUP

(for the last twelve months ended second quarter of 2022)



Source: CFRA, S&P Global Market Intelligence.

Forest products companies have the smallest share of revenue in the combined paper and paper packing value chain, accounting for only 4.3% of industry revenue; despite that, the sub-industry enjoys the healthiest operating margin of 37.2%. Coming in second with the lowest market share is paper products at 7.2% and operating margin of 14.0%. The lower margin is due to the commoditized nature of paper products, competing mainly on price.

Forest REITs fared better in 2022, as the lumber price spiked to a record high in April 2021 before shrinking by more than 60% in August 2022; it has 11.7% share of industry revenue and the second healthiest operating margin among the sub-industries at 30.3%.

Paper packaging companies have the largest share of revenue at 76.8%, with a healthy operating margin of 12.3%. The rise of e-commerce, growing consumer awareness regarding sustainable packaging, and strict regulations imposed by environmental protection agencies to reduce the usage of plastics have driven the market for paper packaging.

Porter's Five Forces

Below, we used the Porter's Five Forces framework as a tool to analyze the competitive environment of the Paper & Paper Packaging industries.

Degree of Rivalry/Competition (High)

In addition to competing against each other, U.S. paper producers also compete with global producers, which may have lower production costs. As most paper products are commodities, they are widely available from many producers and have few distinguishing qualities from producer to producer. As a result, competition for these products is based primarily on price. Therefore, the ability of paper companies to maintain their margins depends largely on their ability to control costs.

Bargaining Power of Buyers (Low)

Buyers do not have significant bargaining power over paper producers. Instead, pricing influences the amount of inventory held by customers.

Bargaining Power of Suppliers (Low)

The main raw material used to make paper is wood fiber. Wood fiber is a commodity, and prices historically have been impacted by a variety of factors, rather than the power of suppliers. With many fiber producers, paper producers can easily switch to another supplier if the current supplier tries to unfairly raise prices.

Threat of Substitutes (Moderate)

Paper as a medium to store information has been sharply diminished by the introduction of digital technologies. The proliferation of digital newspaper and magazine articles has resulted in a sharp decline in demand for newsprint and printing paper. Nevertheless, although the adoption of e-books has gained traction in the past decade, many readers still prefer traditional books. In addition, tissue and other hygienic paper products are not particularly susceptible to substitutions.

For paper packaging, plastic packaging can act as a substitute. However, there is growing awareness and concern regarding the negative impact of plastic packaging on the environment. Plastic and paper are the two most widely used packaging materials.

Threat of New Entrants (Low/Moderate)

Paper mills tend to be highly capital intensive, given their typically large size and the high costs of paper machines, fiber preparation equipment, and converting equipment. Outlays for sophisticated safety and environmental protection equipment also boost capital expenditures, as do extensive industry efforts to modernize and expand plant capacity. These costs create high barriers to entry in the paper segment, making it unlikely that new paper companies will emerge. Wood products mills tend to be smaller and less costly to construct than paper mills. Thus, barriers to entry are not significant in the wood product market.

The paper business is one of the most heavily regulated markets in the U.S, and it spends several billion dollars every year to comply with federal regulations to reduce pollution. This is a major deterrent for new entrants into the segment.

Overview of the Paper and Forest Industry

According to the American Forest & Paper Association's (AF&PA) 2022 preliminary report (latest available), overall paper and paperboard capacity in the U.S. declined by 0.4% in 2021, compared to the average decline of 1.0% per year since 2012, and will remain essentially flat in 2022. However, some segments rose, such as boxboard and containerboard. For the 11th year running, containerboard capacity increased and reached a record high of 42.3 million tons. Especially noteworthy is that containerboard capacity increased at the highest rate in 25 years. Due to strong growth in containerboard and changes in other grades, containerboard as a percentage of the total capacity of all paper and paperboard exceeded 50% for the first time in 2021. Boxboard capacity increased 0.6% after a 2.6% decline in 2020, reversing its long-term trend of 0.4% decline, and should continue increasing in 2022. Meanwhile, tissue paper capacity remained the same in 2021. Most domestic paper & forest product firms derive the majority of their revenues from U.S. sales, with only a small portion from the export market and international operations. However, there are some exceptions, such as International Paper Co. (IP), which has a large and growing presence in overseas markets.

Most larger companies with a printing paper business have decreased paper capacity, converted some capacity to other products, or divested their paper business. International Paper, for example, completed a spin-off of its global printing paper business (now operating as Sylvamo Corporation) in October 2021. The market remains moderately fragmented, although consolidation has reduced the number of competitors in several product categories. The forest products sub-industry remains highly fragmented, and there are only a few large publicly traded companies in this sub-industry; the most notable one is Louisiana-Pacific Corporation.

LARGEST NORTH AMERICAN PAPER & FOREST PRODUCTS AND PAPER PACKAGING COMPANIES

(ranked by 2022 estimated revenue, in \$, millions)

RANK	COMPANY	FISCAL YEAR END	REVENUES*			PERCENT CHANGE
			2020	2021	2022	2021-2022
1	International Paper	Dec	20,580	19,363	21,553	11.3%
2	WestRock	Sep	17,557	19,296	21,714	12.5%
3	Amcor	Jun	12,484	13,588	14,723	8.4%
4	Weyerhaeuser	Dec	7,532	10,201	10,463	2.6%
5	Avery Dennison	Dec	6,972	8,408	9,355	11.3%
6	Boise Cascade	Dec	5,475	7,926	8,445	6.5%
7	Packaging Corporation	Dec	6,658	7,730	8,766	13.4%
8	Sonoco	Dec	5,237	5,590	7,415	32.6%
9	Sealed Air	Dec	4,903	5,534	5,892	6.5%
10	Louisiana Pacific	Dec	2,788	4,553	4,071	-10.6%

*Includes revenues from operations other than paper and forest products in certain cases.

Source: Company reports.

The paper & forest products industry has closed many paper mills over the years, and this has helped the supply-and-demand balance. However, the accelerating decline in demand for newspaper inserts, directories, magazines, and paperback books could adversely impact paper demand and operating rates in 2022 and beyond. With demand expected to continue to decline, CFRA foresees further capacity closures in the years ahead.

Competitive Advantage

E-commerce to Drive Containerboard and Paper Packaging Market Growth

With the increasing penetration of e-commerce, the demand for retail e-commerce packaging has increased considerably. The containerboard market was valued at around \$155.9 billion in 2021 and is expected to reach \$198.4 billion by 2028, with a CAGR of 4.1% over the forecast period of 2021 to 2028, according to a market research report by Valuates Reports. Additionally, another market research report by Fortune Business Insights forecasts the value for e-commerce packaging to reach \$140.86 billion by 2028, from \$48.81 billion in 2021, growing at a 16.3% CAGR over the 2021-2028 period, driven by the emerging significance of e-commerce packaging as a key asset in communicating brand values and sustainability. In combination with the growing usage of containerboard by e-commerce giants such as Amazon.com and eBay, the demand for corrugated cardboard and other sustainable packaging materials has significantly increased.

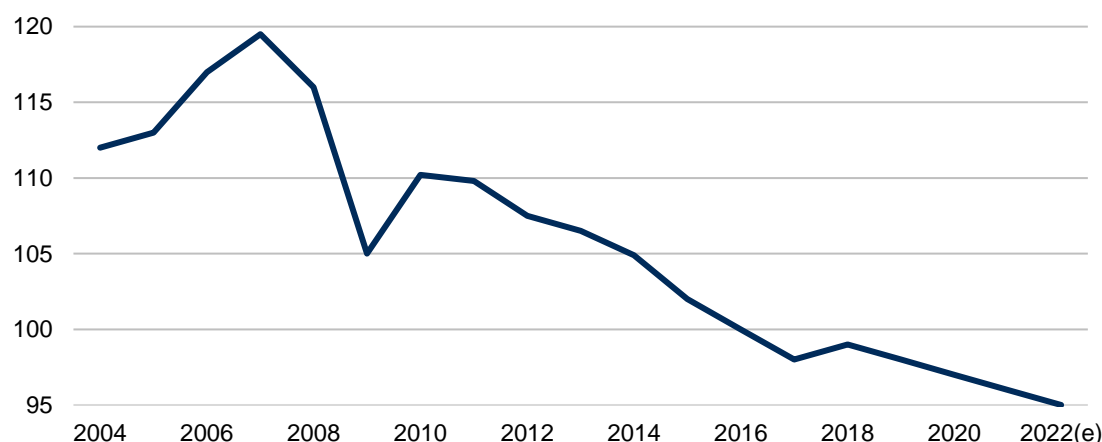
Decline in Print Offset by Growth in Packaging and Tissue

The paper & forest products industry is among the oldest yet most vital industries in the U.S. In recent years, it has been hit hard by expanding technology and electronic devices. The demand for graphic papers has been in decline for several years with only moderate signs of growth in the developing world. The graphic paper market declined over the last decade. The global paper market fell by a CAGR of roughly 3.2% during the five-year period ending in 2020. The newsprint market fell at a 7.5% CAGR from 2016 to 2020, while the graphic papers market declined at a 1.5% CAGR over the same period, according to RISI (latest available). While the market as a whole is declining, it is worth noting that some segments of the market are growing, such as the specialties and digital print markets. Moreover, the global printing and writing paper market size is estimated to grow by \$7.9 billion with a CAGR of over 1.76% during the 2021-2026 forecast period, according to a press release by *MarketWatch*.

According to the July 2022 Printing-Writing Monthly report from the American Forest & Paper Association, total printing-writing paper shipments declined 5% in August 2022 compared to August 2021 and total purchases of printing and writing papers in the U.S. decreased 1% compared to the same period in the prior year. Moreover, total printing-writing papers inventory levels decreased 2% compared to July 2022. U.S. shipments of coated mechanical (CM) papers decreased 10% year-over-year in August 2022 versus August 2021, while inventory levels increased 5% in August 2022 compared to July 2022. Exports of CM declined 16% month-over-month, while imports surged 14% month-over-month in July 2022.

GLOBAL DEMAND FOR PRINTING AND WRITING PAPER

(million tons)



Source: RISI, Paper360.

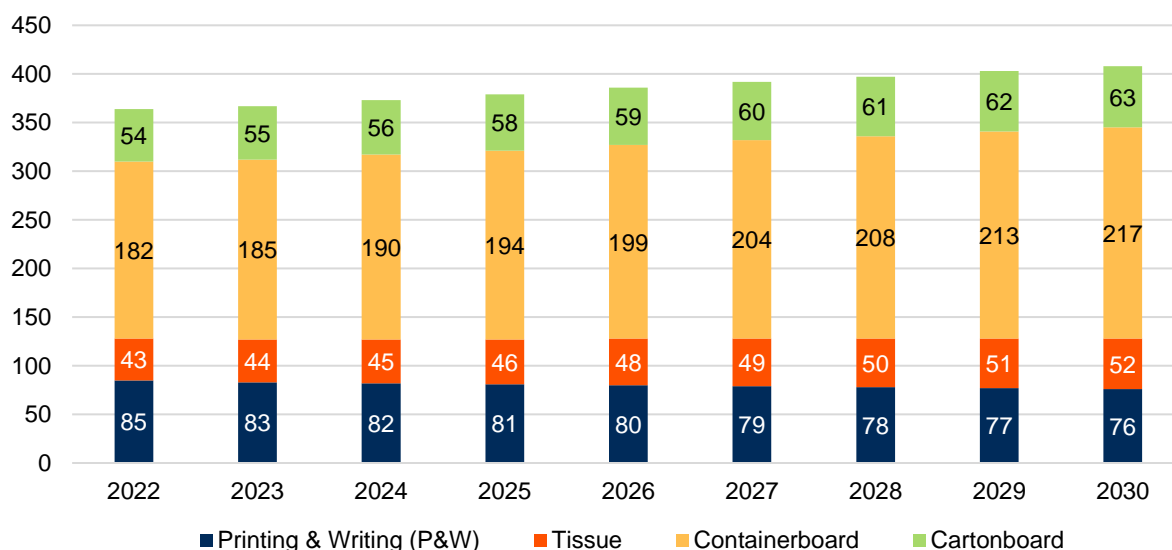
CFRA expects graphic paper demand to decline in almost all regions of the world. We see the rates of decline abating in the developed regions of North America and Western Europe, as these markets have already experienced a big hit from the initial adoption of new technologies. However, we think that other developing regions will not see as huge a hit as they never really saw print media develop to the extent that it did in the western world. We think a sustainable level of demand will eventually be reached and the secular decline will end, but we do not see this happening in the distant future.

Interestingly, the paper and forest products industry as a whole is actually growing, albeit at a slower pace than before, as other products are filling the gap left by the shrinking graphic paper market. Cartonboard packaging, containerboard packaging, and tissue have been offsetting the loss in graphic paper during the last decade and are still expected to grow at CAGRs of 1.9%, 2.2%, and 2.4%, respectively, between 2022 and 2030. Diminishing demand for printing and writing (P&W) paper is further exacerbated by the shortages and price hikes of its raw material, wood pulp.

Despite the secular decline in printing and writing paper demand, paper is still predominantly used to archive knowledge, while tissue, napkins, and non-woven products are essential to personal hygiene and medical care. Fiber-based packaging materials, which are low-cost and recyclable, are used to prevent damage to products that are being transported. Finally, chemicals and materials derived from wood pulp are adopted for a wide range of products in various markets – from consumer electronics to pharmaceuticals.

PAPER END USE CONSUMPTION

(In million tons)



Source: AFRY.

Print Advertising May Be Fighting a Losing Battle

According to statistics on direct mail response rates in 2021, mail volumes in the U.S. have undeniably declined year after year, with volume dropping from 213 billion pieces in 2016 down to 130 billion in 2021. At the same time, however, direct mail response rates skyrocketed. During the period 2006-2021, house list response rates grew 173%, while prospect lists enjoyed a 194% bump. Furthermore, letter-sized envelope campaigns generated a 112% return on investment (ROI), compared to SMS (102%), email (93%), paid search (88%), social media advertising (81%), and digital display advertising (79%).

Based on the latest analysis of U.S. Postal Service financial results for the second quarter of 2022, surprisingly, the revenue for marketing mail increased 9.4% year-over-year to \$324 billion compared to the 2021 period, with volume growth of 545 million pieces or 3.5% increase compared to the same period last year. Despite the strong headwind from the ever-evolving digital marketing channel, marketing mail has proven to be one of the most resilient print advertising channels, and its value to businesses remains strong due to its healthy return on investment rate. Since 2016, the market for direct mail advertising has dwindled at a CAGR of -1.4%, reaching a value of about \$42.8 billion in 2021. The market is anticipated to increase from \$42.8 billion in 2021 to \$46.3 billion in 2026, with a CAGR of 1.6%. The market is then expected to reach \$47.9 billion in 2031, with a projected CAGR of 0.7%.

However, the same cannot be said for other types of print advertising, as the traditional magazine advertising and newspaper advertising markets are declining in size. According to a MarketingCharts report on U.S. online and traditional media advertising outlook for 2021 to 2026, the U.S. consumer magazine advertising and newspaper advertising markets in 2022 were estimated to be valued at around \$8.5 billion and \$11.2 billion, respectively. The figures are expected to drop at a compound annual decline of 5.15% for printed magazine advertising and 3.86% for printed newspaper advertising through 2025. On the other hand, their digital counterparts are expected to grow, with digital consumer magazine advertising expected to rise to \$3.9 billion with a CAGR of 2.8% from 2021 to 2026. In addition, the digital ad spend in B2B trade magazines is expected to hit \$2.2 billion in 2022 with a CAGR of 4.6% through 2026. Although it had officially surpassed the print advertising revenues in 2020, the gap widened further in 2021 to close to \$1 billion.

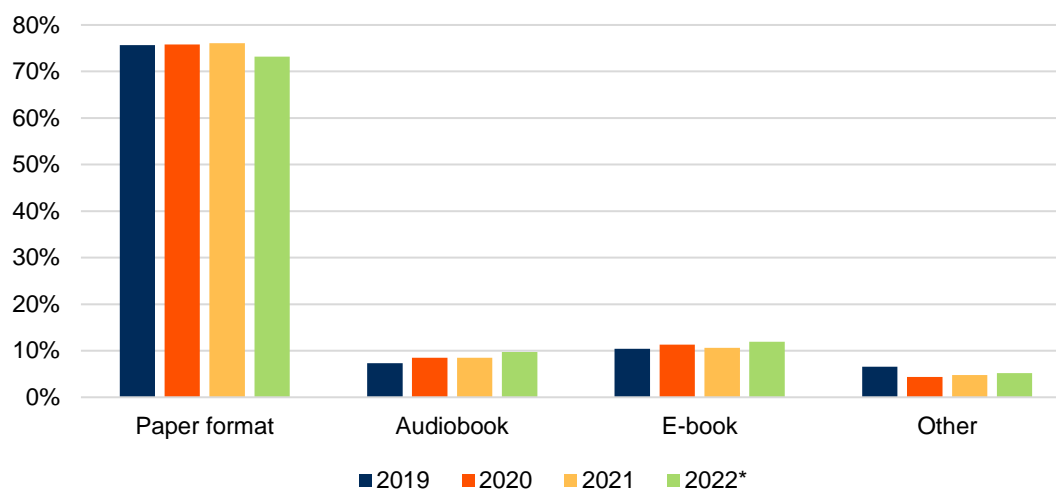
Printed Books Are Still More Popular Than E-books

Although e-book sales and online magazine circulations have grown significantly since 2011, most readers still prefer printed books and newspapers. According to a report by the Association of American Publishers (AAP), total revenue across all categories in 2021 was up 12.2% to \$15.4 billion. In 2021, revenues across all categories expanded except for e-books, which faced a decline of 4.7% compared to 2020. E-book sales faced a tough comparison in 2021, following a surge in e-book revenues in 2020 from the pandemic, which forced people to remain indoors. E-books offered special convenience at the height of the pandemic, as they could be bought online and came with zero risk of spreading Covid-19. However, all of that proved to be temporary; as bookstores gradually came back to life, demand for e-books declined in 2021.

According to a survey by the Pew Research Center, the share of adults who have read print books still surpasses those using other forms in the last 12 months ended January 2021 (latest). The Pew Research Center also revealed the percentage of Americans who read e-books stood at 30%.

According to Audio Publishers Association's Annual Sales survey, audiobooks' revenue has continued to rise for the 10th consecutive year surging 25% in 2021, bringing the estimated industry total revenue to \$1.6 billion. The huge jump in revenue eclipsed 2020's revenue gain of 12%. The growth is partly attributed to increased listening in cars, which surpassed the home as the top audiobook listening location. CFRA foresees audiobook adoption to continue rising, but not to the extent that it will eat into the market share of traditional books, as the two formats provide fundamentally different reading experiences.

SHARE OF CONSUMER BOOK REVENUE (In percent)



*Data through June 2022
Source: AAP Statshot.

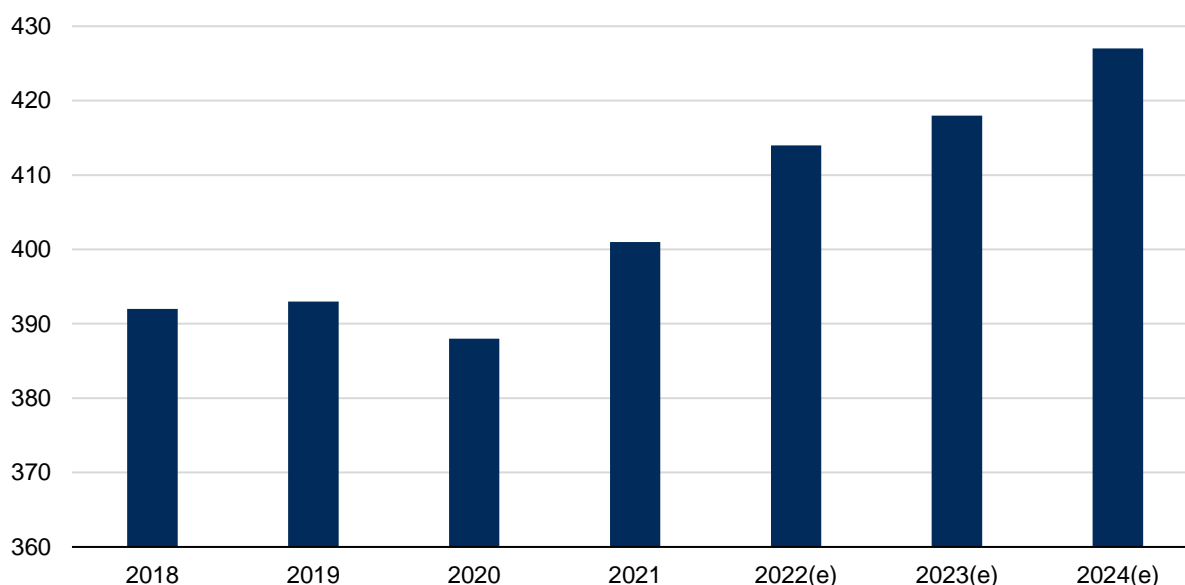
Operating Environment

Corrugated Box Shipments Remain Strong

The rise of e-commerce amid the Covid-19 outbreak and the increasing awareness among consumers on the issue of sustainability has propelled corrugated box shipment volumes in the U.S. After it plunged in early 2020 to the lowest level since 2017, corrugated box shipments recovered quickly in June 2020 through August 2020 and surged higher than the three previous years in September through December of 2020 as the market rebounded sharply. Even as the economy and shopping malls reopen in the second quarter of 2021, the increased usage of online shopping has been inevitable for many customers and sellers due to the Covid-19 pandemic. The trend, in our opinion, is here to stay. Corrugated box shipments are expected to grow at a CAGR of 5.0% during the forecast period of 2022 to 2032. However, we note that old corrugated container (OCC) prices have gradually declined in value and weakened considerably in recent months through August 2022. The deterioration was attributed to weaker demand and oversupply, which could be a forward indicator for slower demand for corrugated boxes.

U.S. CORRUGATED BOX SHIPMENTS

(in billions, square feet)



Source: RISI, Paper 360.

Pulp Prices Spike as Supply Falls Short

In 2020, reduced pulp demand, coupled with the refusal of Brazil's Suzano – the world's largest pulp producer in January 2019 – to initially cut production and prices, led to a substantial loss of revenues and inflated inventories as unsold papers were warehoused. Based on data from the U.S. Bureau of Labor and Statistics, the average Producer Price Index (PPI) for pulp, paper, and allied products sank to a 14-year low of 137.4 in March 2020. In early 2021, paper stockpiles had depleted to historically low inventory levels as demand began to rebound, drying up the mill inventories to an all-time low. The rally in wood pulp price spike continued through the third quarter of 2021 as China, the biggest buyer of pulp, recovered from Covid-19, coupled with disruption in the supply chain. To meet the demand, paper mill operating rates reached over-capacity as some mills had been idle or closed; some shifted to hygiene products amid the Covid-19 outbreak, making it harder for them to meet current demand. Following the law of supply and demand, the mills had the upper hand in pricing leverage.

In 2022, the mixed effect of the pandemic coupled with the disruption of supply chain and rising energy costs have exacerbated the already severe supply shortages as demand continues to rise amid economic comebacks. Publication printing companies (books, newspapers, magazines, and advertising) are particularly susceptible to the alarming shortages and price increases of wood pulp. The PPI surged 19.6% year-over-year in August 2022 to 251.3, a record high and six consecutive monthly gains; the index is expected to increase further with the disruption in global logistics streams. According to AF&PA, the demand for coated freesheet (CFS) is expected to increase in 2022, but shipments in July 2022 increased 2% compared to the prior-year period, while uncoated freesheet (UFS), which strengthened in late 2020 due to election activity and incremental (albeit limited) return to work and school, will also see an increase in demand and is expected to continue to push pulp prices even higher.

PRODUCER PRICE INDEX: WOOD PULP

(Index 1982=100, monthly, not seasonally adjusted)



*Data through August.

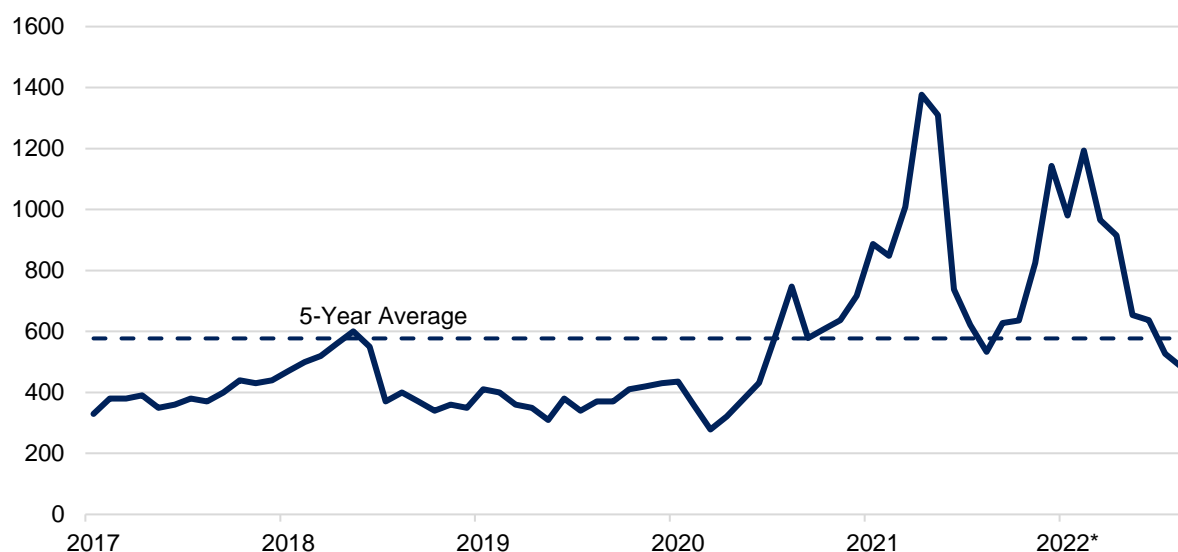
Source: Bureau of Labor Statistics.

Lumber Prices Soften Amid Housing Market Weakening

In May 2021, lumber prices had surged by almost 200% since the pandemic began, driven by temporary shutdowns at lumber mills and increased demand for houses as a result of low mortgage rates. Prices rallied to a record high of \$1,377 per thousand board feet in April 2021. But not long after that, lumber prices plunged more than 40% in June 2021 alone, suffering their worst month since records began in 1978. After a quick recovery in the second half of 2021, the downward trend took place yet again and continued through August 2022, where the price sank to \$484, a peak-to-trough decline of 64%. The quick reversal of lumber prices resulted from a number of factors, including a slowdown of the housing market, soaring mortgage rates amid interest rates hikes by the Fed, and prolonged inflation have weakened consumers' purchasing power, which in turn led to a decline in home demand. We see the recent decline in lumber prices as a simple cooling down of the housing market and going back to pre-pandemic normal rather than crash and we expect to see lumber prices back to normal range of \$300-\$600.

LUMBER PRICE (IOM: ^LB)

(\$ per thousand board feet)



*Data through August.
Source: S&P Capital IQ.

Forest Products: Housing Starts and Permits are Declining

The housing market is the largest end market for lumber and other wood products. When assessing the state of the housing segment, it is important to understand the sales trends for existing homes, housing starts, and housing permits. In general, existing-home sales represent the majority of total housing sales. The National Association of Realtors (NAR) reported that sales of existing homes – a category that includes single-family, townhomes, condominiums, and co-ops – totaled 4.8 million (seasonally adjusted annual rate) in August 2022, down 0.4% from July and 2.3% year-over-year, a decline for seven consecutive months.

Total housing inventory at the end of August 2022 increased for five consecutive months to 1.28 million and remained flat from prior year period. Unsold inventory is at 3.2 months of supply at the current sales pace, up from 2.6 months in August 2021, according to the NAR.

Meanwhile, housing starts in August 2022 remained essentially flat at 1.58 million, with a slight decline of 0.1% from prior year period, according to data from the U.S. Census Bureau. Residential building permits, which indicate how much construction is in the pipeline, decreased by 14.4% to 1.52 million compared to the same period in the prior year (1.77 million). The significant growth slowdown in recent months was due to several factors, such as higher prices, rising mortgage rates, and the Fed's aggressive interest rate hikes, which have exacerbated the affordability issue. However, this may be partly offset by the Biden administration's announcement on incentives and a tax credit of \$15,000 for first-time homebuyers. As of August 2022, however, this bill has yet to become a law.

Household Formations Losing Steam

According to Federal Economic Data, the U.S. had added 4.9 million households (relative to the prior-year period) in June 2020, substantially higher than the two-year average of 1.81 million in 2018-2019. The year-over-year growth rate decelerated through March 2021, before year-over-year declines occurred for five months in 2021 (April through August). As of June 2022, the number has gradually recovered to 128.1 million from its April 2021 low of 125.9 million, up by 2.1 million compared to the prior-year period. This suggests that demographics were favorable for the housing market in the second half of 2021 and the first half of 2022, propelled by a strong labor market.

However, we expect the housing market to start losing steam for the remainder of 2022 and 2023 with the deterioration of consumers' affordability due to higher mortgage rates and multi-decade high inflation rates, coupled with soaring interest rates. In August 2022, housing prices continued to move solidly higher, while existing-home sales declined for seven consecutive months through August 2022, signaling the "great reset" for the housing market. The risk of recession further adds fuel to buyers' fear of buying houses. We see this trend to continue well into 2023, stabilizing the housing market after the market went into overdrive due to the pandemic.

U.S. HOUSEHOLD FORMATIONS (YEAR-OVER-YEAR)

(in thousands)



*Data through June.

Source: Federal Economic Data.

U.S. Home Prices Surge to New Record

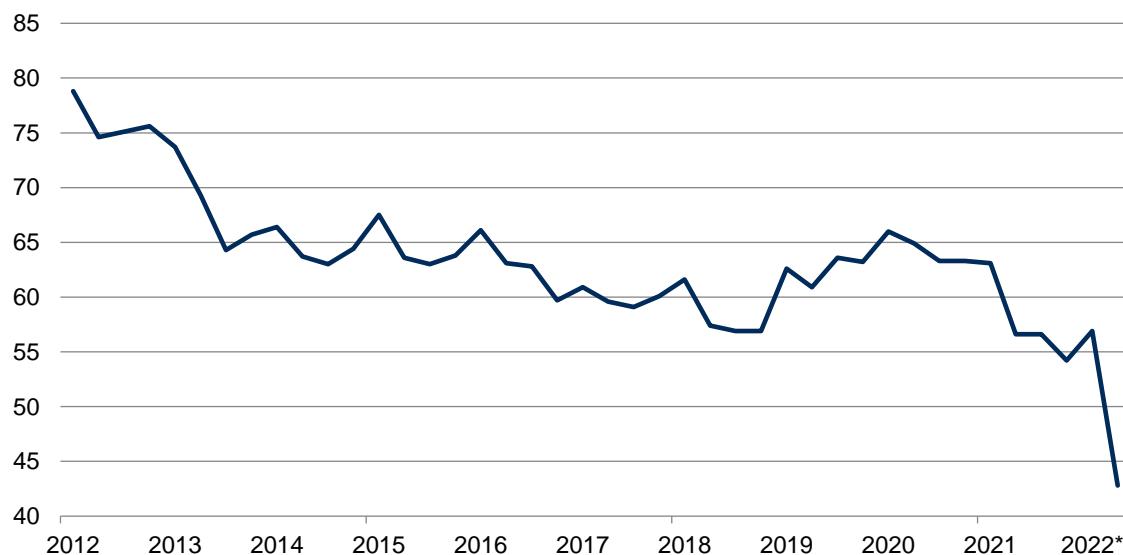
In the second quarter of 2022, strong demand, low inventory, and soaring interest rates by Fed resulted in increased mortgage rates and plunged housing affordability to its lowest level in a decade. According to the NAHB/Wells Fargo Housing Opportunity Index (HOI), 42.8% of new and existing homes sold in the second quarter of 2022 were affordable to families earning the U.S. median income of \$90,000. This is a sharp decline from the 56.9% of homes sold in the first quarter of 2022 and the lowest affordability level since the beginning of the revised series in the first quarter of 2012.

The Housing Affordability Index shows that the national median home price soared to a record \$390,000 in the second quarter of 2022, up \$25,000 and \$70,000 from the first quarter of 2022 and the fourth quarter of 2020, respectively. Meanwhile, average mortgage rates surged by an alarming 147 basis points in the second quarter to 5.33%, from the rate of 3.86% in the first quarter, reaching a level not seen in more than a decade.

In May 2022, the Biden administration announced new actions to tackle housing costs' burden by releasing Housing Supply Action Plan. Starting with the building and preservation of hundreds of thousands of affordable housing units over the next three years, this plan calls for legislative and administrative measures that will assist in closing America's housing supply gap within five years. Closing the gap will result in more cheap rents and more attainable homeownership for Americans. Aligned with other policies will bring down housing costs and ensure affordability, such as rental aid and downpayment support.

NAHB/WELLS FARGO HOUSING OPPORTUNITY INDEX

(in percent)



*Data through second quarter.

Source: National Association of Home Builders.

HOW THE INDUSTRY OPERATES

The paper & forest products industry is involved in the manufacture of paper, paperboard, and wood products. What these products have in common is their use of timber, or some form of timber resource, as a raw material. In the paper and paperboard area, timber or recycled material is converted into printing and writing papers, newsprint, tissue, containerboard, and specialty fibers. In the wood products area, logs are converted into lumber and structural panels. Structural panels consist primarily of plywood and oriented strand board (OSB).

Raw Materials

To manufacture paper & forest products, a company must first develop sources for its raw materials. A firm's method of procurement depends on its degree of vertical integration and its operating strategy. The principal means of fulfilling timber needs include owning timberlands, signing cutting contracts to harvest timber (on land that is either government-owned or privately held), and purchasing already-harvested logs from contractors or landowners. Makers of structural panels and other engineered wood products may produce or purchase wood chips or fiber. Paper makers that are not vertically integrated may rely on purchases of recovered paper or market pulp.

The fulfillment of raw material needs has taken on greater complexity in recent years, as the timber supply from federal lands has been increasingly curtailed by environmental regulations. The main federal regulatory action in this area was the June 1990 ruling by the U.S. Fish and Wildlife Service that listed the northern spotted owl as a threatened species. This decision prohibited timber harvesting from about nine million acres of land in the Pacific Northwest, where the owls reside. Since this ruling eliminated a substantial supply of logs, particularly from old-growth trees, the industry has had to develop alternative raw materials sources.

The Roadless Area Conservation Rule, enacted by the Clinton administration in January 2001, further attempted to restrict the use of raw timber materials. In May 2001, the Bush administration announced that it would uphold the federal regulation, which banned road building, timber harvest, and road reconstruction within the inventoried roadless area (roughly 60 million acres) of the national forest system.

However, in May 2005, the federal government repealed the law and replaced it with regulations governed by each individual state. Under the new policy, roadless areas may receive protection only if the governors of the states in which those roadless areas lie complete a petition process that is filed with the U.S. Department of Agriculture (USDA). The petitions are nonbinding, and the federal government has the choice to accept, modify or reject them. Existing forest plans restrict road building on 40% of the roadless acres managed by the Forest Service.

To ensure that companies in the U.S. paper & forest products industry procure their wood and other plant-derived materials by legal means, the Lacey Act was implemented in 1900, which originally limited trafficking bans to wildlife, before it was amended in 2008 to include plant and plant products such as timber and paper. The amendment included the prohibition of illegally harvesting plants, and required traders to declare the scientific name, value, quantity, and country of harvest origin. The Trans-Pacific Partnership (TPP) also aims to prevent illegal logging by requiring its members to fulfill their obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which includes responsible trading of flora and fauna, promoting the long-term conservation of species at risk, protecting natural habitats such as wetlands, and implementing strong anti-corruption protection against bribery. Members of the TPP reached a final agreement in October 2015. The TPP initially involved 12 countries, including the U.S. However, an executive order from President Trump in January 2017 formally ended participation from the U.S. in TPP.

Recycled Supply

In the paper area, the alternative to virgin wood fiber is recycled fiber, which can come from a variety of sources, including used corrugated containers and wastepaper. Prompted by the U.S. government's environmental protection efforts and the reduced availability of virgin wood fiber, the U.S. pulp, and paper industry has dramatically increased its use of recycled fiber.

Rather than consuming only virgin wood fiber (fiber that has never been part of a production process), many producers reuse wood-based products several times to produce paper and containerboard products. This has relieved some of the pressure caused by the restricted availability of timber resources. The recycling rate in 2020 was 65.7%, down from 66.2% in 2019. The decline was mostly the result of a sharp drop in recovered paper exports (12.6%) following China's import restrictions. Expect a further decline in recycling rate as China moves from import restrictions to ban imported recycled paper altogether. Since 2009, the recycling rate has either met or exceeded 63% each year. AF&PA member companies are working towards a goal to increase the recovery rate to more than 70% in the near future.

Recycling of newspapers and cardboard boxes has been common for some time, with growing amounts of magazines and office paper now being reused. Old corrugated containers (OCC) are widely recycled; the recycling rate was 96.2% in 2018 before dipping to 92% and 88% in 2019 and 2020, respectively. Despite the declining recycling rate, U.S. mill consumption of OCC reached a record level in 2020 of 22.8 million tons. Furthermore, the volatility was largely due to trade flows, according to the AF&PA. For decades, corrugated cardboard has been recycled by collecting cardboard boxes from commercial firms, such as the grocery market, though households and small businesses are now included in corrugated recycling efforts.

Companies that use recycled paper and paperboard for production fiber can obtain it in different ways. Some firms satisfy their wastepaper requirements by making recoveries through their own recycling system: they set up centers at various outside locations to collect fiber for the mills. Other firms purchase wastepaper from suppliers located near their recycling plants. In those instances, the suppliers collect, sort, and bale the material before passing it along to their customers. In many cases, the goods are sold under long-term contracts, with prices and quantities fluctuating according to market conditions. Some firms also use recovered waste materials, such as residual wood chips, sawdust from sawmills, and forest waste.

Managing Timberland Supplies

For companies in the paper & forest products industry, having alternative fiber sources – such as supply contracts for wood from another timberland owner – is important to their long-term survival. Nonetheless, a firm that has extensive timberland holdings often has a competitive advantage. For a company that has control over a large timber base, decisions on proper harvesting levels in a given period are an important factor in maximizing the long-term use of its holdings.

A firm typically makes its harvesting decisions based on the price and supply of timber for sale on the open market; often, it will harvest less of its own holdings if it can purchase timber at a low price. The company also considers what is best for the sound long-term management of its timberlands, including methods to increase the volume of wood fiber available from its forests, as well as the sale of land for other uses. To improve site preparation and planting, fertilizing, thinning, and logging techniques, a company may engage in natural reforestation practices, genetic research, computerization, or other advanced techniques.

Timber: Hardwood and Softwood

Timber is divided into two classes: hardwood and softwood. These names do not necessarily reflect the wood's physical properties; some hardwood timber is actually softer than some softwood timber. Rather, the terms indicate a tree's genetic classification: softwood comes from coniferous trees, while hardwood comes from deciduous trees.

Different woods are suitable for different purposes. In homebuilding, Douglas fir and pine (which are classified as softwood) are frequently used for framing lumber. Oak and maple (both hardwoods) are used for flooring, while redwood and cedar (both softwoods) are used for siding and roofing. In papermaking, pulp made from hardwood fibers promotes smoothness in fine papers and softness in tissue, while softwood pulp has fibers that promote cohesion and strength in heavier papers.

Production

Once a firm has its necessary supply of timber and/or wastepaper, it brings the fiber into its mills to be processed into the various paper, paperboard, and wood products that it has chosen to manufacture.

Paper mills tend to be highly capital intensive, given their typically large size and the high costs of paper machines, fiber preparation equipment, and converting equipment. Outlays for sophisticated safety and environmental protection equipment also boost capital expenditures, as do extensive industry efforts to modernize and expand plant capacity. These costs create high barriers to entry in the paper segment, making it unlikely that new paper companies will emerge.

Wood products mills tend to be smaller and less costly to construct than paper mills. Thus, barriers to entry are not as significant in the wood product market.

Making Pulp for Paper and Paperboard

Plants that produce paper and paperboard use virgin wood fiber and/or recovered paper and board products in a variety of processes to manufacture pulp – the essential ingredient in paper and paperboard products. It is important to note that certain mills may use either recycled or virgin products only, while some mills are engineered to allow operators to shift between using recycled and virgin materials. The latter allows firms to take advantage of fluctuations in market prices and to use the material that has the most competitive price.

Pulp is made by separating wood fibers from a substance called lignin, which acts as a glue holding the fibers together. Two commonly used methods are dissolving the fibers chemically or tearing them apart mechanically. One mechanical method involves grinding wood chips, then mixing the fibers with water. Pulp is often bleached to prepare it for its end use. In most cases, a mixture of different kinds of pulp is prepared to create the specific characteristics of the paper or paperboard into which it will be processed.

Once the pulp has been prepared, it may be sent immediately to one of the firm's paper machines, dried and inventoried, or sold to another company. The water, spent chemicals, and other waste from the pulping process must undergo biological and other waste elimination treatments to meet stringent federal (and sometimes state) environmental regulations.

Making Wood Products

In the wood products area, large-diameter logs are taken to mills equipped with converting capacity. These mills transform the logs into solid wood products, predominantly lumber and structural panels. The processing of lumber products begins with the debarking of the logs. The logs are then sawed, seasoned (dried), and planed.

Plywood is made by gluing one or more veneers (thin sheets of wood peeled from logs) to another veneer or to a solid wood core to form a laminated wood panel. The grains of alternate layers are placed at right angles to add strength.

Engineered wood products, which can be manufactured from smaller-diameter logs, have gained market share in recent years. OSB, the most prominent engineered wood product, is made by combining discrete strands of wood with resin, then shaping the mixture into panel form using resins and high pressure.

Cost Structures Differ

The paper segment is highly capital intensive and is characterized by large fixed costs; according to the USDA, it is the most capital-intensive manufacturing sector in the U.S. economy. A large paper machine can cost between \$300 million and \$500 million to construct, and building a large integrated pulp and paper facility can require more than \$1 billion. These heavy capital requirements create a high barrier to entry. The large fixed-cost base also encourages producers to run their facilities at high operating rates to reduce their capital cost per ton and generate cash. This creates pricing and earnings pressures for all industry players during periods of excess industry capacity.

Regarding variable costs, the largest expenditures for paper companies are usually fibrous raw materials (e.g., wood and pulp), followed by non-fibrous raw materials, which typically consist of chemicals and paper additives. Other variable costs include fuel and energy, consumables (e.g., fabric and felts), maintenance, materials, water and effluent, and solid waste disposal.

The forest products segment is less capital intensive than paper products. Building a sawmill generally costs between \$50 million and \$70 million, according to the USDA. For engineered wood product plants, the USDA estimates that an integrated OSB plant costs between \$100 million and \$150 million. An I-joist plant costs \$10 million to \$20 million, and a laminated veneer lumber (LVL) plant costs slightly more than that.

As with paper companies, forest products companies' primary variable cost is wood. It accounts for a larger portion of variable costs for makers of sawn lumber and plywood than for makers of engineered wood. The USDA estimates the percentages at 50%-70% of variable costs for plywood, and 30%-35% for OSB. Although the fixed costs for I-joists and LVL are lower than traditional sawn lumber, these engineered wood products typically have higher production costs. The unique adhesives and resins, additional processing, and specialized manufacturing skills make engineered wood products more costly to produce than sawn lumber.

Paper & Forest Products Categories

Companies in the paper & forest products industry produce a large number of paperboards, paper, and wood product grades.

Paperboard

In the paperboard area, products are divided between containerboard and boxboard. In recent years, these products have accounted for slightly more than half of the industry's total production of paper and paperboard.

◆ **Containerboard.** Containerboard is the material used to make corrugated containers, which are used primarily for packaging applications. Containerboard is made of two kinds of paperboard: linerboard and corrugating medium.

- *Linerboard* is the material used on the inside and outside of corrugated boxes. It is made in a variety of basis weights, from both virgin and recycled fibers. Production of linerboard that is based on 100% wastepaper has been growing rapidly in the U.S.
- *Corrugating medium* is the fluting material comprising the middle portion of containerboard. It is made in a variety of basis weights, from both semi-chemical pulp and recycled fiber.

◆ **Boxboard.** The boxboard category of paperboard is a paper grade used to make folding packaging for food, toiletries, cosmetics, pharmaceuticals, milk, and other products. Boxboard includes solid bleached sulfate (SBS) board (the premium grade used in folding cartons), unbleached kraft boxboard, and recycled boxboard. The most significant trend in this category is SBS's loss of market share over the past decade to plastic products and to the more environmentally friendly recycled grades of boxboard.

Paper

Printing and writing papers, newsprint, tissue, and others are among the various classified grades of paper.

◆ **Printing and writing papers.** The printing and writing paper market consists of uncoated and coated paper.

- *Uncoated* paper includes free sheet (defined as paper made from cooked wood fibers mixed with chemicals and washed free of impurities) and groundwood (containing at least 10% mechanical pulp) grades. Uncoated free sheet is used for publishing (mostly textbooks and trade books), writing, and business applications such as photocopying, computer printing, and envelopes. Uncoated ground wood paper, meanwhile, is used for preprinted newspaper inserts, lower-cost business forms, paperback books, and telephone directories.
- *Coated paper* production includes about equal quantities of free sheet and ground wood grades. Coated paper is used principally for magazines, catalogs, and other publications that require colored inks. These papers are covered with a thin, transparent clay coating that provides a smooth surface, allowing for superior color reproduction. Most coated paper has a glossy finish on both sides.

◆ **Newsprint.** Newsprint is the thin paper used in newspaper printing. The grade is generally made mostly with mechanical pulp, and it may include some chemical pulp.

◆ **Tissue paper.** Tissue paper is used in sanitary products such as bath tissue, paper towels, facial tissue, and napkins. About two-thirds of domestic tissue paper sales go to the consumer market and the remaining one-third goes to the commercial/industrial (C&I) market. Products are sold mainly through supermarkets and drugstores. C&I products are sold for use in hotels, offices, factories, restaurants, schools, hospitals, and other institutions.

◆ **Other products.** Other products are composed of non-paperboard packaging products and converted products. Included in this category are papers used for grocery bags, multiwall sacks, folders, cups, labels, tapes, playing cards, and other specialty items.

Converting

Most paper-producing plants are very large, and the papers they make are stored on rolls weighing several tons. For that paper to be used by printers, and businesses and industrial customers, it must first be converted. Major paper makers usually have numerous converting plants located around the country. These plants primarily cut large rolls of paper into smaller sheets or rolls that can then be used to make a variety of products, such as office paper, envelopes, cardboard boxes, cup stock, folders, cereal boxes, tubes, and other similar products.

Wood Products

The wood products side of forestry manufacturing has lumber and structural panels as its two main categories.

◆ **Lumber.** The principal consumers of lumber are the homebuilding and repair/remodeling markets, which now account for a combined total of more than two-thirds of domestic lumber usage. Lumber can be used for almost all elements in building a home, including structural framing, flooring, siding, and roofing.

◆ **Structural panels.** The two predominant types of structural panels are plywood (layers of solid wood) and OSB (engineered wood). Structural panels are used mainly to build walls, roofs, and floors before the finished materials, such as plasterboard and shingles, are put in place.

Selling and Distribution

Most major paper companies maintain direct sales forces to sell their paper and paperboard products. The sales staff markets the products to distributors, industrial customers, and integrated and independent converters and manufacturers. They sell directly to paper-intensive markets, including printers, publishers, direct mail firms, retail and corporate copy centers, and office supply retailers. Paper companies typically have sales offices located throughout the U.S.; a few own large distribution businesses with customer service and retail store locations in addition to distribution centers. Some paper companies also use paper merchants or brokers to sell their products.

Like paper companies, most forest products companies employ a sales force to market their wood products. The sales efforts of most wood products firms target independent wholesalers, distributors, and industrial customers (*e.g.*, cabinet and furniture manufacturers). More attention is now being paid to home centers, such as Home Depot Inc. and Lowe's Cos. Inc., which have become a major retail category for building materials. Some forest products firms also operate their own building materials distribution centers, which sell to retail lumber dealers, home centers specializing in the do-it-yourself market, and industrial clients. A few companies with large distribution businesses also purchase wood products from third parties to sell through their distribution channels.

Business Cycles, Strategies, and R&D

The performance of the paper & forest products industry is driven mainly by the interaction of supply and demand. Because of dependence on factors such as global economic health and the capacity of the industry, supply and demand are frequently out of balance. Although the industry cannot control the global economic situation, it can try to keep supply from greatly exceeding demand. One way to do this is to limit capacity expansion. In addition, producers on occasion take downtime, halting production to allow supply and demand to balance out, or to conduct scheduled or unscheduled maintenance.

Companies in the paper & forest products industry typically maintain research and development (R&D) divisions. The R&D activities of a paper company may focus on identifying innovations and improvements to the pulping, papermaking, bleaching, and chemical recovery processes; discovering improvements to paper coatings and barriers, stiffeners, and inks; perfecting packaging designs; and reducing environmental discharges. For a forest products company, R&D may focus on tree nutrition, regeneration, and propagation; sustainable forestry methods; and improved applications of computer controls to sawmills and engineered wood production facilities.

Government and Industry Regulations

The paper & forest products industry falls under the jurisdiction of the U.S. Department of Justice when issues concerning fairness of trade arise. The industry is also subject to a variety of federal, state, and local environmental and pollution control laws and regulations. Federal environmental regulations – primarily the Endangered Species Act and the Clean Air and Clean Water Acts – have a substantial impact on forestry companies. The Environmental Protection Agency (EPA) enforces these laws.

◆ **The Clean Air Act.** This federal law regulates air emissions from area, stationary, and mobile sources. Passed in 1970 and amended in 1977 and 1990, the law permits the EPA to establish National Ambient Air Quality Standards, which set limits on how much of a given pollutant may be in the air in the U.S. In 1990, the law was amended to address problems related to acid rain, ground-level ozone, stratospheric

ozone depletion, and air toxins. In 1993, the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for the pulp and paper production sources was originally proposed, and it was promulgated in 1998. Under NESHAP, the EPA identified large quantities of methanol, acetaldehyde, formaldehyde, and other hazardous air pollutants from pulp and paper production sources. As a result, this subpart regulates “total HAP” emissions.

◆ **The Clean Water Act.** This is a 1977 amendment to the Federal Water Pollution Control Act of 1972. This law, which focuses on toxic pollutants, made it illegal to release a pollutant from a point source into navigable waters unless a permit is obtained according to the provisions of the Act. In 1987, the Act was again amended to include the State Revolving Funds program for sewage-treatment-plant construction, wherein states and localities will be responsible for financing, constructing, and managing municipal wastewater facilities.

◆ **The Endangered Species Act.** This legislation focuses on the conservation of threatened and endangered animals and plants, as well as their habitats. The regulations regarding air and water quality standards for pulp and paper companies grew more stringent under the Cluster Rule, which the EPA published in the Federal Register in April 1998.

The Cluster Rule regulations affecting air emissions are entitled MACT I, MACT II, and MACT III. (MACT stands for maximum achievable control technology.) Each level covers a specific type of mill operation and its pollutants. The Cluster Rule set new limits for the level of toxins and nonconventional pollutants that can be released into the air and water. The EPA originally proposed the Cluster Rule in December 1993; however, the AF&PA put forth considerable argument, leading the EPA to agree to less rigorous wastewater controls than originally proposed.

Compliance deadlines for this multiphase rule are staggered; the paper sector achieved compliance with Phase I of the Cluster Rule (which applied to MACT I and MACT III) in April 2001. The date for compliance with the second phase of MACT I was April 2006. MACT II regulations were promulgated in February 2001, and firms were to be in compliance by March 2004. In late February 2004, the EPA announced two new MACT standards for plywood and composite panel facilities, as well as for boilers at wood products and pulp and paper facilities. Compliance with the standards was required by mid-2007. In June 2010, the EPA proposed MACT standards for commercial and industrial boilers; a final rule was issued in February 2011. EPA promulgated changes in January 2013, which included new rules and resetting the clock for compliance, giving firms more time to install their control equipment.

Industry Guidelines

In addition to the federal environmental regulations, companies in the paper & forest products industry also operate in accordance with industry guidelines. For example, the environmental, health, and safety guidelines of the AF&PA govern most domestic forest industry companies. Specifically, the AF&PA’s Sustainable Forestry Initiative Program (SFIP) oversees the industry’s most exacting and broadly applied standards of forest management. Participants in the SFIP program, all members of the AF&PA, must comply with the program’s guidelines and performance measures in such areas as sustainable forestry, forest and health productivity, legal compliance, protecting special sites, and continual improvement.

HOW TO ANALYZE A COMPANY IN THIS INDUSTRY

At CFRA, we recommend a top-down approach to valuation. An examination of the industry drivers outlined on page 9 – e-commerce retail sales, housing starts, and containerboard, paperboard, and pulp prices – is a good starting point.

Industry Drivers

◆ **E-commerce retail sales.** E-commerce has been growing at a rapid rate, proving to have a significant impact on the demand for corrugated packaging. The increasing adoption of online shopping is a huge growth driver for the global retail e-commerce market. The growing demand for packaged food and the presence of online stores ranging from specialty packaged foods to non-perishable groceries can be purchased online and delivered to the consumer's doorstep, thus driving the paper packaging market.

◆ **Housing starts.** The housing market is the largest end market for lumber and other wood products. As a result, housing starts – the number of residences on which construction has begun during a given period – are a key indicator of the direction and health of the paper & forest products industry. The U.S. Department of Commerce reports monthly on the seasonally adjusted annualized rate of housing starts.

◆ **Gross domestic product.** Compiled quarterly by the U.S. Department of Commerce, gross domestic product (GDP) is a measure of the total value of goods and services produced by labor and property in the U.S. GDP is reported quarterly; calendar-year totals are reported annually.

The growth of GDP is an important indicator of the economy's general health, which tends to have a significant effect on conditions in the paper & forest products industry. Much of the industry shadows GDP growth because staple items that people use in daily living, such as tissues and paper towels, come from this industry. Strong economic growth is not always a positive factor, however, as it can be a precursor to inflation. GDP is watched closely by the Federal Reserve Board (the Fed), which currently tends to favor real growth (that is, growth with inflation factored out) in the range of 3% to 4%. The Fed is apt to raise interest rates if the economy grows too quickly.

◆ **Operating rates.** The operating rate – the proportion of total manufacturing capacity being utilized – is a key indicator of the current health of a given plant or the overall industry. Paper, paperboard, and wood products facilities have significant fixed costs – especially the first two segments. They therefore benefit from a high operating rate, which allows these plants to spread their costs over a greater number of units, typically boosting operating profits. Of course, this is true only if prices being received for a grade exceed the operating costs to make that product.

The AF&PA calculates operating rates for paper and paperboard monthly. For wood products, operating rates are compiled by the AF&PA and APA – The Engineered Wood Association, another industry trade group.

◆ **International trade.** International trade can play an important part in the performance of the paper & forest products industry. A solid level of exports can help the industry to thrive during periods of strength in domestic markets and can keep the industry afloat during difficult times. Imports can also play a positive role when domestic supply is tight. At times, however, heavy imports can depress pricing in the U.S. market, as in the case of Canadian lumber imports at times in the past.

Product Mix

An important factor to examine when reviewing a company in the paper & forest products industry is the product mix, which has a significant influence on a company's financial results and outlook. Although they are influenced by some of the same factors, prices for paper products and wood products are not closely correlated.

In general, a firm that produces more value-added products and relies less on commodity-oriented items will be valued more highly by investors. Most of the industry's products are commodities – goods produced in large volumes with little differentiation among manufacturers. Pricing for commodity products depends on the supply/demand balance and tends to be volatile. To succeed in these markets, companies should have strong sales and financing capabilities, as well as low-cost manufacturing, in order to survive the periods of weak demand or excess supply when manufacturers have little control over selling prices.

Value-added wood products generally target smaller markets, and thus are often impractical for larger manufacturers to produce. Such products frequently consist of certain species of softwood and hardwood lumber, as well as engineered wood products. On the paper side, some smaller firms focus on specialty products, which include premium coated paper, some recycled grades, premium grades of bleached board and Bristol, technical papers, and specialty fibers.

Smaller firms may lack the financial strength to thrive as major players in commodity markets. Manufacturing specialty products can help them to perform steadily despite periods of economic sluggishness. At the same time, a narrow focus may deliver less exceptional earnings during periods of market strength.

It is important to understand the composition of a company's product line within each of the broad categories, along with the market drivers and conditions for each grade. An investor should examine the company's level of product differentiation, its market share, and its cost profile relative to the competition.

Influences on Supply and Demand

The balance (or imbalance) between supply and demand has a major impact on the industry's health. To assess this condition, an investor should consider the following factors: general domestic and international economic prospects; the business outlook for the company's principal customers; the inventory situation in each of a company's product categories; and the production capacity and planned additions in each grade, which affect a company's operating rate.

The relationship between supply and demand in a given commodity grade almost exclusively determines the level and direction of prices. Pricing is exceptionally important for companies in the paper & forest products industry, since it largely determines their net income. Commodity prices are sensitive to economic cycles and capacity additions, and they can also be highly volatile in response to seasonal and economically driven demand shifts and adjustments to inventory levels.

Demand Drivers Vary by Product

For the paper & forest products industry, a key determinant of product demand is the strength of markets served by major customers.

In the paper segment, demand can take on distinct characteristics for different grades. For example, because containerboard is used to make cardboard boxes, demand tends to track the economic cycle. When the economy is strong, more products are shipped, and thus more boxes are needed. For the same reason, containerboard is normally one of the first paper grades to revive when the economy recovers from

recession. Other grades that generally track the economy are coated paper (used in magazines and catalogs), and various printing grades (used for business purposes).

If the economic outlook is uncertain, or if a slowdown appears imminent, companies that produce tissue or bleached board may benefit. These grades are used in consumer staples markets, which are less cyclical than other sectors. The trade-off is that these less-cyclical firms also do not see the dramatic earnings gains that commodity paper and packaging firms can experience during strong economic times.

When forecasting future demand for a grade of paper, specific trends are key indicators. For newsprint and coated paper, these have historically included projections for advertising spending. For containerboard and corrugated containers, the growth rates for nondurable manufactured goods should be considered. Secular trends are also important to consider as the increasing use of electronic forms of communication has had a significant negative impact on the demand for paper, especially newsprint, and, to a lesser degree, printing papers.

In the wood products area, the major determinants of demand are residential homebuilding and remodeling activity, which accounts for about three-fourths of total usage. Factors affecting homebuilding include interest rates, credit availability, employment levels, housing affordability, consumer confidence, and the level of household formations.

Taking Stock of Inventory

Inventory levels and pricing have significant effects on demand. Pricing influences the amount of inventory held by customers, who tend to order extra stock when producers announce price hikes during an industry uptrend. This pattern eventually leads to an inventory buildup. Indeed, when demand far exceeds supply, customers may frantically double- or triple-order as they try to fill their needs. Often, they receive shipments on these orders after economic and industry conditions have begun to slow.

When customer inventory levels grow, manufacturers' price hikes usually near an end, as customers will have no need to place orders for a while. This scenario leads to the down cycle: as paper and wood product makers find that they are suddenly lacking orders, they are forced to reduce prices as an incentive to encourage customers to buy.

Therefore, inventories at both the customer and manufacturer levels should be considered when analyzing a paper & forest product company. These statistics are available through groups such as the AF&PA. In addition, when companies in the paper & forest products industry release earnings, most indicate the inventory situation of their predominant grades.

Capacity Levels

Our discussion of inventory relates to the next topic of importance: changes in industry capacity. Because building a mill is an extremely capital-intensive proposition – particularly in the paper area – operators make every effort to keep their mills running continuously. Companies must take downtime periodically, however, to correct pricing and inventory situations, perform scheduled maintenance, and make repairs.

Most capacity expansions are planned during boom periods, but because construction takes a considerable amount of time, new machines are often not started up until after a down cycle has begun. Increased capacity in a given product area raises the level of supply, which in turn intensifies price competition. Thus, capacity additions tend to increase the severity of industry downturns. Both overcapacity and undercapacity can have a significant impact on a particular grade of paper. Excess capacity will put downward pressure on prices, while undercapacity can lead to price increases when demand rises. Thus, one should pay considerable attention to a company's capacity to produce major grades.

Capacity in the U.S. paper and board segment is reported annually by the AF&PA, and the international situation is surveyed by certain industry research organizations. The capacity data for wood product can be obtained through sources such as RISI and The Engineered Wood Association.

Operating Rates

For the paper & forest products industry as a whole, the operating rate is the percentage of manufacturing capacity used industry-wide in a given period for a particular paper grade. Typically, when utilization rates approach the mid-90% range, they signal a favorable near-term pricing and profit outlook. An examination of an individual company's operating rate will likely provide a clear picture of its profitability. The paper segment's high fixed-cost structure means that a drop in its operating rate will likely lead to a significant decline in its net income, while a rising rate will magnify net income.

Cost Position

The business of manufacturing paper & forest products is cyclical, with pricing largely outside of manufacturers' control; therefore, it is crucial for companies to manage their cost structures to remain competitive. Investors should scrutinize a company's cost structure and examine key cost drivers, such as fiber, energy, transportation, and labor, as well as the age and efficiency of equipment, operating rates, relative cost of capital, environmental compliance costs, and mill locations.

Companies with a greater degree of vertical integration typically have lower-cost positions relative to their less integrated peers, which generally translates into higher profitability. A company in the paper & forest products industry is vertically integrated if it owns timberlands (providing a readily available supply of pulp for paper companies), has energy cogeneration capabilities, adds value through additional processing (e.g., converting containerboard into corrugated boxes), and/or controls its distribution channels.

Analyzing Financial Statements

Income Statement

Sales and operating margins are important factors to analyze on an income statement of a company in the paper & forest products industry.

◆ **Sales.** Of all items on the income statement, sales performance usually reveals the most about the present business situation of a company in the paper & forest products industry. Quarterly changes in sales volume and pricing indicate the recent supply-and-demand levels for a company's product lines and are the principal factors to watch.

Long-term growth trends are important, but it is also useful to look at sequential changes in sales, which offer a better picture of the current industry environment than do year-to-year comparisons. For instance, if selling prices are down on a year-over-year basis, one might think the company is in a bad position. However, in examining sequential trends, one might discover that, after a dramatic nine-month downtrend, prices had turned upward in the most recent quarter, indicating a positive turn in the company's prospects.

When conducting a sequential analysis, the investor should pay attention to whether the company has any seasonal operating patterns. Although most paper companies' operations are not highly seasonal, firms that make cardboard boxes may have somewhat stronger demand after agricultural harvests or before the Christmas holiday season. Those that make notebook paper may have slow growth after September, when demand for school supplies typically declines. Wood product companies, on the other hand, tend to have slower sales in the winter, when cold weather interrupts homebuilding.



Watch Out! Management can boost earnings in the current period by selling off timber and timberlands at its discretion for a gain. Look out for income statement or footnote disclosure of gains on the sale of timberland.

◆ **Operating margins.** Pricing has a significant impact on gross margins (revenues minus the cost of goods sold, expressed as a percentage of sales). Although lower sales prices for paper or wood products are typically accompanied by a downturn in raw materials costs, costs for those materials almost never fall enough to leave a producer's gross margins intact.

Gross margins tend to move in the same direction as major pricing upturns or downturns. Although pricing patterns are very difficult to offset in the gross margin equation, most top companies put considerable effort into establishing operating efficiencies. Such efforts become noticeable when a firm's gross margins remain more stable than those of its peers during difficult industry times.

Costs for selling, marketing, and administrative functions also figure into a company's operating margins. A firm has much greater control over these factors than its raw materials costs. The most successful firms usually make major efforts to control these cost levels.



Watch Out! Companies can use inventory accounting to manipulate margins. Rising inventories can be a sign of a business slowdown. Look out for rising inventory levels relative to cost of sales and changes in inventory accounting policies.

Cash Flow and Balance Sheet Data

In a paper company analysis, an examination of cash flow trends is essential. Cash flow is equal to the firm's net income plus non-cash items such as depreciation and amortization (D&A). Because the overall paper & forest products industry is so cyclical in nature, a large number of industry participants are likely to experience losses during portions of a down cycle. Since most paper companies (and some wood products companies) typically have high debt levels, it is essential to determine whether a company's cash flow levels during hard times will cover interest charges.



Watch Out! Companies in the Paper and Forest Products industry are fixed asset intensive, making depreciation a significant expense for most of these companies. Since depreciation is based on estimates of asset lives, management can manipulate these estimates to manage earnings. Specifically, extending the depreciable life of an asset will boost a company's earnings while shortening depreciable lives will decrease earnings. Look out for declines in depreciation expense relative to gross property plant and equipment (PP&E), longer depreciable lives for PP&E than competitors, and footnote disclosures of change in depreciable lives of PP&E.

The investor should note a firm's traditional level of non-cash charges in order to determine how much loss it can sustain before turning cash flow negative. The firm's traditional or expected level of capital spending should also be observed to determine if recent or expected cash flow will support its programs.

If a firm's cash flow seems unlikely to cover its desired level of capital spending or, in another instance, to finance a sizable acquisition, the firm's long-term debt-to-capitalization ratio must be examined. Most paper product firms have long-term debt in the range of 40% to 60% of capitalization; companies that have made large acquisitions may have higher ratios. Those with lower ratios have greater financial flexibility and more room to borrow in the future.



Watch Out! Some companies engage in supplier financing, arrangements whereby the retailer arranges a financial institution to pay its suppliers and the retailer repays the financial institution later. This effectively lengthens the supplier payment terms and thus improves working capital. However, operating cash flows can be overstated if the cash payment to the financial institution is presented as financing outflows rather than operating cash flows, which would be the case if the company pays the supplier directly. Look out for disclosure of a company's arrangement to finance its payables, substantial increases in accounts payable without a similar increase in inventory and increases in interest expenses and/or disclosure of related interest costs within footnotes.

Acquisitions and divestitures can have a major influence on a firm's balance sheet and operating results; they also provide clues about a company's business strategy. If an operation is purchased or sold, it is important to determine which grades have been added or eliminated, as well as the reasons behind this shift. Sometimes companies sell operations to raise funds to pay down debt or because they lack enthusiasm for a grade's prospects. Conversely, a firm might add operations if it is optimistic about the outlook for a certain grade or believes that the grade has characteristics well suited to its business plan. Companies may also pursue acquisitions in order to add modern, low-cost production facilities.

Equity Valuation

Several different methods can be used to evaluate the attractiveness of an individual paper & forest product company. Because of the cyclical nature of the industry, it may be necessary to use different methods at different times or more than one method at any given time, to get a true picture of the proper value of a stock.

P/E Ratio

The P/E ratio divides the price of a stock at any point in time by the earnings over a one-year period, typically the fiscal year of the company being analyzed. Historical P/E ratios utilize actual earnings for a given year as the denominator and the average stock price for that year as the numerator. Looking at this measure over several years gives an investor a good idea of where the stock has traded historically on average as well as the range over which the stock has fluctuated.

Stocks of companies that have exhibited, and are expected to continue to show, strong earnings growth usually trade at relatively high P/E ratios, while shares of stocks that exhibit highly variable earnings tend to trade at relatively low P/E ratios. Other factors that can affect P/E ratios include debt levels, the track record of management, the level or lack of dividend payouts, and the industry in which the company operates.

Forward-looking P/E ratios use at least a partial estimate of future earnings compared with the current stock price. This P/E is then compared with the historical ratio to determine if the stock appears to be overvalued, undervalued, or in line with its historical levels. Sometimes, a stock's P/E is compared with the average of an appropriate peer group of similar companies to determine if that stock is trading above or below its peers. Stocks with P/Es below their peers or lower than historical averages are frequently viewed as attractive investments, although there can be reasons for stocks to trade at a discount, such as poor financial condition.

Cyclical stocks (such as those in the paper & forest products industry) usually trade at lower P/E levels than the broad market averages because of their cyclical earnings pattern and relatively high debt levels. At certain times, such as when a company has very low earnings or losses, P/E ratios can be of limited value in evaluating stock prices.

Discounted Cash Flow

Because of the limitations of P/E ratios, other methods for valuing paper & forest product stocks are often used. One such method is the discounted cash flow (DCF) model. Compared with the P/E ratio, this

metric is much more complicated, as it involves making estimates for a variety of factors well into the future. However, many investors feel that this gives a true long-term intrinsic value of the stock, since it is based on the fundamental expectations of the business rather than on public market factors or historical precedents.

In DCF analysis, the net present value of projected cash flows for a company, minus the investment needed to generate future cash flows, is calculated. While DCF analysis provides an inherent value of the company based on its ability to generate future cash flows, it is highly dependent on the accuracy of the many assumptions regarding free cash flows, terminal value, and the discount rate.

Sum of the Parts

Another method used by investors in the paper & forest products industry in evaluating their companies is the sum-of-the-parts (SOTP) model. This model has historically been especially appropriate for this sector because many companies in the industry have several different and distinct businesses, and because some of the companies have major land holdings that do not produce significant earnings. However, consolidation in the sector in recent years has made this method less useful.

SOTP, sometimes known as “break-up” analysis, involves adding up the value of a company’s individual businesses to arrive at a total enterprise value (TEV). Equity value is then determined by subtracting net debt and other non-operating adjustments. The first step in SOTP analysis is to determine a value for each segment. After the value of each segment is determined, they are totaled; then, the amount of debt and other non-operating adjustments are subtracted. This figure is divided by the number of shares outstanding to determine a current value for the stock. If that value is significantly more than the current market value of the stock, an investment opportunity may exist.

Investors can also look at a company’s enterprise value to EBITDA (EV/EBITDA) ratio. EV is the market value of a company’s equity shares and debt financing, less cash. EBITDA is indicative of a firm’s earning power, regardless of capital structure, tax planning, or non-cash charges, and can be compared with those of other companies on an apples-to-apples basis. For this reason, EV/EBITDA is the preferred method to valuing merger & acquisition (M&A) multiples.

GLOSSARY

Bristol—A heavy paper (either coated or uncoated) that is used for folders, tags, posters, tickets, and similar products.

Containerboard—Material used in the manufacture of shipping containers and related products can be either solid fiberboard or corrugated and combined board. In its most common combined board form, two sheets of linerboard sandwich a fluted layer of corrugated medium.

Engineered wood products—Composite wood products that use glued fiber, lumber, and/or veneer to meet specific criteria. Examples include laminated veneer lumber (LVL), parallel strand board, I-beams, oriented strand board (OSB), and glue-laminated timber (glu-lams).

Fiber—The principal raw material for making paper; usually wood reduced to fine pieces.

Fine paper—High-grade paper used for copying, tablets, computer forms, envelopes, and printing.

Forestry—The management, protection, and utilization of forest resources. (*See Silviculture.*)

Free sheet—Paper made from chemical pulp that may contain up to 10% mechanical pulp (groundwood), or paper made from pulps having a high degree of “freeness” (the rate at which water drains from a stock suspension through a wire mesh screen or perforated plate).

Grade—A particular type or weight of paper.

Groundwood—Paper and newsprint made from woodchips that have been mechanically ground rather than chemically refined.

Hardwood—Wood from a deciduous tree; generally used for interior construction, making furniture, and some pulp.

Kraft—Heavy paper or paperboard made from unbleached kraft pulp, which is made by boiling wood chips in a sodium and sulfate solution.

Laminate—The act of bonding together two or more pieces of wood to make a single piece, using adhesives and pressure.

Lignin—A substance that combines with cellulose to form the woody cell walls of plants; it is extracted during pulping.

Market pulp—Pulp that is sold (by the company that produced it) on the open market rather than used by the company in the production of its paper grades.

Mechanical pulp—Pulp made by grinding fiber mechanically, as opposed to breaking it down chemically; also called groundwood pulp.

Oriented strand board (OSB)—An engineered wood product manufactured from waterproof heat-cured adhesives and rectangular-shaped wood strands that are arranged in cross-oriented layers, similar to plywood.

Plywood—An engineered wood product manufactured from thin sheets of cross-laminated veneer and bonded under heat and pressure with strong adhesives.

Recovery—The percentage of a log that is processed into salable lumber products by a sawmill.

Recycled fiber—Any fiber resource that is reused to manufacture a new product.

Silviculture—The theory and practice of establishing and maintaining groups of trees (known as stands) for particular management objectives.

Softwood—Wood cut from coniferous trees, such as spruce, fir, and pine, among others; the principal wood used in the construction of houses. It is also used for pulp production.

Sustainable forestry—A forestry method based on meeting present-day supply requirements while keeping future generations in mind. This land stewardship ethic combines the growing and harvesting of trees for useful products with reforestation; the conservation of soil, air, and water quality, biological diversity, and wildlife and aquatic habitat; recreation; and aesthetics.

Ton—A unit of mass of 2,000 pounds; also called a short ton.

Tonne—A metric ton, a unit of mass of 2,240 pounds; also called a long ton.

Veneer—A thin sheet of wood peeled or sawed from a log. Layers of this material are glued together to produce plywood.

INDUSTRY REFERENCES

PERIODICALS

Fortune Business Insights

fortunebusinessinsights.com

The leading publisher delivers market research reports and custom services with keen focus on accuracy of data.

MarketWatch

marketwatch.com

A website that provides financial information, business news, analysis, and stock market data.

MarketingCharts

Marketingcharts.com

MarketingCharts is first and foremost a hub of marketing data, graphics, and analyses.

Paper360

Paper360.tappi.org

A bi-monthly publication dedicated to exploring the links within the pulp and paper industry around the world.

Paper, Paperboard & Wood Pulp Statistical Reports

afandpa.org

Monthly, quarterly, and annually; detailed roundup of pulp, paper, and paperboard statistics.

Pulp & Paper Week

risiinfo.com

Weekly publication providing current news, market analysis (including monthly prices for pulp, paper, and wastepaper markets, as well as inventory and shipment data), and information on mergers, regulations, management changes, and financial results.

Valuates Reports

reports.valuates.com

National Valuates Reports provides premium market research reports customized for specific needs with deep focus on the current market trends with precision.

TRADE ASSOCIATIONS

Audio Publisher Association

audiopub.org

The first and only not-for-profit trade organization of the audiobook industry in the United States.

American Forest & Paper Association (AF&PA)

afandpa.org

National trade organization of the forest, paper, and wood products industries.

Association of American Publishers (AAP)

publishers.org

National trade association of the American book publishing industry.

The Engineered Wood Association (APA)

apawood.org

National trade association representing manufacturers of plywood, oriented strand board (OSB), structural composite panels, glued laminated timber, and wood I-joists.

National Association of Home Builders (NAHB)

nahb.org

One of the largest trade associations in the U.S., it is a representation of the housing industry.

RESEARCH FIRMS

eMarketer

emarketer.com

Market research company that provides insights and trends related to digital marketing, media, and commerce.

Pew Research Center

pewresearch.org

A nonpartisan fact tank that informs the public about the issues, attitudes, and trends shaping the globe. It conducts public opinion polling, demographic research, media content analysis, and other empirical social science research.

RISI, Inc.

risiinfo.com

Private economic forecasting firm for the international forest products industry; formerly called Resource Information Systems Inc.

GOVERNMENT AGENCIES

U.S. Department of Commerce (DOC)

commerce.gov

Government department tasked with promoting economic growth, gathering economic and demographic data for business and government decision-making, and helping to set industrial standards.

U.S. Department of the Treasury (USDT)

treasury.gov

The treasury of the U.S. federal government.

U.S. Environmental Protection Agency (EPA)

epa.gov

Governmental agency charged with protecting public health and safeguarding and improving the natural environment; enforces governmental regulations regarding air, water, and land resources.

COMPARATIVE COMPANY ANALYSIS

		Operating Revenues																
Ticker	Company	Yr. End	Million \$							CAGR (%)			Index Basis (2012=100)					
			2021	2020	2019	2018	2017	2016	2015	10-Yr.	5-Yr.	1-Yr.	2021	2020	2019	2018	2017	2016
PAPER PRODUCTS																		
CLW	§ CLEARWATER PAPER CORPORATION	DEC	1,772.6	1,868.6	1,761.5	1,724.2	1,730.4	1,734.8	1,752.4	-0.8	0.4	-5.1	101	107	101	98	99	99
UFS	DOMTAR CORPORATION	DEC	3,668.0	3,415.0	4,119.0	4,565.0	5,148.0	5,090.0	5,264.0	-4.2	-6.3	7.4	70	65	78	87	98	97
MERC	§ MERCER INTERNATIONAL INC.	DEC	1,803.3	1,423.1	1,624.4	1,457.7	1,169.1	931.6	1,033.2	3.7	14.1	26.7	175	138	157	141	113	90
NP	§ NEENAH, INC.	DEC	1,028.5	792.6	938.5	1,034.9	979.9	941.5	887.7	4.0	1.8	29.8	116	89	106	117	110	106
GLT	§ GLATFELTER CORPORATION	DEC	1,084.7	916.5	927.7	866.3	800.4	761.2	1,666.7	-3.9	7.3	18.4	65	55	56	52	48	46
SWM	§ SCHWEITZER-MAUDUIT INTERNATIONAL, INC.	DEC	1,440.0	1,074.4	1,022.8	1,041.3	982.1	839.9	764.1	6.2	11.4	34.0	188	141	134	136	129	110
FOREST PRODUCTS																		
BCC	§ BOISE CASCADE COMPANY	DEC	7,926.1	5,474.8	4,643.4	4,995.3	4,432.0	3,911.2	3,633.4	13.4	15.2	44.8	218	151	128	137	122	108
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	4,553.0	2,788.0	2,310.0	2,828.0	2,734.0	2,233.4	1,892.5	13.1	15.3	63.3	241	147	122	149	144	118
PAPER PACKAGING																		
AMCR	□ AMCOR PLC	JUN	12,861.0	12,468.0	9,458.0	9,319.1	9,101.0	9,421.3	9,611.8	0.4	6.4	3.2	134	130	98	97	95	98
AVY	□ AVERY DENNISON CORPORATION	JAN	NA	8,408.3	7,070.1	7,159.0	6,613.8	6,086.5	6,086.5	3.7	6.7	20.6	NA	138	116	118	109	100
IP	□ INTERNATIONAL PAPER COMPANY	DEC	19,363.0	17,565.0	18,317.0	23,306.0	21,743.0	19,495.0	20,675.0	-2.9	-0.1	10.2	94	85	89	113	105	94
PKG	□ PACKAGING CORPORATION OF AMERICA	DEC	7,730.3	6,658.2	6,964.3	7,014.6	6,444.9	5,779.0	5,741.7	11.4	6.0	16.1	135	116	121	122	112	101
SEE	□ SEALED AIR CORPORATION	DEC	5,533.8	4,903.2	4,791.1	4,732.7	4,461.6	4,211.3	4,410.3	0.1	5.6	12.9	125	111	109	107	101	95
SON	† SONOCO PRODUCTS COMPANY	DEC	5,590.4	5,237.4	5,374.2	5,390.9	5,036.7	4,782.9	4,964.4	2.2	3.2	6.7	113	106	108	109	101	96
WRK	□ WESTROCK COMPANY	SEP	18,746.1	17,578.8	18,289.0	16,285.1	14,859.7	14,171.8	11,124.8	13.3	5.8	6.6	169	158	164	146	134	127
FORESTRY REITS																		
WY	□ WEYERHAEUSER COMPANY	DEC	10,201.0	7,532.0	6,554.0	7,476.0	7,196.0	6,365.0	5,246.0	5.1	9.9	35.4	194	144	125	143	137	121
RYN	† RAYONIER INC.	DEC	1,109.6	859.2	711.6	816.1	819.6	815.9	568.8	-2.5	6.3	29.1	195	151	125	143	144	143
PCH	† POTLATCHDELTIC CORPORATION	DEC	1,337.4	1,040.9	827.1	974.6	678.6	599.1	575.3	10.4	17.4	28.5	232	181	144	169	118	104

Note: Data as originally reported. CAGR-Compound annual growth rate.

□ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Source: S&P Capital IQ.

Net Income

		Million \$								CAGR (%)			Index Basis (2012=100)						
Ticker	Company	Yr. End	2021	2020	2019	2018	2017	2016	2015	10-Yr.	5-Yr.	1-Yr.	2021	2020	2019	2018	2017	2016	
PAPER PRODUCTS																			
CLW	§ CLEARWATER PAPER CORPORATION	DEC	-28.1	77.1	-5.6	-143.8	97.3	49.6	56.0	NA	NM	NM	-50	138	-10	-257	174	89	
UFS	DOMTAR CORPORATION	DEC	-27.0	-127.0	84.0	283.0	-258.0	128.0	142.0	NA	NM	-78.7	-19	-89	59	199	-182	90	
MERC	§ MERCER INTERNATIONAL INC.	DEC	171.0	-17.2	-9.6	128.6	70.5	34.9	75.5	9.4	37.4	NM	226	-23	-13	170	93	46	
NP	§ NEENAH, INC.	DEC	-24.9	-15.8	55.4	36.4	80.3	73.0	51.1	NA	NM	57.6	-49	-31	108	71	157	143	
GLT	§ GLATFELTER CORPORATION	DEC	6.9	21.3	-21.5	-177.6	7.9	21.6	64.6	-16.6	-20.3	-67.4	11	33	-33	-275	12	33	
SWM	§ SCHWEITZER-MAUDUIT INTERNATIONAL, INC.	DEC	88.9	83.8	85.8	94.5	34.5	82.8	89.7	-0.4	1.4	6.1	99	93	96	105	38	92	
FOREST PRODUCTS																			
BCC	§ BOISE CASCADE COMPANY	DEC	712.5	175.0	80.9	20.5	83.0	38.3	52.2	NA	79.5	307.2	1365	335	155	39	159	73	
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	1,377.0	499.0	-5.0	395.0	390.0	149.8	-88.1	NA	55.8	176.0	NM	-566	6	-448	-443	-170	
PAPER PACKAGING																			
AMCR	▯ AMCOR PLC	JUN	939.0	612.0	430.0	575.2	564.0	244.1	680.3	10.2	30.9	53.4	138	90	63	85	83	36	
AVY	▯ AVERY DENNISON CORPORATION	JAN	NA	740.1	303.6	467.4	281.8	320.7	320.7	14.6	18.2	33.1	NA	231	95	146	88	100	
IP	▯ INTERNATIONAL PAPER COMPANY	DEC	1,752.0	482.0	1,225.0	2,012.0	2,144.0	904.0	938.0	2.9	14.1	263.5	187	51	131	214	229	96	
PKG	▯ PACKAGING CORPORATION OF AMERICA	DEC	841.1	461.0	696.4	738.0	668.6	449.6	436.8	18.2	13.3	82.5	193	106	159	169	153	103	
SEE	▯ SEALED AIR CORPORATION	DEC	506.8	502.9	263.0	193.1	814.9	486.4	335.4	13.0	0.8	0.8	151	150	78	58	243	145	
SON	† SONOCO PRODUCTS COMPANY	DEC	-85.5	207.5	291.8	313.6	175.3	286.4	250.1	NA	NM	NM	-34	83	117	125	70	115	
WRK	▯ WESTROCK COMPANY	SEP	838.3	-690.9	862.9	1,906.1	708.2	-396.3	507.1	19.5	NM	NM	165	-136	170	376	140	-78	
FORESTRY REITS																			
WY	▯ WEYERHAEUSER COMPANY	DEC	2,607.0	797.0	-76.0	748.0	582.0	1,027.0	506.0	22.9	20.5	227.1	515	158	-15	148	115	203	
RYN	† RAYONIER INC.	DEC	152.6	37.1	59.1	102.2	151.7	212.0	46.2	-5.8	-6.4	311.4	330	80	128	221	329	459	
PCH	† POTLATCHDELTIC CORPORATION	DEC	423.9	166.8	55.7	122.9	86.5	10.9	31.7	26.5	107.8	154.1	1337	526	176	387	273	34	

Note: Data as originally reported. CAGR-Compound annual growth rate.

□ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Source: S&P Capital IQ.

Ticker	Company	Yr. End	Return on Revenues (%)						Return on Assets (%)						Return on Equity (%)					
			2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
PAPER PRODUCTS																				
CLW	§ CLEARWATER PAPER CORPORATION	DEC	NM	4.1	NM	NM	5.6	2.9	NM	4.3	NM	NM	5.4	2.9	NM	16.2	NM	NM	18.6	10.5
UFS	DOMTAR CORPORATION	DEC	NM	NM	2.0	6.2	NM	2.5	NM	NM	1.7	5.7	NM	2.3	NM	NM	2.7	11.2	NM	4.8
MERC	§ MERCER INTERNATIONAL INC.	DEC	9.5	NM	NM	8.8	6.0	3.8	7.3	NM	NM	6.5	4.1	3.0	26.4	NM	NM	22.7	15.2	9.2
NP	§ NEENAH, INC.	DEC	NM	NM	5.9	3.5	8.2	7.8	NM	NM	6.7	4.2	8.9	9.5	NM	NM	13.9	9.4	21.8	22.6
GLT	§ GLATFELTER CORPORATION	DEC	0.6	2.3	NM	NM	1.0	2.8	0.4	1.7	NM	NM	0.5	1.4	1.2	3.7	NM	NM	NM	NM
SWM	§ SCHWEITZER-MAUDUIT INTERNATIONAL, INC.	DEC	6.2	7.8	8.4	9.1	3.5	9.9	3.7	5.3	5.8	6.4	2.2	7.1	13.4	13.4	14.8	17.2	6.5	17.0
FOREST PRODUCTS																				
BCC	§ BOISE CASCADE COMPANY	DEC	9.0	3.2	1.7	0.4	1.9	1.0	27.7	8.9	4.8	1.3	5.2	2.7	64.7	22.5	11.8	3.0	13.2	6.9
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	30.2	17.9	NM	14.0	14.3	6.7	62.8	23.9	NM	15.7	15.9	7.4	110.6	44.3	NM	24.1	27.9	13.6
PAPER PACKAGING																				
AMCR	▯ AMCOR PLC	JUN	7.3	4.9	4.5	6.2	6.2	2.6	5.5	3.7	2.5	6.4	6.2	2.8	20.0	12.0	13.7	75.0	67.7	22.5
AVY	▯ AVERY DENNISON CORPORATION	JAN	NA	8.8	8.0	4.3	6.5	4.3	NA	9.3	9.1	5.5	9.0	5.5	0.0	43.4	41.3	28.1	46.7	28.6
IP	▯ INTERNATIONAL PAPER COMPANY	DEC	9.0	2.7	6.7	8.6	9.9	4.6	6.9	1.5	3.7	6.0	6.3	2.7	13.3	3.0	9.2	24.0	38.7	19.4
PKG	▯ PACKAGING CORPORATION OF AMERICA	DEC	10.9	6.9	10.0	10.5	10.4	7.8	10.7	6.2	9.6	11.2	10.8	7.8	24.5	14.6	24.3	30.4	33.9	26.5
SEE	▯ SEALED AIR CORPORATION	DEC	9.2	10.3	5.5	4.1	18.3	11.5	8.1	8.3	4.6	3.8	15.4	6.6	233.2	NM	NM	NM	16.5	51.4
SON	† SONOCO PRODUCTS COMPANY	DEC	NM	4.0	5.4	5.8	3.5	6.0	NM	3.9	5.7	6.8	3.8	7.3	NM	11.1	16.3	18.0	10.8	18.6
WRK	▯ WESTROCK COMPANY	SEP	4.5	NM	4.7	11.7	4.8	NM	2.9	NM	2.9	7.5	2.8	NM	7.5	NM	7.5	17.5	6.9	1.4
FORESTRY REITS																				
WY	▯ WEYERHAEUSER COMPANY	DEC	25.6	10.6	NM	10.0	8.1	16.1	14.8	4.9	NM	4.3	3.2	5.3	26.7	9.4	NM	8.3	6.4	5.9
RYN	† RAYONIER INC.	DEC	13.7	4.3	8.3	12.5	18.5	26.0	4.2	1.0	2.1	3.7	5.3	7.9	10.7	1.7	3.8	6.4	10.3	15.2
PCH	† POTLATCHDELTIC CORPORATION	DEC	31.7	16.0	6.7	12.6	12.7	1.8	16.7	7.0	2.5	5.3	9.1	1.2	29.9	13.2	4.4	16.2	48.5	6.1

Note: Data as originally reported. CAGR-Compound annual growth rate.

▯ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Source: S&P Capital IQ.

Ticker	Company	Yr. End	Current Ratio						Debt/Capital Ratio (%)						Debt as a % of Net Working Capital					
			2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
PAPER PRODUCTS																				
CLW	§ CLEARWATER PAPER CORPORATION	DEC	1.9	1.9	1.7	1.0	1.1	1.2	54.8	57.2	66.7	61.1	63.3	67.8	266.0	303.0	466.0	NM	2,163.4	881.2
UFS	DOMTAR CORPORATION	DEC	2.0	3.0	2.0	2.0	2.2	2.1	51.6	32.2	28.4	24.9	31.0	31.6	180.8	62.6	124.7	104.5	121.7	150.9
MERC	§ MERCER INTERNATIONAL INC.	DEC	3.8	4.1	3.3	4.1	2.0	4.3	63.0	65.6	66.4	64.2	54.6	62.0	151.3	172.7	184.9	169.2	157.2	200.1
NP	§ NEENAH, INC.	DEC	2.0	2.3	2.5	2.3	2.3	2.2	57.9	34.0	32.8	37.8	38.9	39.4	252.8	122.0	130.1	150.7	158.2	171.2
GLT	§ GLATFELTER CORPORATION	DEC	1.7	1.9	2.1	2.0	1.7	1.5	59.4	33.3	37.7	42.7	39.9	35.7	286.7	131.4	136.5	169.6	197.7	212.4
SWM	§ SCHWEITZER-MAUDUIT INTERNATIONAL, INC.	DEC	2.6	2.4	2.7	3.0	2.9	2.7	65.0	47.8	47.4	52.4	55.3	46.3	348.5	259.4	199.3	214.9	236.0	191.6
FOREST PRODUCTS																				
BCC	§ BOISE CASCADE COMPANY	DEC	2.9	2.5	2.7	2.7	2.4	2.4	24.7	34.3	38.6	39.5	39.4	43.0	35.7	56.6	69.1	71.3	79.5	97.8
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	2.5	3.5	2.5	4.9	5.0	4.4	21.8	21.9	25.7	16.9	17.9	23.8	64.2	49.2	92.5	33.8	32.1	48.0
PAPER PACKAGING																				
AMCR	▯ AMCOR PLC	JUN	1.2	1.1	1.1	0.7	0.8	0.9	57.0	58.0	55.5	114.2	97.9	94.0	679.0	1,103.7	911.8	NM	NM	NM
AVY	▯ AVERY DENNISON CORPORATION	JAN	NA	1.1	1.3	1.0	1.2	1.1	NA	65.8	59.8	61.4	72.1	66.6	NA	1,659.2	433.5	1,896.3	646.8	585.0
IP	▯ INTERNATIONAL PAPER COMPANY	DEC	1.7	1.4	0.8	1.5	1.6	1.6	37.0	50.4	55.4	60.1	62.4	71.8	180.5	270.4	NM	452.5	341.6	425.8
PKG	▯ PACKAGING CORPORATION OF AMERICA	DEC	3.1	3.5	3.4	3.0	2.3	2.7	40.7	43.3	44.6	48.2	53.2	59.8	133.7	126.0	141.2	174.7	229.2	244.7
SEE	▯ SEALED AIR CORPORATION	DEC	1.0	1.4	1.1	1.0	1.4	1.0	92.8	95.7	108.5	120.1	96.2	88.0	5,139.2	722.6	2,949.0	5,240.6	666.9	3,993.4
SON	† SONOCO PRODUCTS COMPANY	DEC	1.1	1.2	1.1	1.4	1.6	1.7	38.3	38.8	47.6	44.2	46.8	39.6	862.0	379.8	1,217.5	300.2	250.5	186.9
WRK	▯ WESTROCK COMPANY	SEP	1.6	1.7	1.4	1.4	1.5	1.8	39.9	45.6	44.8	33.1	35.7	35.8	385.5	443.6	611.1	390.9	389.9	317.8
FORESTRY REITS																				
WY	▯ WEYERHAEUSER COMPANY	DEC	3.3	1.7	1.6	0.8	1.5	1.3	32.1	37.9	44.5	40.4	41.2	42.7	233.8	808.0	1,054.0	NM	1,133.1	1,644.2
RYN	† RAYONIER INC.	DEC	1.9	1.9	0.8	3.4	2.7	1.8	39.2	41.7	39.0	24.7	37.7	40.9	572.8	1,794.2	NM	441.3	890.6	1,422.6
PCH	† POTLATCHDELTIC CORPORATION	DEC	3.3	2.6	1.6	1.9	2.6	2.7	32.6	36.9	37.4	35.3	73.6	78.6	250.6	350.9	1,044.2	570.5	471.7	556.0

Note: Data as originally reported. CAGR-Compound annual growth rate.

□ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Source: S&P Capital IQ.

Ticker	Company	Yr. End	Price/Earnings Ratio (High-Low)						Dividend Payout Ratio (%)						Dividend Yield (High-Low, %)					
			2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
PAPER PRODUCTS																				
CLW	§ CLEARWATER PAPER CORPORATION	DEC	NM - NM	9 - 3	NM - NM	NM - NM	11 - 7	24 - 12	0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
UFS	DOMTAR CORPORATION	DEC		NM - NM	51 - 31	16 - 11	NM - NM	27 - 21	0.0	NM	131.0	38.2	NM	79.7	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
MERC	§ MERCER INTERNATIONAL INC.	DEC	7 - 4	NM - NM	NM - NM	10 - 5	14 - 10	20 - 11	10.0	NM	NM	31.7	42.4	85.1	2.6 - 1.7	3.2 - 1.5	8.1 - 2.5	5.2 - 3.1	4.2 - 2.6	4.8 - 3.2
NP	NOVELPLUS TECHNOLOGY BERHAD	DEC	NM - NM	NA - NA	NA - NA				0.0	0.0	0.0	0.0	0.0	0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
GLT	§ GLATFELTER CORPORATION	DEC	122 - 87	38 - 21	NM - NM	NM - NM	138 - 92	50 - 29	352.6	110.3	NM	NM	284.1	100.2	24.0 - 3.0	4.1 - 2.8	5.2 - 2.7	5.4 - 2.8	4.2 - 2.2	3.1 - 2.0
SWM	SEVEN WEST MEDIA LIMITED	JUN	3 - 0	NM - NM	NM - NM	10 - 5	NM - NM	10 - 5	0.0	0.0	0.0	22.7	NM	65.6	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	8.3 - 0.0	11.9 - 5.1
FOREST PRODUCTS																				
BCC	§ BOISE CASCADE COMPANY	DEC	4 - 3	11 - 5	19 - 11	93 - 42	19 - 10	28 - 14	12.9	43.1	18.5	57.2	3.3	0.0	10.8 - 6.4	10.0 - 2.8	6.8 - 2.9	4.0 - 1.0	1.4 - 0.6	0.8 - 0.7
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	6 - 3	9 - 3	NM - NM	11 - 7	11 - 7	20 - 13	4.8	13.0	NM	18.7	0.0	0.0	1.8 - 0.9	1.7 - 0.9	4.2 - 1.6	2.5 - 1.8	2.5 - 1.6	0.0 - 0.0
PAPER PACKAGING																				
AMCR	□ AMCOR PLC	JUN	21 - 16	31 - 16	32 - 29	NA - NA	NA - NA	NA - NA	77.5	122.2	154.9	89.6	85.2	191.2	4.4 - 3.6	5.0 - 3.8	7.7 - 4.1	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
AVY	□ AVERY DENNISON CORPORATION	JAN	18 - 9	20 - 15	34 - 23	23 - 14	25 - 19	18 - 14	NA	29.8	35.4	62.5	37.4	55.2	1.7 - 1.2	2.9 - 1.6	2.4 - 1.7	2.5 - 1.5	2.3 - 1.5	2.5 - 2.0
IP	□ INTERNATIONAL PAPER COMPANY	DEC	14 - 10	42 - 22	15 - 12	13 - 8	11 - 10	25 - 15	44.5	167.2	65.0	39.2	35.9	81.1	5.9 - 3.7	4.5 - 3.2	7.7 - 4.0	5.4 - 4.2	5.0 - 2.9	3.7 - 3.2
PKG	□ PACKAGING CORPORATION OF AMERICA	DEC	17 - 14	28 - 16	15 - 11	17 - 10	17 - 12	18 - 9	45.2	65.0	42.9	36.3	35.5	48.1	4.5 - 2.4	3.1 - 2.3	4.1 - 2.3	4.1 - 2.8	3.8 - 1.9	3.0 - 2.1
SEE	□ SEALED AIR CORPORATION	DEC	20 - 12	14 - 5	28 - 20	41 - 25	12 - 10	21 - 15	22.8	20.0	37.7	53.9	14.7	25.0	1.8 - 1.1	1.5 - 1.1	3.6 - 1.4	2.0 - 1.4	2.1 - 1.3	1.5 - 1.3
SON	† SONOCO PRODUCTS COMPANY	DEC	NM - NM	30 - 18	23 - 18	19 - 15	32 - 27	19 - 13	NM	83.2	58.3	51.5	87.3	51.1	3.8 - 2.7	3.1 - 2.6	4.5 - 2.8	3.3 - 2.6	3.3 - 2.8	3.3 - 2.7
WRK	□ WESTROCK COMPANY	SEP	20 - 11	NM - NM	16 - 10	9 - 7	21 - 16	NM - NM	27.9	NM	54.2	23.1	56.9	NM	2.6 - 1.8	2.5 - 1.4	8.4 - 2.4	5.6 - 3.0	3.1 - 2.4	3.6 - 2.7
FORESTRY REITS																				
WY	□ WEYERHAEUSER COMPANY	DEC	12 - 9	32 - 13	NM - NM	39 - 21	47 - 39	24 - 16	19.5	47.8	NM	133.0	161.7	92.9	2.6 - 1.6	2.4 - 1.7	4.8 - 0.0	6.4 - 4.5	5.2 - 3.3	4.1 - 3.4
RYN	† RAYONIER INC.	DEC	38 - 27	118 - 68	72 - 57	50 - 34	27 - 22	16 - 11	100.6	394.6	238.7	133.8	27.0	58.0	3.8 - 2.4	3.8 - 2.6	5.8 - 3.3	4.1 - 3.3	3.6 - 2.6	3.8 - 3.1
PCH	† POTLATCHDELTIC CORPORATION	DEC	10 - 8	21 - 9	54 - 37	27 - 14	25 - 19	162 - 92	91.6	64.6	193.5	83.3	71.6	556.2	4.5 - 2.9	3.6 - 2.6	6.8 - 3.4	5.5 - 3.6	4.7 - 2.9	3.8 - 2.8

Note: Data as originally reported. CAGR-Compound annual growth rate.

□ Company included in the S&P 500. † Company included in the S&P MidCap 400. § Company included in the S&P SmallCap 600. # Of the following calendar year.

Source: S&P Capital IQ.

Ticker	Company	Yr. End	Earnings per Share (\$)						Tangible Book Value per Share (\$)						Share Price (High-Low, \$)					
			2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016	2021	2020	2019	2018	2017	2016
PAPER PRODUCTS																				
CLW	§ CLEARWATER PAPER CORPORATION	DEC	-1.7	4.6	-0.3	-8.7	5.9	2.9	30.7	31.4	23.0	22.3	18.2	11.2	45.8 - 27.3	42.5 - 11.9	35.3 - 13.9	50.6 - 21.6	67.5 - 42.2	69.8 - 32.0
UFS	DOMTAR CORPORATION	DEC	0.0	-2.3	1.4	4.5	-4.1	2.0	0.0	40.4	41.2	30.9	29.5	24.3	71.0 - 37.1	52.4 - 25.3	70.9 - 42.2	70.9 - 46.5	64.4 - 47.0	55.1 - 41.6
MERC	§ MERCER INTERNATIONAL INC.	DEC	2.6	-0.3	-0.2	2.0	1.1	0.5	9.8	8.4	7.6	8.1	8.1	5.7	18.1 - 9.5	13.4 - 5.8	17.7 - 10.1	19.1 - 9.4	15.0 - 10.4	10.8 - 5.9
NP	NOVELPLUS TECHNOLOGY BERHAD	DEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3 - 0.2	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
GLT	§ GLATFELTER CORPORATION	DEC	0.2	0.5	-0.5	-4.1	0.2	0.5	3.4	7.5	7.3	6.6	13.0	12.0	19.5 - 13.3	18.4 - 9.4	19.0 - 9.3	23.9 - 9.4	25.6 - 16.5	25.5 - 14.1
SWM	SEVEN WEST MEDIA LIMITED	JUN	0.2	-0.1	-0.2	0.1	-0.5	0.1	-0.4	-0.5	-0.4	-0.3	-0.4	-0.2	0.7 - 0.3	0.3 - 0.1	0.6 - 0.3	1.1 - 0.5	0.9 - 0.6	1.2 - 0.7
FOREST PRODUCTS																				
BCC	§ BOISE CASCADE COMPANY	DEC	18.0	4.4	2.1	0.5	2.1	1.0	32.3	19.6	15.9	15.3	15.5	13.1	78.4 - 45.8	50.4 - 20.1	40.1 - 22.1	49.3 - 22.0	41.0 - 22.6	30.0 - 13.8
LPX	† LOUISIANA-PACIFIC CORPORATION	DEC	14.1	4.5	0.0	2.7	2.7	1.0	14.0	11.2	8.4	12.2	10.9	8.2	79.7 - 36.7	40.8 - 13.0	30.3 - 20.7	32.2 - 20.4	29.4 - 18.7	21.2 - 13.3
PAPER PACKAGING																				
AMCR	▯ AMCOR PLC	JUN	0.6	0.4	0.4	0.5	0.5	0.2	-1.6	-1.7	-1.1	-1.5	-1.4	-1.1	12.9 - 10.3	12.4 - 5.8	11.8 - 9.2	0.0 - 0.0	0.0 - 0.0	0.0 - 0.0
AVY	▯ AVERY DENNISON CORPORATION	JAN	NA	8.8	6.6	3.6	5.3	3.1	NA	-12.0	-0.2	-0.1	-3.1	-2.6	229.2 - 147.4	156.8 - 77.0	134.6 - 86.9	123.7 - 82.9	117.9 - 69.5	79.3 - 57.1
IP	▯ INTERNATIONAL PAPER COMPANY	DEC	4.5	1.2	3.1	4.9	5.1	2.2	15.7	12.1	11.1	10.0	7.5	2.4	65.3 - 43.9	52.0 - 26.4	48.2 - 36.5	66.9 - 37.6	59.0 - 49.6	54.7 - 32.5
PKG	▯ PACKAGING CORPORATION OF AMERICA	DEC	8.8	4.8	7.3	7.8	7.1	4.8	25.5	22.1	19.3	14.7	9.5	7.0	156.5 - 124.8	139.0 - 71.1	114.8 - 81.9	131.1 - 77.9	121.4 - 84.0	88.4 - 44.3
SEE	▯ SEALED AIR CORPORATION	DEC	3.3	3.2	1.7	1.2	4.3	2.5	-14.1	-14.3	-16.8	-15.4	-11.1	-6.8	68.0 - 41.8	46.4 - 17.1	47.1 - 34.3	49.9 - 30.2	50.6 - 41.2	52.8 - 38.0
SON	† SONOCO PRODUCTS COMPANY	DEC	-0.9	2.1	2.9	3.1	1.7	2.8	2.4	1.9	-0.1	1.0	1.3	2.2	69.8 - 54.8	62.5 - 37.3	66.6 - 51.3	58.7 - 46.6	55.8 - 47.1	55.5 - 36.6
WRK	▯ WESTROCK COMPANY	SEP	3.1	-2.7	3.3	7.3	2.8	-1.5	9.0	3.8	1.3	10.9	5.8	9.4	62.0 - 40.0	45.6 - 21.5	43.4 - 31.9	71.6 - 35.2	64.9 - 49.2	53.6 - 29.7
FORESTRY REITS																				
WY	▯ WEYERHAEUSER COMPANY	DEC	3.5	1.1	-0.1	1.0	0.8	1.4	14.4	11.7	11.0	12.1	11.8	12.2	41.7 - 30.9	34.7 - 13.1	30.3 - 20.9	38.4 - 20.5	36.9 - 29.9	33.3 - 22.1
RYN	† RAYONIER INC.	DEC	1.1	0.3	0.5	0.8	1.2	1.7	12.1	10.6	11.1	14.5	12.3	11.4	41.1 - 28.9	33.1 - 16.0	33.1 - 25.8	39.7 - 26.3	31.9 - 26.5	28.5 - 17.9
PCH	† POTLATCHDELTIC CORPORATION	DEC	6.3	2.5	0.8	2.0	2.1	0.3	21.9	19.3	18.0	19.2	4.9	3.9	65.7 - 46.9	51.7 - 22.4	44.7 - 29.8	55.8 - 28.1	56.4 - 39.1	44.0 - 24.0

Note: Data as originally reported. CAGR-Compound annual growth rate.

□Company included in the S&P 500. †Company included in the S&P MidCap 400. §Company included in the S&P SmallCap 600. #Of the following calendar year.

Source: S&P Capital IQ.

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