



Timber End-Markets and the Digital Economy

Timberland Investment Group

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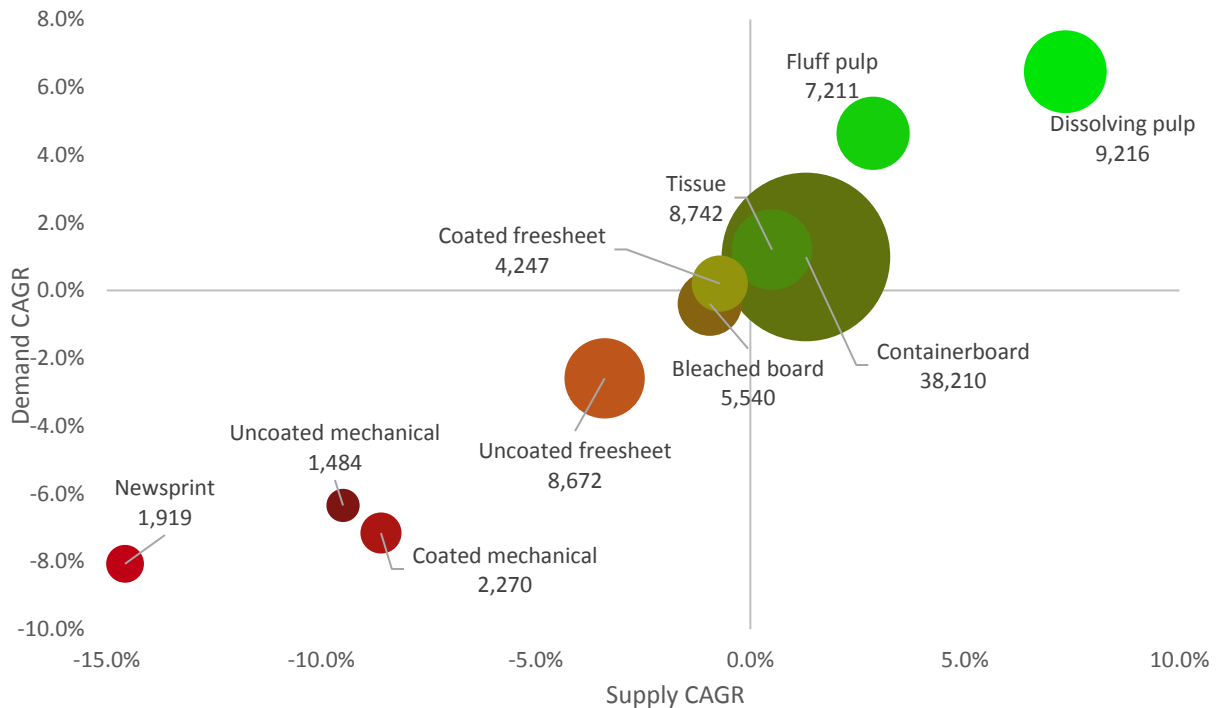
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Timber End-Markets and the Digital Economy

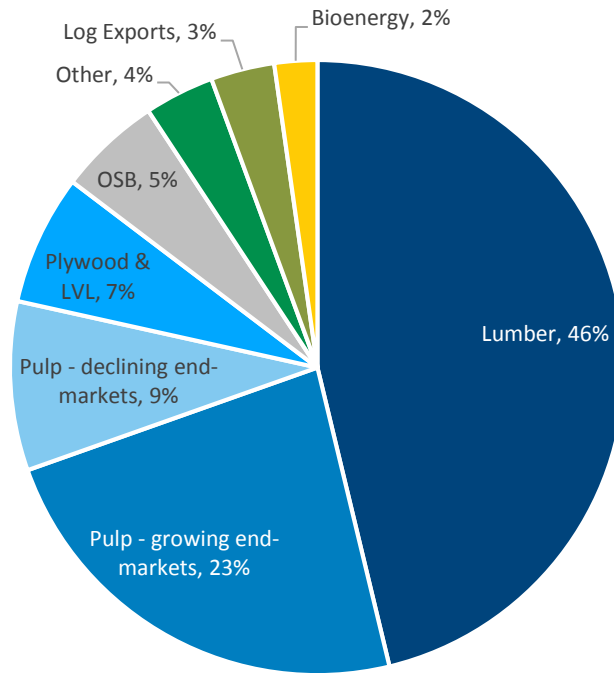
The rise of the digital economy has driven fundamental changes in United States (“US”) end-market demand for timber, especially pulpwood, over the past two decades. In aggregate, board, printing & writing papers, newsprint, tissue, and pulp end-markets comprise 32% of total US softwood demand. Demand for containerboard and tissue has grown with increased e-commerce activity and home delivery of consumer goods, while demand for printing & writing papers and newsprint has declined due to increasing workplace efficiency, resulting in more electronic storage and less reliance on business forms and paper files. Consequently, several mills producing printing & writing grades and newsprint have closed or converted into facilities for growing end-markets such as containerboard and tissue. And, most new capacity has targeted containerboard and tissue end-markets as opposed to paper & writing or newsprint. Separately, dissolving pulp capacity is growing partly due to demand for tablets and other technology utilizing LCD screens (dissolving pulp is converted into a polarizing film used in LCD screens), while demand for fluff pulp (used primarily in diapers and other absorbent products) continues to grow due to emerging market development, a growing global population, and rising incomes. Despite the disruptions caused by these market changes, it is important to note that the demand increase from these growing end-markets more than outweighs the demand loss from declining markets (Figure 1) and that US timber demand remains robust overall. Of all the softwood timber consumed in the US (including wood products, which are not analyzed in this report), 82% is derived from growing end-markets (Figure 2). Moreover, those end-markets currently in secular decline should stabilize at some point as supply and demand reach equilibrium.

Figure 1: Growing timber end-markets versus declining timber end-markets



Source: RISI; TIG Analysis. Note: Size of bubble based on market size in thousands of tons; CAGR since 2010

Figure 2: 82% of all softwood consumed in the US is derived from growing end-markets



Source: FEA; RISI; TIG Analysis; (1) Pulp includes pulp, printing & writing papers, and board

Growing Timber End-Markets

Containerboard, tissue, dissolving pulp, and fluff pulp represent growing timber end-markets in the US. The growth in containerboard has been driven by improving industrial production, increased agriculture (e.g., fruits and vegetables shipped from the West Coast), shifting consumer preferences for fresh food over processed food, and expanding e-commerce, which increase demand for packaging materials. Growth in tissue is primarily due to an increasing US population and improving macro environment. Meanwhile, dissolving pulp continues to grow given increasing demand for electronics, cigarettes (internationally), and pharmaceuticals and food, while demand for fluff pulp is growing due to emerging market development, an increasing global population, an increase in the number of older adults (fluff pulp is used to make incontinence products), and rising incomes.

Containerboard

The US containerboard market represents 32-33 million tons of demand on an annual basis. Containerboard (Figure 3) has two grades, linerboard and corrugated medium, which when glued together produce corrugated packaging (e.g., boxes). Virgin containerboard, which represents 70% of the overall market, is produced using softwood timber while recycled containerboard is produced using old corrugated cartons (“OCC”).

Figure 3: Containerboard



Source: Getty Images

Containerboard is a growing end-market that is used in a variety of applications ranging from corrugated shipping boxes to point-of-sale displays. Since 2013, corrugated box demand has increased at a compounded annual growth rate (“CAGR”) of 1.7% (Figure 4). This improvement has been driven by an increase in industrial production of non-durable goods. In particular, protein and agriculture markets, which comprise 25% of the box market, are strong. Consumer preferences have also shifted to more fresh food, which requires greater shipments in boxes from the field to the store. Last, there has been strong growth in e-commerce that has led to increased box demand for direct-to-consumer package deliveries. E-commerce constitutes 10% of box shipments (Figure 5).

Figure 4. Year-over-year change in US box demand shipments

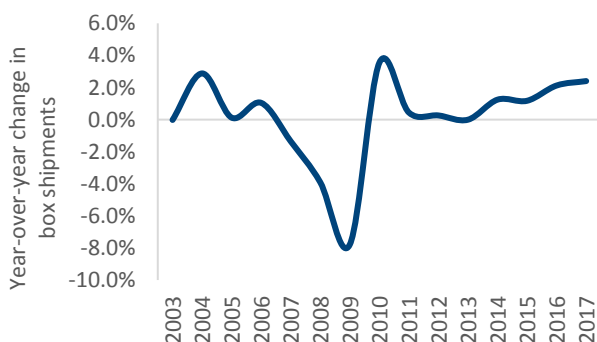
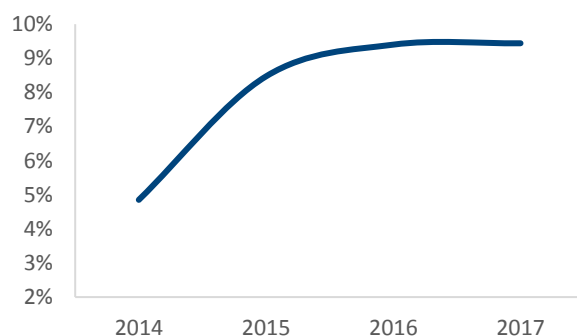


Figure 5. Ecommerce box shipments as a % of total box shipments



Sources: Fibre Box Association; TIG Analysis

Given containerboard's growth dynamic and profitability (please refer to section "Relative Profitability also a Driver of Shifting End-Markets" below), several mills have converted from production of declining and less profitable grades of paper, such as uncoated freesheet, to containerboard. In aggregate, six mills have converted to containerboard over the last five years adding over 1.9 million tons of containerboard capacity, or an increase of 5% of total US capacity (Table 1).

Table 1: Mill conversions to containerboard

Mill Project	Location	Date	Capacity (tons)
SP Fiber	Dublin, GA	2013	390,000
Packaging Corp	DeRidder, LA	2014	355,000
SP Fiber	Newberg, OR	2015	200,000
Corrugated Supplies	Alsip, IL	2015	190,000
Packaging Corp	Wallula, WA	2018	400,000
International Paper	Selma, AL	2019	450,000
Total			1,985,000

Sources: Company Reports; TIG Analysis

Importantly, most of these conversions continue to consume softwood timber given existing pulp lines at the mills. That said, the 1.3 million tons of greenfield containerboard capacity that has been added over the last five years utilize OCC (Table 2).

Table 2: Greenfield mills

Mill Project	Location	Date	Capacity (tons)
Norampac	Niagara Falls, NY	2013	540,000
Pratt	Valparaiso, IN	2015	360,000
Corrugated Supplies	Midwest	2017	350,000
Total			1,250,000

Sources: Company Reports; TIG Analysis

Tissue

Annually, the US tissue market represents 8.5-9.0 million tons of demand (Figure 6 & 7) with at-home tissue comprising 5.5 million tons and away-from-home tissue (hotels, restaurants, offices, factories, and other commercial markets) comprising 3.0-3.5 million tons.

Figure 6. Tissue



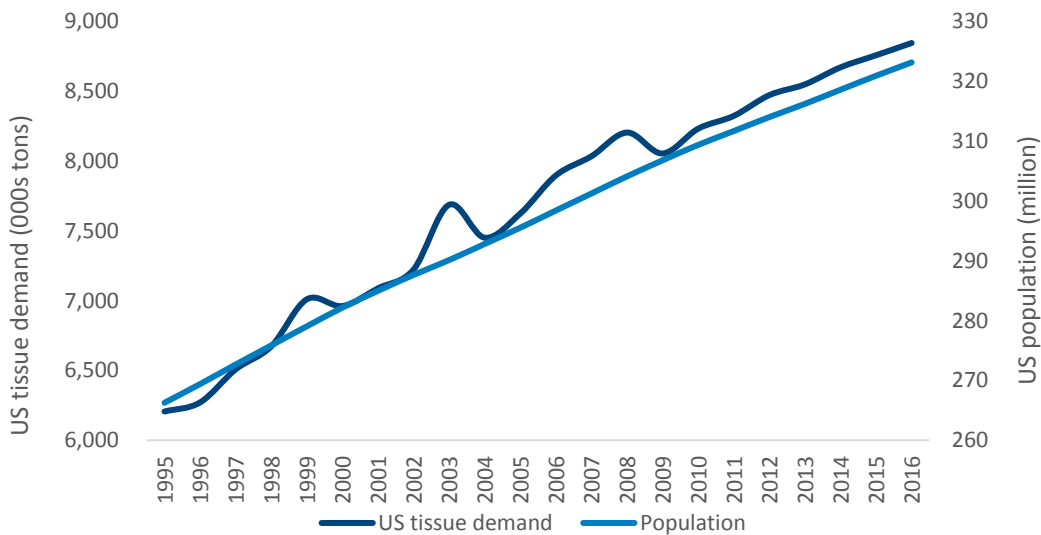
Figure 7. Napkins



Sources: Getty Images

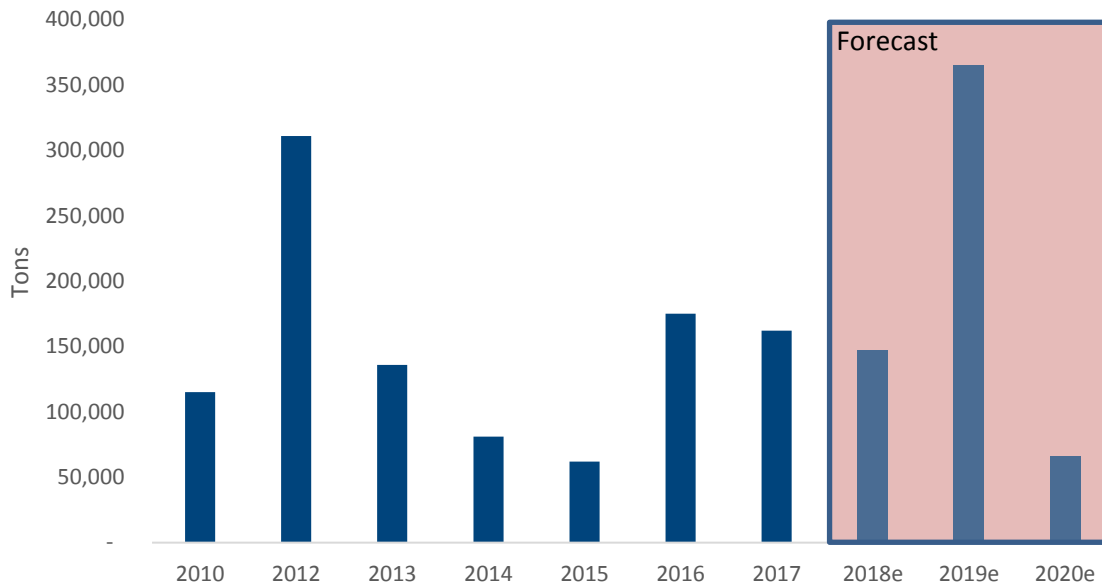
Tissue is a growing end-market used in a variety of applications including facial, bath, and toilet tissue, paper towels, and napkins. The market also includes absorbent products such as diapers, wipes, and feminine hygiene products. Since 2000, tissue demand has increased at a CAGR of 1.5% due to US population growth (which has averaged 1% per annum since 2000), increasing US employment, and an improving macro environment (Figure 8). Given tissue’s growth dynamic, tissue capacity continues to increase (Figure 9).

Figure 8: US tissue demand and population growth



Sources: RISI; World Bank; TIG Analysis

Figure 9: Historical and Forecasted US Tissue Capacity Additions by Year



Sources: RISI; Company Reports; TIG Analysis

Dissolving Pulp

The global dissolving pulp market represents 8 million tons of demand annually. Of that demand, commodity viscose, which is primarily converted into viscose staple fiber to manufacture textiles, accounts for close to 5.5-6.0 million tons, while hi-alpha dissolving pulp (acetate for cigarette filters and LCD screens; high-value ethers for pharma and food products; other for cords, casings, and other products) accounts for the remainder (Figure 10, 11, 12, & 13). China accounts for close to 60% of global demand.

Figure 10. Polarizing film in LCD screens



Sources: Getty Images

Figure 11. Cigarette filters



Figure 12. Tire cord



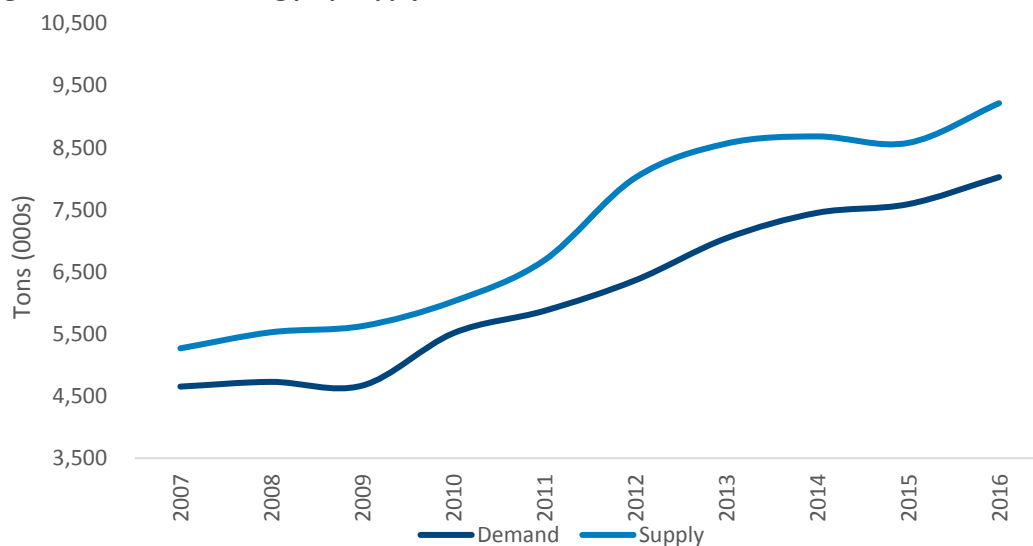
Sources: Getty Images

Figure 13. Paint



Dissolving pulp is a rapidly growing end-market. Since 2007, global demand has increased at a CAGR of 6.2% (Figure 14). This is due to growing demand for LCD screens (e.g., iPhones, tablets, other electronic devices, etc.), cigarettes (internationally), pharmaceuticals and food (growing in mid-single digits), and growing European construction and automotive markets (high strength viscose). Meanwhile, commodity viscose demand is improving given increasing textile demand. While Figure 10 illustrates that dissolving pulp supply exceeds demand, supply and demand tightened in 2017 given improving demand and industry consolidation (Rayonier Advanced Materials acquired Tembec in November 2017).

Figure 14: Global dissolving pulp supply and demand



Sources: RISI; TIG Analysis; (1) The difference between supply and demand is made up by exports

Fluff Pulp

The global fluff pulp market represents 6.5 million tons of demand annually. Major end uses include diapers, pads, and personal hygiene products (Figure 15, 16). Fluff pulp is primarily produced in the US South given the favorable traits (e.g., absorbency) of southern yellow pine.

Figure 15. Diapers



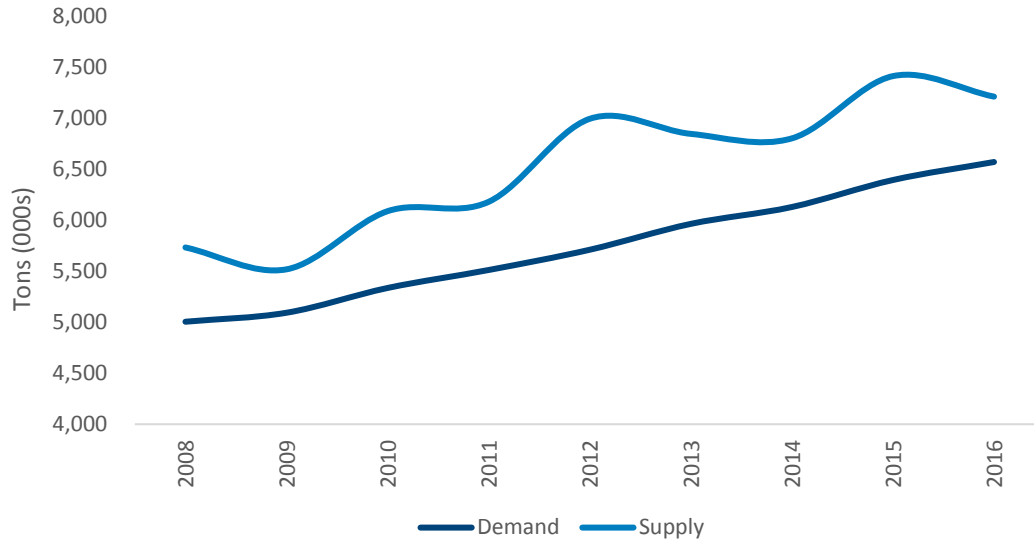
Sources: Getty Images

Figure 16. Personal hygiene products



Fluff pulp is also a rapidly growing end-market. Since 2008, global demand has increased at a CAGR of 3.5% (Figure 17). This is due to emerging market development, an increasing global population, an increase in the number of older adults (fluff pulp is used to make incontinence products), and rising incomes. While Figure 17 illustrates that fluff pulp supply exceeds demand, supply and demand tightened in 2017 given improving demand and industry consolidation (International Paper acquired Weyerhaeuser's fluff pulp business in December 2016).

Figure 17: Global fluff pulp supply and demand



Sources: RISI; TIG Analysis; (1) The difference between supply and demand is made up by exports

Secular Factors Eroding Paper, Bleached Board Demand

The increasing use of technology has disintermediated the consumption of printing & writing paper grades and newsprint, eroding demand for copy paper, magazines, and newsprint. Further, shifting consumer preferences for fresh food over processed food has weighed on bleached board demand.

Uncoated Freesheet

The US uncoated freesheet market (“UCFS”) is the largest category of printing & writing papers accounting for 8.0-8.5 million tons of demand annually. Major end uses include office reprographics, commercial printing/books, business forms, and envelopes (Figure 18, 19).

Figure 18. Copy paper



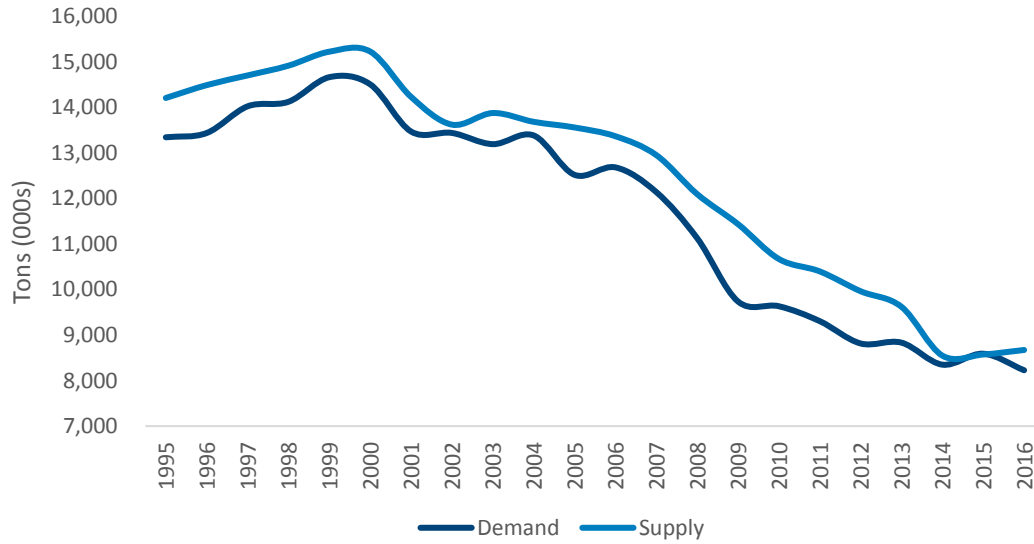
Figure 19. Envelopes



Sources: Getty Images

Since peaking in 2000, UCFS demand has been in secular decline falling at a CAGR of 3.5% for a total market loss of 43% (6.3 million tons, Figure 20). This decline is attributable to the growing penetration of electronic media and increased workplace efficiency, which has translated into more electronic storage and less business forms (hence less paper demand). A portion of this demand destruction has also been caused by economic slowdowns. During recessions, per capita consumption declines as labor learns to become more efficient. However, as the economy improves, paper consumption stabilizes at these lower levels.

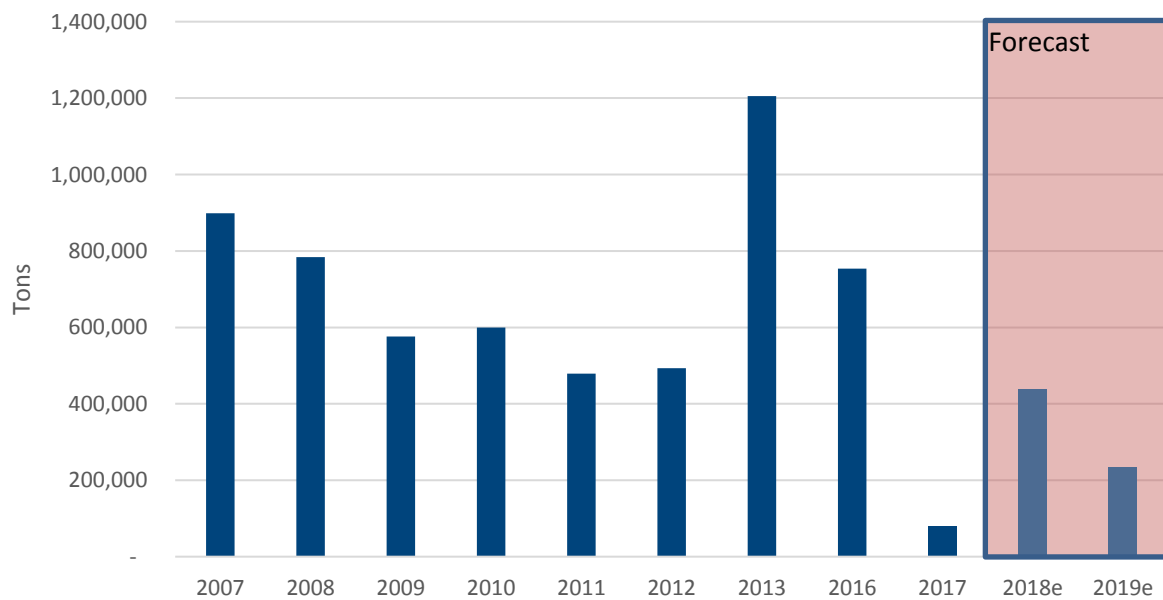
Figure 20: US UCFS supply and demand



Sources: RISI; TIG Analysis; (1) The difference between supply and demand is made up by exports

This persistent erosion in demand has motivated producers to either close UCFS mills outright or attempt to repurpose them into products with growing and more profitable markets (Figure 21).

Figure 21: Historical and Forecasted US UCFS Mill Closure Capacity by Year



Sources: RISI; Company Filings; TIG Analysis

Coated Paper

Coated paper is used for magazines, catalogs, promotional inserts, flyers, and circulars (Figure 22). The US coated paper market is comprised of both coated freesheet (“CFS”) and coated groundwood (“CGW”). Together, the two paper grades account for 6.5-7.0 million tons of demand with CFS accounting for 4.0 million tons and CGW accounting for 2.5-3.0 million tons, annually.

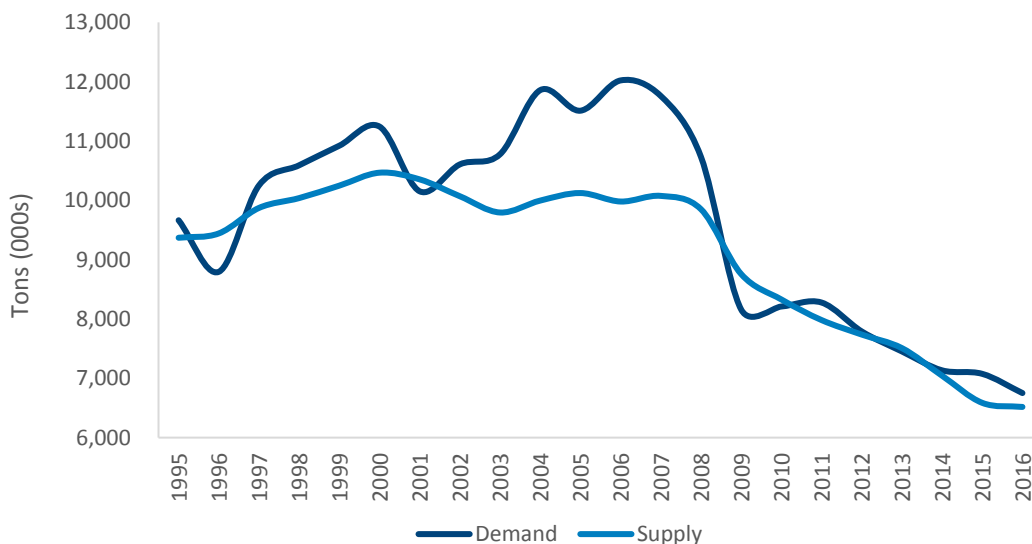
Figure 22: Coated paper



Source: Getty Images

Since peaking in 2000, coated paper demand has been in secular decline falling at a CAGR of 3.1% for a market loss of 4.5 million tons (Figure 23).

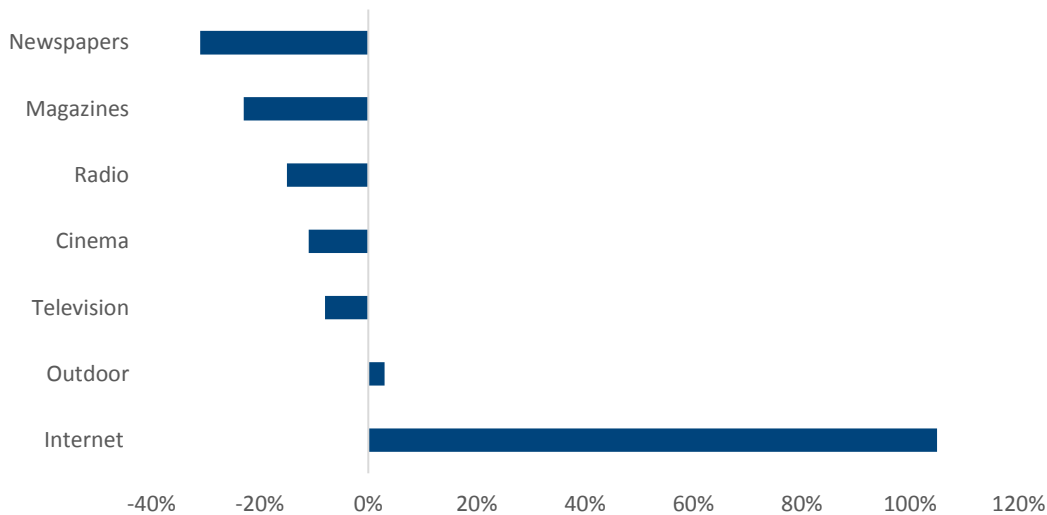
Figure 23: US coated paper supply and demand



Sources: RISI; TIG Analysis; (1) From 2003-2008, the difference between supply and demand was made up by imports, which averaged 2.5-3.5 tons annually

As with uncoated freesheet, this decline is due to the replacement of paper with digital media, and lower print advertising dollars, which have rapidly skewed towards digital media (Figure 24).

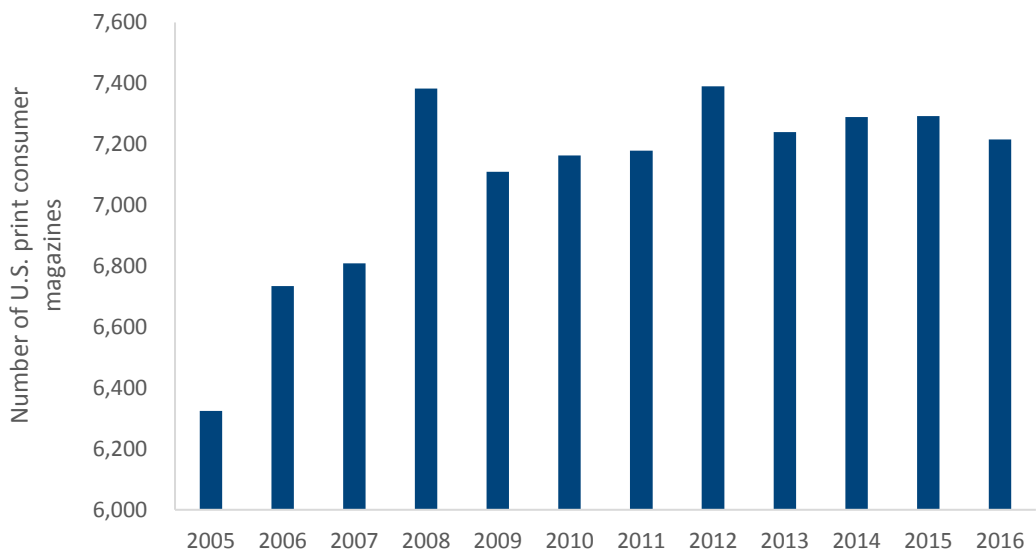
Figure 24: Change in average daily media consumption, 2015 vs. 2010



Sources: ZenithOptimedia; TIG Analysis

To attempt to address this decline, many magazines have chosen to “go digital” and eliminated hard copies (Figure 25). Since peaking in 2012, the number of magazines in circulation has declined by 174. The decline in demand has even affected the profitability of publishers themselves causing large publishers to merge (e.g., Meredith’s acquisition of Time Inc. and Hearst’s acquisition of Rodale Inc.).

Figure 25: Number of US print consumer magazines



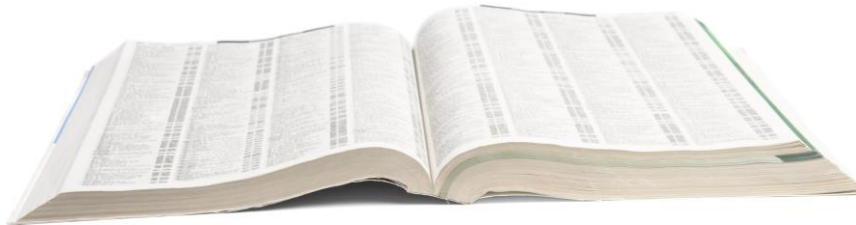
Sources: The Association of Magazine Media; TIG Analysis

While coated paper producers have largely responded to this demand decline by closing mills, some producers have more recently begun to explore mill conversions. Verso announced that it intends to convert a coated paper machine to containerboard at its Androscoggin mill in Maine, aiming to produce between 190,000-200,000 tons of containerboard annually.

Uncoated Groundwood

Uncoated groundwood (“UCGW”, Figure 26), a small paper grade within the broader printing & writing category, accounts for 3.0-3.5 million tons of demand annually. Major end uses include telephone directories, newspaper advertising inserts, direct mail flyers, catalogs, and paperback books.

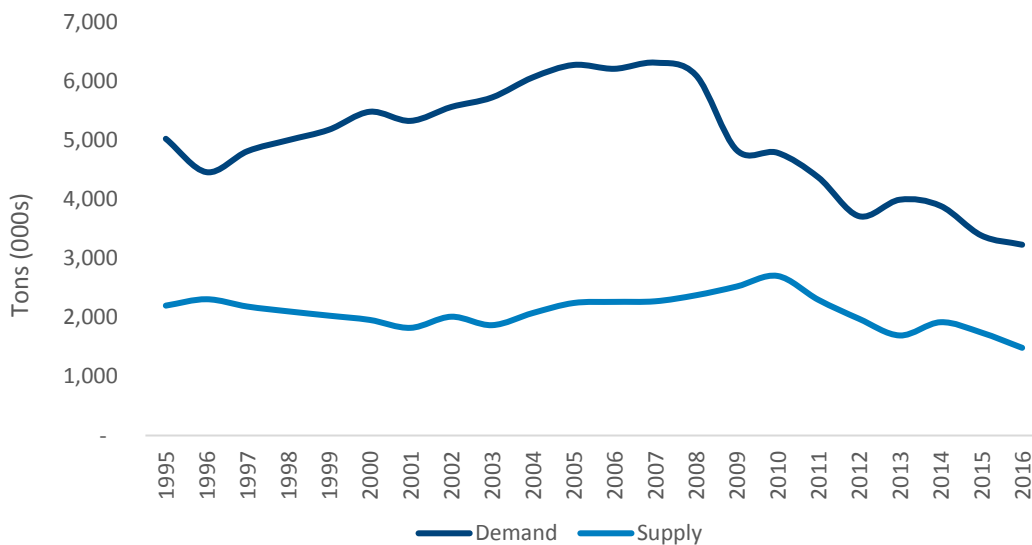
Figure 26: Uncoated groundwood paper used in a telephone directory



Source: Getty Images

Since peaking in 2010, uncoated groundwood demand has declined at a CAGR of 6.3% for a market loss of 1.5 million tons (Figure 27). Electronification, the decline in directory paper, and the elimination of white page listings have negatively impacted UCGW’s demand trajectory.

Figure 27: US uncoated groundwood supply and demand



Sources: RISI; TIG Analysis; (1) The difference between supply and demand is made up by imports, which amount to over 2 million tons annually

Newsprint

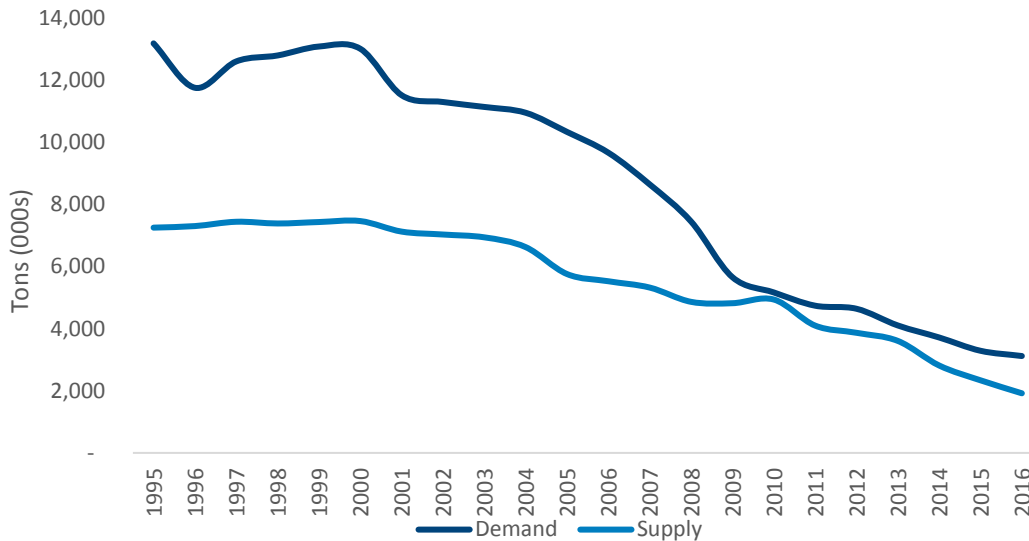
Annually, the US newsprint (Figure 28) market accounts for 3.1 million tons of demand and 1.9 million tons of supply (the domestic supply shortfall is made up by imports). Since peaking in the late 1990s/early 2000s, the newsprint market has been in secular decline with demand declining at a CAGR of 8.5% and capacity declining at a CAGR of 8.1% (Figure 29). Consumers now more frequently utilize tablets and other electronic devices to receive their news. The decline in classified advertising has also contributed to the weakness in newsprint consumption as targeted advertising can be achieved more easily via digital media.

Figure 28: Newsprint



Source: Getty Images

Figure 29: US newsprint supply and demand



Sources: RISI; TIG Analysis; (1) The difference between supply and demand is made up by imports

Similar to the coated paper producers, newsprint producers have largely adjusted to this newsprint demand decline by closing capacity. For example, in 2017, Resolute Forest Products converted its Calhoun, TN mill from newsprint (90,000-100,000 MT) to tissue (66,000 tons).

Bleached Board

Bleached board, a smaller packaging grade made of solid fiber (as opposed to containerboard, which is made from sheets), accounts for 3.5-4.0 million tons of demand annually (Figure 30 & 31). Major end uses include milk and juice cartons, drink boxes, cosmetic boxes, frozen food boxes, and other non-durable goods.

Figure 30. Milk cartons



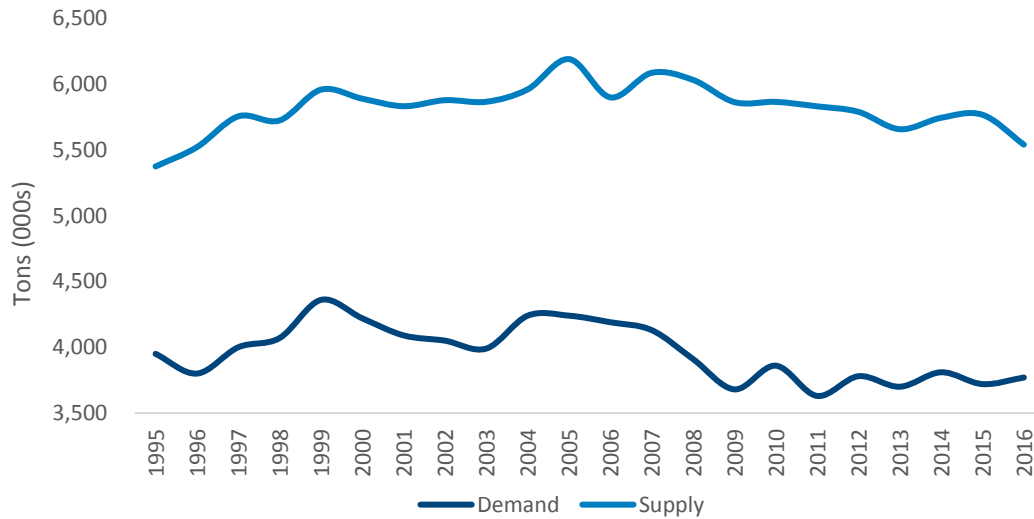
Sources: Getty Images

Figure 31. Frozen food boxes



Since peaking in 2005, bleached board demand has declined at a CAGR of 1.1% for a market loss of 470,000 tons (Figure 32). Shifting consumer preferences for fresh food over processed food has contributed to this demand weakness.

Figure 32: US bleached board supply and demand



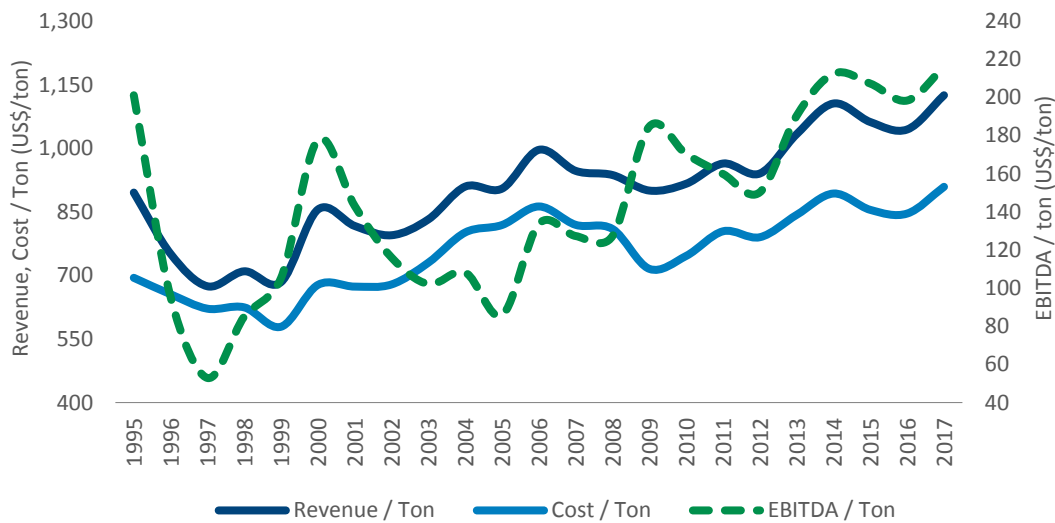
Sources: RISI; TIG Analysis

Relative Profitability also a Driver of Shifting End-Markets

Relative profitability has also been responsible for shifting end-markets by encouraging producers to convert underperforming assets into growing, profitable assets. In particular, the containerboard industry has

experienced improving profitability with EBITDA/ton rising from US\$ 125-130/ton in 2007 to US\$ 200-225/ton in 2016, a 5.4% CAGR (Figure 33). This profitability improvement has been driven by better product pricing, increasing demand, disciplined supply management, industry consolidation, and well-managed inventories. This better return profile has also been one of the motivating factors encouraging paper producers to convert to containerboard.

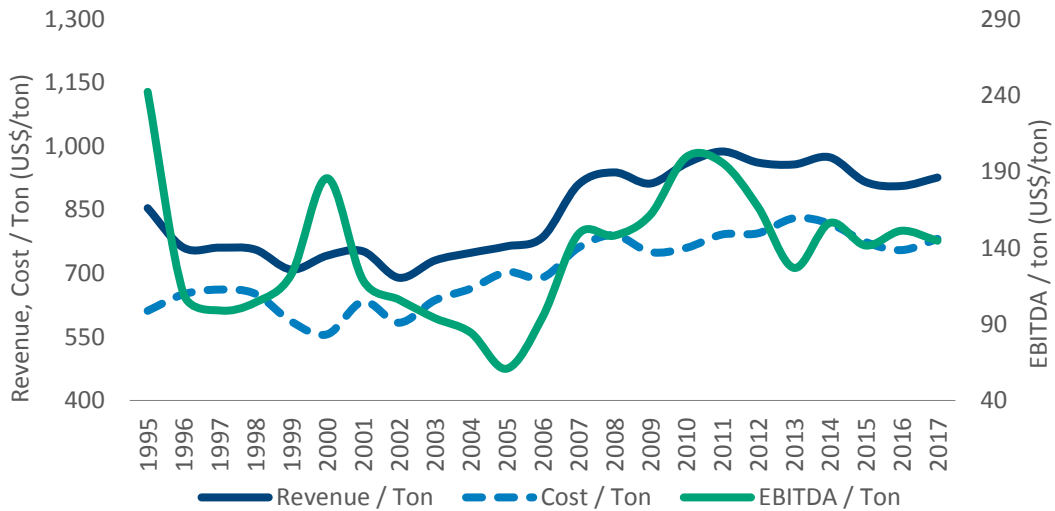
Figure 33: US containerboard profitability has steadily improved over time



Sources: Company Reports; TIG Analysis

On the other hand, UCFS profitability has been challenged with EBITDA/ton remaining flat since 2007 (Figure 34). To maintain profitability given UCFS’s demand decline, producers have had to close or convert capacity. In 2018, Packaging Corp. plans to convert its Wallula, WA UCFS mill (200,000 tons) to containerboard (400,000 tons), while Georgia-Pacific is planning to close its 237,000 tons Camas, WA mill. In 2019, International Paper is planning to convert its Selma, AL UCFS mill (235,000 tons) to containerboard (450,000 tons).

Figure 34: US UCFS profitability has stagnated



Sources: Company Reports; TIG Analysis

Conclusion

US timber end-markets, particularly pulpwood, have undergone a significant transformation over the last two decades due to the rise of the digital economy. Although overall market demand for US timber products, particularly pulpwood, continues to grow, not all end-market categories have fared equally well. Demand for containerboard and tissue have grown given expanding e-commerce, growing agriculture (e.g., fresh fruit and produce shipments from the West Coast), and shifting consumer preferences while printing & writing grades and newsprint have been disintermediated by technology and seen notable demand declines. However, US timber markets remain strong. Of all the softwood timber consumed in the US (including wood products), 82% is derived from growing end-markets. Overall, it is important for timberland investors to be mindful of the specific end-markets in which their investment properties are exposed in order for them to be able to achieve appropriate investment returns.

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