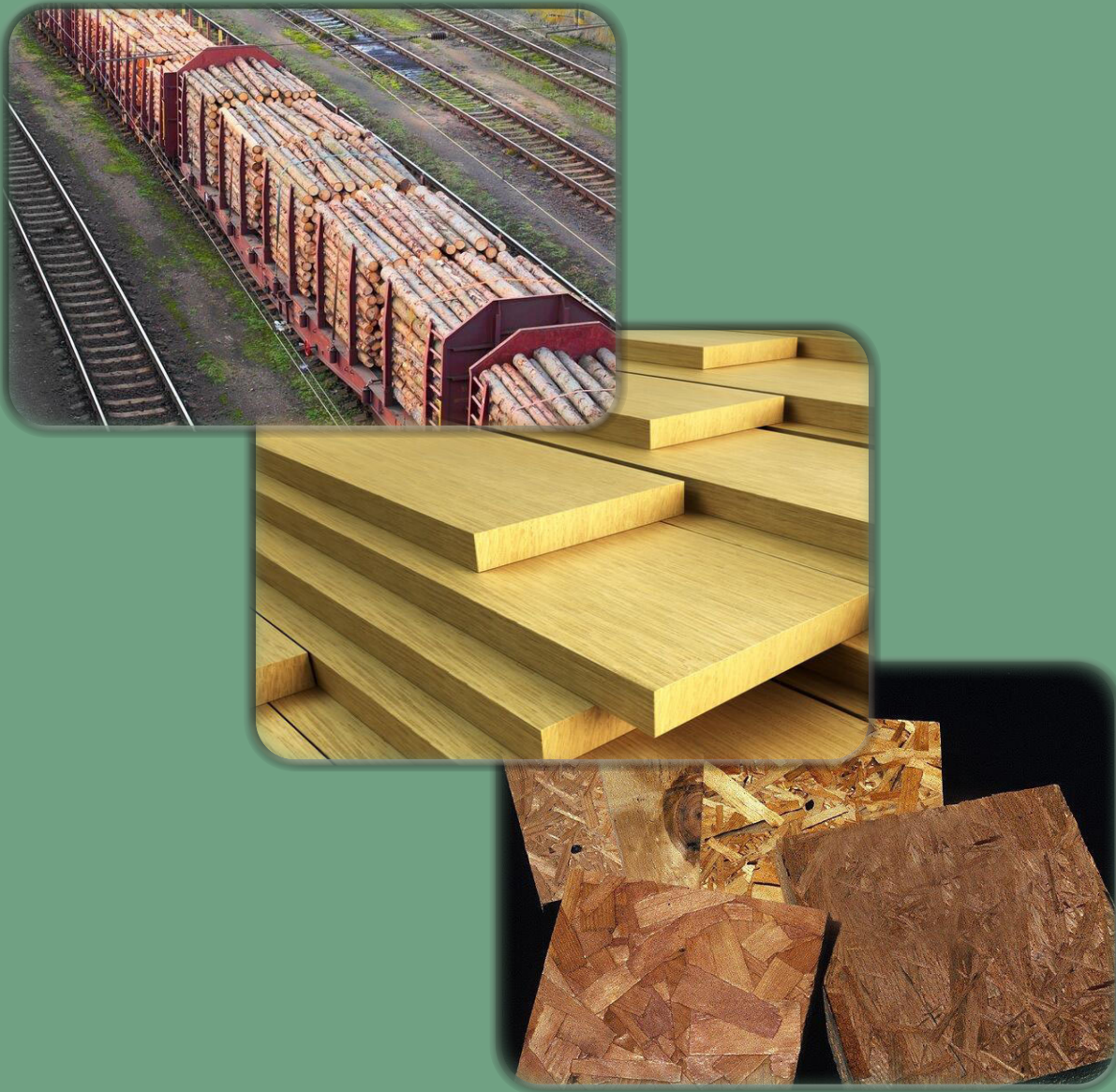




United States Department of Agriculture

U.S. Forest Products Annual Market Review and Prospects, 2015–2021

Delton Alderman



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Forest
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Abstract

The year 2020 was unlike any other in recent United States and world history as a result of the 2019 COVID-19 coronavirus disease wreaking havoc on world health and nearly shuttering the global economy. Presented in this report are data and information on the current state of the U.S. economy and wood products markets and near-term prospects. This report is supported by conventional information and statistical data concerning forest products in terms of consumption, consumer credit, industrial production, prices, and trade. Market development information is offered for sawn softwood and hardwood, softwood and hardwood log trade, wood-based panels, paper and paperboard, fuelwood, forest product prices, and new housing sales and starts. Policy initiatives, which may affect domestic markets and international trade in wood products, also are discussed. Selected data are provided for the years 2015 through 2019, with estimates for 2020 and forecasts for 2021.

Keywords: United States wood products markets; engineered wood products; lumber, log, and pulpwood markets; international wood products trade; new housing construction; repair and remodeling; softwood lumber agreement; wood consumption and production; wood products prices; wood energy

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U.S. Forest Products Annual Market Review and Prospects, 2015–2021

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Contents

Executive Summary	3
United States General Economy	3
Major Market Developments in the United States Affecting Forest Products Consumption	5
Overview of United States Forest Products Markets	7
Timber Products Production, Trade, and Consumption.....	8
Sawn Softwood.....	9
Softwood Log Trade	12
Sawn Hardwood.....	12
Hardwood Log Trade.....	13
Pulpwood	13
Furniture	14
Structural Panels	18
Engineered Wood Products	18
Hardwood Plywood	19
Particleboard and Medium-Density Fiberboard.....	20
Hardboard	20
Insulation Board.....	20
Fuelwood	20
Forest Products Prices.....	21
Energy Policy Initiatives.....	21
Softwood Lumber Agreement	23
Summary.....	23
Acknowledgments	24
Literature Cited.....	25

Conversion table

English unit	Conversion factor	SI unit
British thermal unit (Btu)	1.055056×10^{-3}	megajoule (MJ)
foot (ft)	3.048×10^{-1}	meter (m)
gallon (gal)	3.785412	liter (L)
ton (2,000 lb)	9.071847×10^{-1}	metric ton (t)
thousand board foot (nominal)	2.36	cubic meter (m ³)
billion	$\times 10^9$	

Factors for converting standard units to short tons

Product	Standard unit	Weight of wood per standard unit (short tons)
Roundwood products		
Softwood	1,000 cubic feet	17.5 air dried
Hardwood	1,000 cubic feet	20.0 air dried
Softwood	cord (80 cubic feet)	1.4
Hardwood	cord (80 cubic feet)	1.6
Lumber		
Softwood	1,000 board feet	0.974
Hardwood	1,000 board feet	1.680
Laminated veneer lumber	1,000 cubic feet	17.5
Structural panels		
Softwood plywood	1,000 square feet, 3/8-in. basis	0.544
Waferboard and OSB ^a	1,000 square feet, 3/8-in. basis	0.866
Medium-density fiberboard	1,000 square feet, 3/4-in. basis	1.406
Nonstructural panels		
Hardboard	1,000 square feet, 1/8-in. basis	0.380
Insulation board	1,000 square feet, 1/2-in. basis	0.367
Particleboard	1,000 square feet, 3/4-in. basis	0.578
Hardwood plywood	1,000 square feet, 3/8-in. basis	0.657
Hardwood plywood	1,000 square feet, surface measure	0.200
Pulp, paper, and board	1,000 tons	1,000
Other industrial products	1,000 tons	16.5

^aOriented strandboard.

Executive Summary

This report provides an analysis and evaluation of the current status and near-term prospects for forest product markets and the U.S. economy. The United States began 2020 on firm economic footing, but by the end of the first quarter, the effects of COVID-19 on world health and world economies, including the United States, were beginning to unfold. The Federal Reserve Board of Governors forecast U.S. gross domestic product at 2 percent for 2020 and as a result of the deleterious effects of COVID-19, reduced their estimate to negative 3.7 percent. The Federal Reserve Bank of Philadelphia's forecasters survey estimated U.S. gross domestic product at negative 5.2 percent for 2020.

The COVID-19 outbreak affected U.S. employment, and the job losses were greater than those from the Great Recession (2007 to 2009). By April's end, 25 million jobs were lost resulting in an unemployment rate of nearly 15 percent. Into summer of 2020, the U.S. economy slowly recovered, as the number of employed increased to 142.2 million and the unemployment rate declined to 11 percent in June.

Consumer spending also was affected as total consumer spending decreased by \$332 billion (–31 percent) from quarter two of 2020 compared with the same time period of 2019. Industrial production improved to 101 (index: 2012 = 100) in August, yet it was 7 percent less than reported in February.

In 2019 and into the first half of 2020, the U.S. housing markets continued their recovery. In spite of COVID-19's devastating effects, new housing construction was a bright spot for the U.S. economy in the first half of 2020. Total starts were 2.3 percent greater and single-family starts were minimally less (0.3 percent) than reported for the first half of 2019. New house sales in the first half of 2020 were nearly 690,000 units, and this was 2.8 percent more than the same period in 2019. Single-family starts increased 5.0 percent (\$288.7 billion) in the first half of 2020 compared with the first half of 2019. Likewise, residential repair and remodeling's volume surprised most (\$199.5 billion) and improved by more than 15 percent compared with the first half of 2019.

The work-at-home, or stay-in-place, orders resulted in a positive effect on the repair and remodeling subsector and may lead to changes in residential design and nonresidential construction. Some architects are designing new houses with office space. Many speculate that the demand for office buildings may decline going forward, as many firms noted that productivity of employees actually increased while they were working from home. Several have noted a mini-exodus from large metro areas to suburban and/or rural areas.

Aggregate housing improvement is projected to have a positive effect on many wood products markets. The shelter-or work-at-home orders are a double-edged sword — consumer paper products recorded large purchase increases,

whereas office paper products were the opposite. In 2019, several wood product categories production and consumption volumes were negligibly less than in 2018, whereas other categories reported moderate declines. Softwood lumber production and consumption both increased year-over-year in 2019. Composite panel products, hardwood plywood, and furniture consumption also increased from 2017 to 2018. Wood pellet production and sales continue to increase. Euro nations have invested greatly in pellets for both heating and generation of electricity.

Conversely, sawn hardwood production and consumption decreased for the second consecutive year; structural panel production and consumption were minimally less than 2018; paper and paperboard production remain in a decade long decline; pulpwood consumption decreased for the fifth year in a row; and furniture production declined in 2018 compared with 2017. Softwood lumber exports decreased in 2019 because of trade tensions, decreasing demand, and a surge in central European exports.

In summary, the near-term effects of COVID-19 are the main factors affecting U.S. economic and wood products activity in 2020. This also holds true for world economies. Reduced global demand as a result of COVID-19, trade tensions, events in nature, and geopolitical events also are critical to forest products production and trade and global economies.

United States General Economy

The Federal Reserve Board of Governors Federal Open Market Committee (FOMC) forecast for the U.S. economy was downgraded for 2020. Real gross domestic product (GDP) was revised from 2.0 to –3.7 percent in 2020 and is projected at 4.0 percent for 2021. The revisions were caused by the detrimental effects of COVID-19. The FOMC labor market estimates and forecasts also reflect COVID-19 effects as the committee estimated an unemployment rate of 7.6 percent for 2020 and forecast a rate of 5.5 percent for 2021. Core inflation, as measured by personal consumption expenditures (PCE), was estimated at 1.5 percent for 2020 and was projected to increase to 1.7 percent in 2021 and 1.8 percent in 2022 (FOMC 2020a). FOMC directors noted that economic activity and employment have improved recently but the economy remains far less than the levels at the beginning of 2020. Demand has weakened, and appreciably lower oil prices are restraining consumer price inflation. In total, financial conditions have improved recently. The economy's recovery will depend extensively on the course of the virus. The ongoing pandemic will continue to impact economic activity, employment, and inflation in the short-term and presents sizable risks to the economic outlook in the medium-term (FOMC 2020b). The FOMC's September Beige Book (FOMC 2020c) noted that "Economic activity increased among most Districts, but

gains were generally modest and activity remained well below levels prior to the COVID-19 pandemic.”

The Federal Reserve Bank of Philadelphia’s Survey of Professional Forecasters (FRBP-SPF) projects real GDP to decline to an annual rate of –5.2 percent in 2020 and improve to 3.2 percent in 2021. The FRBP-SPF estimates an unemployment rate of 9.0 percent (2020) and 8.0 percent for 2021. The FRBP-SPF estimates that job losses will be at a rate of 64,750 per month for 2020, a labor market recovery will begin in quarter three of 2020, and job gains will improve to a monthly rate of 269,800 in 2021. Survey results suggest that quarter three prospects appear to be “brighter now” than in quarter two. The panel foresees recovery ranging from an annual rate of 3.5 percent in 2022 to 2.2 percent in 2023. The headline consumer price index (CPI) for PCE was estimated at 0.4 percent for quarter three 2020, decreasing to 1.6 percent in quarter four, and 1.7 percent in quarter one (2021). On a quarter four over quarter four basis, the annual average core CPI is estimated at 0.4 percent in 2020, increasing to 1.8 percent in 2021 and 2.0 percent in 2022 (FRBP-SPF 2020).

The COVID-19 outbreak also affected U.S. employment, and the job losses were greater than those from the Great Recession (2007 to 2009) when the U.S. economy lost eight million jobs. In January 2020, 158.714 million were employed and the unemployment rate was 3.6 percent. By April’s end, 25 million jobs were lost, resulting in an unemployment rate of 14.7 percent. The U.S. economy is slowly recovering, reflected in the number of employed increasing to 142.2 million and the unemployment rate declining to 11.1 percent in June (BLS 2020a). According to Bloom (2020), as a result of shelter- or work-at-home orders, 42 percent (68.7 million (BLS 2020b)) of the U.S. labor force is working from home full-time. According to BLS (2020c), 31.0 percent (40.4 million) of U.S. employees

teleworked for pay in June, a 4.0 percent decrease from May. These data do not include those whose telework is not related to COVID-19.

Consumer spending, and associated consumer credit, are often attributed as the primary drivers for the aggregate U.S. economy. The Council of Economic Advisers (CEA 2020) reports that consumer spending influences aggregate GDP growth, as it accounts for about 68 percent of U.S. GDP (Table 1). The Federal Reserve Bank of New York (FRBNY) reported that total household debt was \$14.3 trillion in quarter two of 2020. Included in this total was credit card debt, which was \$890 billion (6.2 percent of total debt outstanding) (FRBNY 2020). Credit cards represent the largest consumer lending market in the United States, and credit card loans are a component of revolving consumer credit. In quarter two of 2020, revolving credit decreased by \$199.251 billion from quarter two of 2019 (FOMC 2020d). Real PCE declined 11.3 percent (\$13.089 billion) in the first half of 2020 versus the first half of 2019 (\$11.756 billion) (BEA 2020a). From January to May 31, households in the top 25 percent of U.S. income distribution reduced spending by 66 percent and persons in the lowest 25 percent spent at the same levels they had before the COVID-19 crisis. As a result of the decreased spending of high-income consumers, businesses in the most affluent U.S. localities realized more than a 70 percent decline in revenues. As businesses underwent drastically reduced revenues, they began to lay off employees. In the more affluent areas, nearly 70 percent of workers were laid off, a majority being low-wage earners. In contrast, in less affluent areas, 30 percent of low-wage earners were laid off (Chetty and others 2020).

Regarding the U.S. GDP, Wells Fargo (2020) opined that the U.S. economy is recovering sooner than many expected. However, they speculate the recovery from the COVID-19

Table 1—Selected U.S. economic indicators, 2017–2021^a

Indicator	Actual			Estimate ^b	Forecast ^c
	2017	2018	2019	2020	2021
Gross domestic product (billion 2012 dollars)	18,108	18,638	19,073	18,019	18,740
New housing starts (thousand units)	1,203	1,250	1,295	1,345	1,387
New housing sales (thousand units)	613	617	685	760	734
Manufactured housing shipments (thousand units)	92	97	95	90	94
Total residential fixed investment (billion 2012 dollars)	546	564	551	517	538
Total nonresidential fixed investment (billion 2012 dollars)	2,524	2,699	2,777	2,608	2,712
Furniture and related products (Index: 2012 = 100)	106.3	106.3	105.7	99.3	103.2
Paper products (Index: 2012 = 100)	96.9	95.9	93.0	87.3	90.8
Wood products (Index: 2012 = 100)	124.1	127.1	126.7	119.0	123.7
Total industrial production (Index: 2012 = 100)	104.4	108.6	109.4	102.7	106.8

^aSources: BEA 2020b, 2020c; Census Bureau 2020a, 2020d, 2020h; FOMC 2020e, 2020f, 2020g; FRBP-SPF 2020; MBA 2020; World Bank 2020.

^bMBA 2020; USDA Forest Service estimates based on historical and first-half 2020 data; World Bank 2020.

^cFRBP-SPF 2020; MBA 2020; USDA Forest Service estimates based on historical and first-half 2020 data; World Bank 2020.

induced recession is far from complete. Wells Fargo estimates that quarter three GDP is increasing at a 25 percent annualized rate.

Industrial production is an economic indicator measuring real output for all facilities located in the United States, which includes manufacturing, mining, and electric and gas utility installations. Reported total industrial production index was 101.4 in August, 101.0 in July, and 97.5 in June. The August index was 1.3 percent less than its preCOVID-19 February level (102.7). In August, manufacturing capacity utilization was 71.4, which was 11.4 percentage points more than reported in April (FOMC 2020e). Total real private residential fixed investment was \$813.9 billion in 2019, a 1.9 percent increase from 2018. The first half of 2020 (\$1,226 billion) was 1.8 percent more than the first half of 2019. Total real private nonresidential fixed investment was \$2,822 billion in 2019, a 4.3 percent increase from 2018. The first half of 2020 (\$5,311 billion) was 5.2 percent less than the same time period a year earlier (Table 1) (BEA 2020b).

Major Market Developments in the United States Affecting Forest Products Consumption

New Housing Construction and Housing Sales

New housing construction was a bright spot for the U.S. economy in the first half of 2020. During this time period, total housing starts were 1,282,000 units (Table 1) and single-family starts were 867,000 units (seasonally adjusted annual rate (SAAR)). Compared with the same period in 2019, total starts were 4.2 percent greater and single-family starts were 1.4 percent more. Multifamily starts, in the first half of 2020, averaged 415,000 units (SAAR), and this was 10.4 percent greater than that reported for the same time frame in 2019 (U.S. Department of Commerce (DOC)) (Census Bureau 2020a). The Mortgage Bankers Association (MBA 2020) total housing starts estimate for 2020 is 1,345,000 units (SAAR), also an increase of 3.8 percent from 2019. The single-family estimate is 915,000 units (SAAR), an increase of 2.5 percent from 2019. Projections for 2021 are 1,387,000 total units and 1,002,000 single-family units (SAAR) (Table 1).

Housing permits were similar to starts in the first half of 2020, with total permits at 1,312,000 units and single-family permits at 851,000 units (SAAR). Total permits were 0.2 percent less than the same period in 2019, and single-family permits were 3.8 percent more than recorded for the same period in 2019. Multifamily permits, in the first half, averaged 461,000 units (SAAR), and this was 6.9 percent less than reported for the same period in 2019 (Census Bureau 2020a).

In the first-half of 2020, total housing completions were 1,253,000 units and single-family completions were 913,000 units (SAAR). Total completions were 1.6 percent less than the same period in 2019, and single-family completions were 2.7 percent more than recorded for the same period in 2019. Multifamily completions, in the first half, averaged 341,000 units (SAAR), and this was 9.1 percent less than reported for the same period in 2019 (Census Bureau 2020a). In 2019, new housing construction, including manufactured housing, consumed 30.9 percent of total solid wood products in the United States. New single-family starts and sales are vital for the wood products industry, with new housing units consuming more value-added products than any other wood-utilizing sector.

Although the new housing construction market has not fully recovered to historical levels, the mean/median size of houses is greater than historic levels. This is reflected in the fact that smaller or “starter” house production has declined precipitously since the Great Recession. Houses that are 130 m² (1,400 ft²) or less of floor area typically are considered “starter” houses. New single-family houses built after 2011 are much larger, averaging 240.5 m² (2,600 ft²) (Census Bureau 2020d). The increase in average new construction size is accredited to greater builder margins and prospective buyers’ ability to qualify for a home loan. The lack of starter house availability also is frequently mentioned as a main factor in the current housing shortage.

Household formations are considered a precursor to new construction (starts and sales). Census housing vacancies and home ownership data provide a rough approximation or proxy for household formations. The number of apparent household formations increased in 2019 by 1.2 percent or 1.4 million (Census Bureau 2020f). Contrasting the second quarters of 2019 and 2020, apparent household formations increased in quarter two 2020 by 3.5 percent (4.3 million) compared with quarter two 2019 (Census Bureau 2020e, 2020f). Although the change in household formations is positive, these levels remain less than the historical average and are considered a drag on future housing construction and sales. For instance, Fry and others (2020) reported that the number of households headed by 18- to 29-year-olds decreased by 1.9 million, or 12 percent, (from 15.8 to 13.9 million) from February to July of 2020.

New house sales in the first half of 2020 were 701,833 units, which was 5.5 percent more than the same period in 2019 (Census Bureau 2020b) (Table 1). New house sales are projected at 685,000 units (SAAR) in 2020, and the forecast is 760,000 units (SAAR) to be sold in 2021 (MBA 2020). Common themes often cited to explain the development of a robust U.S. housing construction and sales market include an undersupplied inventory of new and existing houses for sale, a lack of available lots for new construction, and in some locations, lack of construction workers, regulatory burdens, stringent builder financing requirements, student

loan debts accrued from higher education, shifting attitudes toward home ownership, underemployment, and stagnant to declining median incomes. There also remains a tendency for millennials (adults born between 1982 and 1996) to live with their parents (Alderman 2019). This trend has been exacerbated since the onset of COVID-19. Deutch and Perlman (2020) report 1.1 million 23- to 30-year old's have moved back to their parents' homes. Fry and others (2020) conveyed similar findings, indicating that 52 percent (26.6 million) of young adults (18- to 29-year-olds) lived with their parents in July of 2020 – an increase of 2.6 million from February 2020. This is the greatest percentage of young adults living with their parents since the Great Depression.

Existing housing and sales are important for the residential repair and remodeling (R&R) subsector. Since 2013, existing house sales have averaged about 5.3 million units annually. In 2019, 5.3 million units were sold, and in spite of COVID-19, sales were at a SAAR of 5.1 million units in the first half of 2020. However, in the first half of 2020, 4.9 million units were sold (SAAR), a 6.9 percent decrease from the first half of 2019 (FRED 2020a). One factor for existing housing's importance to wood products consumption is the aging U.S. housing stock; 82 percent of U.S. housing stock was built before the year 2000. The median age of a housing unit is 39 years and increasing — 1977 is the median year a residential structure was built (Census Bureau 2020c). As the U.S. housing stock ages, so does the U.S. population, and this has ramifications for the R&R subsector. Portions of the senior generation may prefer aging in place (Aging in Place 2020), and some seniors may prefer to upgrade their existing home rather than moving into a retirement facility or purchasing a smaller house because of affordability issues, as many seniors are cost burdened (Molinsky 2017).

A by-product of COVID-19 is “Zoom towns”, and this recent phenomenon is affecting both new and existing house sales. Zoom towns are cities or towns where well-paid workers move to in order to work from home with extra space and solitude. Many Americans, especially employed 30-somethings, are leaving their rental apartments in expensive cities and moving to purchase houses in more affordable cities or the suburbs. Zoom town locales include vacation destinations and medium- to small-sized cities and towns. Apparently zoom town housing sales are robust. “Zoom towns” is a moniker referring to virtual work via video conferencing (Rosalsky 2020).

If the telework trend continues, or accelerates, it may affect future office construction. COVID-19 has swiftly restructured Americans' daily living and work routines, with numerous office workers now working from home for six months without a designated date to return to their offices. Interior design, open space access, and the capability to simply reconfigure workspaces will be top priorities in the

future, and amplified attention for suburban office buildings also may develop. Estimates indicate that 37 percent of the U.S. work force could conceivably work from home; if so, this may lead to the adoption of a hybrid work model that allows for detailed work at home while office space is created for customer collaboration and firm meetings. This may alter design, with the desired effect of creating additional space for workers, after years of condensing office sizes from $\pm 23.2 \text{ m}^2$ (250 ft^2) 10 years ago to less than $\pm 18.6 \text{ m}^2$ (200 ft^2) (Pontius and others 2020).

Historically, manufactured housing fabrication and sales played a pivotal role in meeting U.S. housing demand. Manufactured housing (mobile, modular, etc.) production and shipments have improved since the Great Recession yet remain far less than the greatest shipment years of 1973 (580,000 units) and 1998 (373,000 units). Shipments in 2019 were 95,000 units, 2.1 percent less than in 2018 (Census Bureau 2020g, MHI 2020) (Table 1). In 2020, shipments averaged 100,000 units from January to March. Then, as a result of the pandemic, shipments dramatically declined. Through the first half of 2020, shipments were 90,500 units, a 1.5 percent decline from the first half of 2018. The average floor area of manufactured housing has steadily increased since 1950, from ≤ 45 to $\leq 135 \text{ m}^2$ (484 to 1,453 ft^2) in 2019. The size increase is attributable to changes in the types of units being produced. Single-wide unit production has declined, and manufacture has shifted to double-wide and/or multisectional units (Census Bureau 2020h).

Mortgage interest rates are at historically low levels. In fact, the 30-year conventional loan rate breached the 3 percent level for the first time in July (Freddie Mac 2020). Yet, potential buyers may have some difficulty qualifying for a housing loan. Sapriza and Castro (2020) reported that banks tightened standards for all residential real estate loan categories. The exceptions are subprime residential lenders, as most did not tighten standards. Low interest rates at the current levels are a double-edged sword. Existing homeowners may realize increasing nominal house values contrasted against first-time buyers, who might experience difficulties qualifying for a loan because of escalating housing prices. Housing affordability generally improves with lower interest rates. Thus, the supply and demand inequity that existed before COVID-19 has persisted and has been exacerbated as a result of low interest rates, which may portend to housing prices increasing throughout 2020 (Fleming 2020).

Construction Expenditures

In the first half of 2020, U.S. total construction expenditures were \$1,404 billion (SAAR), which was \$64 billion more than the first half of 2019 (\$1,340 billion). When 2020 and 2019 month-over-month reported total construction SAARs were compared, 2020 values were greater than 2019 values

for each month through June 2020, even with COVID-19 effects. Private residential construction was \$553.7 billion (SAAR) in June 2020, which was \$15.3 billion more than 2019. In June 2020, single-family construction spending was \$262.2 billion (4.1 percent less than 2019), multifamily expenditures were \$81.4 billion (0.4 percent less than 2019), and R&R was \$210.1 billion (14.7 percent more than 2019) (Census Bureau 2020i).

The quantity of wood products consumed in residential R&R is similar to that used in new housing construction. For illustration, in 2019, 27.9 percent of all solid wood products consumed in the United States were used in residential R&R, which included 36.1 percent of all lumber, 24.3 percent of all structural panels, and 21.6 percent of all nonstructural panels (USDA Forest Service (FS) interpolation). Expenditures on wood products are affected by the types of expenditures in any given year. R&R extends to various projects, some that require substantial amounts of solid wood products and others that do not. Three major R&R activity types exist: maintenance and repairs, additions and alterations, and major replacements. Maintenance and repair expenditures are for upkeep of a residential property rather than additional investment in the property. Addition and alteration expenditures are for enlargements or improvements to or within the residential structure or the property. Major replacements are construction improvements to the property and are closely related to maintenance and repair. The scope of the R&R project defines its classification. Of the three expenditure types, additions and alterations are the most wood-intensive and the most important in determining the total level of solid wood products consumption (Skog and others 2012).

Expenditures for R&R increased in 2019. But they were projected to decrease in 2020 to \$158.8 billion (2012 dollars), a decline of 6.6 percent from one year earlier and far less than the record spending years of 2006 and 2007 (nominal dollars) (Census Bureau 2020i) (Table 1). The early projections for R&R spending have proven to be for naught. For instance, the Leading Indicator of Remodeling Activity (LIRA) (JCHS 2020) forecasted R&R spending to decline from a rate of 1.9 percent in quarter one of 2020 (the original estimate) to -0.4 percent in quarter four of 2020 due to the COVID-19 pandemic. Several analysts speculate that as a result of shelter-in-place or work-at-home orders, and subsequent additional free time and extra monies, homeowners conceived of remodeling projects and then initiated their plans. This may be a factor in the surge in R&R activity. Numerous reasons are proffered about why the forecast spending demise of R&R was invalidated. Morris (2020) reported that necessity was a factor, “Americans have been required to use their houses more – and differently.” Additionally, low interest rates may have adjudicated spending concerns about R&R projects, with the reduced costs rendering R&R plans attractive. Also, during

disconcerting times, altering one’s home may be comforting.

Nonresidential expenditures also were affected by the Great Recession, and in the first half of 2020, spending decreased compared with 2019 – primarily due to COVID-19, although other factors also are noted (e.g., electronic commerce, oversaturation of commercial buildings, shelter-or work-at-home orders). Nonresidential construction is typically segmented into several categories. Of interest to this report are the commercial, conservation and development, educational, health care, lodging, manufacturing, office, and religious construction subsectors, which are the largest markets for wood products in the nonresidential construction sector. These nonresidential subsectors were estimated at \$442 billion (SAAR) in 2019, an \$18 billion increase from 2018 (Table 1). In the first half of 2020, total spending for these subsectors decreased; \$447 billion in January to \$425 billion in June (Census Bureau 2020i). Since 2008, nonresidential construction has ranged from 32.6 to 38 percent of total construction output. Basu reported that the stability of nonresidential construction has been “remarkable” (ABC 2020). As GDP plummeted in quarter two of 2020, nonresidential construction spending was stable, partially because of its status as an essential industry in many cities and states and thus it was not subject to shut-down orders. The U.S. nonresidential construction sector put in place nearly as much construction volume as in June 2019. Yet, Sapriza and Castro (2020) reported that on balance, banks tightened standards and terms on commercial and industrial (C&I) loans to firms of all sizes. If loan tightening continues, this also may deter C&I lending in the future.

The future of nonresidential construction is tenuous, as economic fundamentals of discrete nonresidential construction segments (e.g., apartments, hotel/lodging, office, retail) have been impacted by COVID-19. Vitner and others (2020) stated that amongst all main commercial property types, vacancy rates have increased and rent growth has decelerated, and in the retail sector, vacancies and rents have unquestionably increased and declined, respectively. Only industrial properties appear to be immune from COVID-19 effects; the other commercial real estate sectors, such as apartments, hotel/lodging, office, and retail, all are experiencing some form of business decline.

Overview of United States Forest Products Markets

With ample forest resources and prodigious production capacity, the United States is the world’s leading producer and largest single consumer of wood products, and the United States continues to play an essential role in global forest products markets. The United States is the world’s greatest producer of industrial roundwood (i.e., wood in rough form; whole and/or chipped logs used in industrial

manufacturing) (18 percent), wood pellets (20 percent), and pulp for paper (25 percent). The United States is the second leading producer of sawn wood (18 percent), wood-based panels (9 percent), recovered paper (21 percent), and paper and paperboard (18 percent). The United States is the leading consumer of industrial roundwood (18 percent), sawn wood (21 percent), wood-based panels (12 percent), recovered paper (13 percent), and paper and paperboard (17 percent) (FAO 2020).

The United States is also the world's largest consumer of paper and paperboard products, 68.8 million metric tons in 2019, which are primarily supplied via domestic production and imports from Canada (AF&PA 2020a). In 2019, domestic paper and paperboard production was 4.6 percent less than that reported for 2018 (71.9 million metric tons) (AF&PA 2020b). This decline was reflected in all production categories: newsprint, printing-writing, packaging, and paperboard. The paper and wood products industries contributed \$303.8 billion to the total U.S. manufacturing GDP in 2019 (5.0 percent of 'all' U.S. manufacturing industries). Of that total, the paper products sector added \$193.7 billion, and the other wood product sectors added \$110.1 billion (not seasonally adjusted) (Census Bureau 2020j).

In 2019, the U.S. softwood industry manufactured about 59.8 million m³ of softwood lumber (WWPA 2020a), sawn hardwood production was 17.9 million m³ (HMR 2020a), structural panel production was 21.2 million m³, engineered wood production was 0.5 million m³ (i.e., glued laminated timber (glulam) and laminated veneer lumber (LVL)), and I-joist production was 464 million linear feet (APA 2020a, 2020b), and nonstructural panel production was 11.8 million m³ (CPA 2020a, Johnston and others 2021) (Table 2).

There are four major indexes for forest products: furniture and related products, paper products, wood products, and total industrial production (Table 1). Each indicator declined during the first half of 2020 compared with the first half of 2019.

Industrial production and capacity utilization (G.17) is a principal indicator for pallet lumber, containerboard, and discrete grades of paper. The index declined 12.0 percent during the first half of 2020 (January 109.2, June 97.5; Index 2012 = 100) (FOMC 2020e).

Paper products are an important gauge for pulpwood and wood residues, as well as recycled fiber. The index decreased 11.4 percent during the first half of 2020 (January 95.7, June 85.9; Index 2012 = 100) (FOMC 2020f).

Wood products are an important indicator for the overall forest products industry. This index declined 13.1 percent during the first half of 2020 (January 132.7, June 117.3; Index 2012 = 100) (FOMC 2020g).

Furniture and related products are key indicators for higher-grade hardwood lumber. This index declined 17.4 percent during the first half of 2020 (January 106.7, June 90.9; Index 2012 = 100) (FOMC 2020g).

Timber Products Production, Trade, and Consumption

Statistics and Projections

U.S. solid wood and biomass products consumption, production, and foreign trade data are collected monthly, and annually by U.S. governmental agencies and industry associations. This information provides an overview of wood consumption and production sectors of the U.S. economy, and it indicates change over time. The data do not provide detailed information required to assess in-depth changes of consumption and production for discrete end-use markets. In this report, markets of interest include new housing construction (single-family, multifamily, and manufactured/modular), repair and remodeling of existing residential structures, low-rise nonresidential buildings and other nonresidential construction types, furniture and other manufactured wood products, and packaging and shipping. These end-use markets typically account for 80 to 90 percent of all solid wood products consumption. The market share data presented are based on results obtained from analysis of limited public and private research reports. These data are related to readily available, annual economic indicator data specific to each end-use market. Consumption was estimated for all end uses, and market shares were developed. These estimates provide consistent and reliable observations of solid wood products markets in the United States (McKeever and Howard 2011).

The following section provides data, estimates and forecasts, and narratives from industry professionals for leading sectors and subsectors of the U.S. wood products markets. Estimates and forecasts for forest and wood products are presented in Table 2. The percentage of wood products consumption by industry sector is presented in Table 3. In this report, the majority of volumes are reported in nominal 1,000 m³ volumes, with the exceptions being I-joists (lineal feet) and insulation board (metric tons). Data for 2019 are estimates, and data for 2020 are USDA FS estimates and USDA FS Resources Planning Act (RPA) forest sector model forecasts.

United States Wood Products Markets

With plentiful forest resources and exceptional production capacity, the United States is the world's leading producer and largest consumer of wood products. As such, the United States continues to play a significant role in global forest products markets. The United States is the largest consumer of paper and paperboard products (AF&PA 2020c) and the largest producer of industrial roundwood, wood pellets, and pulp for paper. The United States is the second leading

Table 2—Prospects and statistics for forest and wood products, 2018–2020^a

	2018	2019	2020 ^b		2018	2019	2020 ^b
Sawn softwood (coniferous)				Sawn hardwood (deciduous)			
Production	59,344	59,781	61,021	Production	19,311	17,922	14,325
Imports	35,220	34,036	34,628	Imports	944	768	606
Exports	3,370	2,652	2,305	Exports	4,073	3,245	3,038
Consumption	91,194	91,165	93,344	Consumption	16,182	15,445	11,893
Oriented strandboard				Coniferous plywood (softwood)			
Production	13,389	13,588	13,459	Production	8,869	8,557	7,296
Imports	7,313	6,368	6,821	Imports	2,324	1,761	1,577
Exports	183	190	180	Exports	368	286	224
Consumption	20,519	19,766	20,100	Consumption	10,825	10,032	8,649
Hardboard				Medium-density fiberboard			
Production	614	571	535	Production	3,977	3,857	3,700
Imports	253	182	201	Imports	2,413	2,221	2,160
Exports	186	203	220	Exports	514	312	415
Consumption	681	550	516	Consumption	5,876	5,766	4,665
Insulation board				Roundwood pulpwood			
Production	670	670	668	Production	191,396	185,780	186,386
Imports	27	15	20	Imports	67	40	40
Exports	41	35	38	Exports	91	62	66
Consumption	656	650	650	Consumption	191,372	185,758	186,360
Particleboard				Nonconiferous plywood (hardwood/deciduous)			
Production	5,838	5,589	5,605	Production	2,093	2,149	2,100
Imports	1,267	1,409	1,338	Imports	2,626	2,447	2,600
Exports	287	316	302	Exports	115	96	75
Consumption	6,818	6,682	6,641	Consumption	4,603	4,500	4,625

^aAll volumes are reported in thousand cubic meters except for insulation board, which is reported in thousand metric tons.

Sources: APA 2020a; CPA 2020a, 2020b; FAS 2020; HMR 2020a, 2020b; Johnston and others 2021; Wood Resources International 2020a; WWPA 2020a. USDA Forest Service estimates.

^bJohnston and others 2021.

producer of sawnwood, wood-based panels, recovered paper, and paper and paperboard. The United States is also the leading consumer of industrial roundwood, sawnwood, wood-based panels, recovered paper, and paper and paperboard (FAO 2020). Production estimates for U.S. forest and wood products for the years 2018 to 2020 are exhibited in Table 2. Annual wood products consumption percentages, by subsector, for sawn wood, structural panels, and nonstructural panels are presented in Table 3. Exhibited in these tables are reported data for the years 2015 through 2019, and forecasts for 2020. Figure 1 exhibits combined market shares on a value basis for solid wood products for the years 2010 to 2019.

Sawn Softwood

The largest value-added market for sawn wood products, including softwoods, is the new housing construction sector. Since 2010, the housing sector's consumption of sawn softwood has increased market share, rising from 24.0 percent in 2010 to 34.5 percent in 2019 (Fig. 1, Table 2). In 2020, housing and other construction markets

began strongly, then declined precipitously with the onset of the COVID-19 pandemic, but by the end of the first half, housing construction had demonstrated remarkable resiliency. U.S. housing construction improved from COVID-19 effects during the first half of 2020. First-half single-family starts were only 0.9 percent less than recorded in the first half of 2019 (863,167 units) (Census Bureau 2020a). Correspondingly, the R&R sector has been a substantial consumer of sawn softwood. Another positive factor supporting future sawn softwood markets is that, in the United States, new single-family housing units have been under-built for the past decade in relation to population growth. The deficit ranges from 300,000 to 400,000 single-family units per year (Alderman and Buehlmann 2020). Looking forward, the Mortgage Bankers Association (MBA 2020) projects 2021 total new housing construction at 1,379,000 units (6.5 percent more than in 2019) and 989,000 single-family units (a 9.6 percent increase).

Congruent with strengthening new housing construction and R&R markets, the Western Wood Products Association reported U.S. sawn softwood production of 59.8 million m³

Table 3—Wood product market shares in the United States by end use, 2015–2019^a

Year	Residential construction																Total, reported use (%)	Other (%)
	New housing						Nonresidential construction (%)			Total construction (%)	Manufacturing (%)			Packaging & shipping (%)				
	New single family (%)	New multi- family (%)	Manufactured housing (%)	Total (%)	Repair & remodeling (%)	Total (%)					Other mfg	Total						
							Buildings	Other	Total									
Sawn softwood ^b																		
2015	26	3	1	30	39	69	8	2	10	79	3	5	8	8	94	6		
2016	27	3	1	31	39	70	8	2	9	80	3	5	8	7	94	6		
2017	28	4	1	32	39	71	7	2	9	80	3	5	8	7	94	4		
2018	27	3	1	31	38	70	7	2	9	79	3	5	8	8	95	4		
2019	28	3	1	32	39	71	8	2	9	80	3	5	8	8	96	4		
Sawn hardwood																		
2015	3	1	0	4	4	7	3	8	11	18	6	17	23	59	100	0		
2016	2	1	0	3	5	8	3	8	12	20	5	19	25	56	100	0		
2017	3	1	0	4	6	10	3	9	12	22	5	20	25	53	100	0		
2018	2	1	0	3	4	7	4	9	13	20	5	21	26	54	100	0		
2019	3	1	0	4	5	8	3	6	9	17	6	20	26	57	100	0		
Total: sawn wood																		
2015	22	3	1	25	32	58	7	3	10	68	3	7	10	17	95	5		
2016	22	3	1	26	33	60	7	3	10	69	3	8	11	16	95	5		
2017	24	3	1	28	33	61	6	3	10	71	3	8	10	14	95	5		
2018	23	3	1	27	33	60	7	3	10	69	3	8	11	15	95	5		
2019	23	3	1	27	33	60	7	2	9	69	3	8	11	16	96	4		
Oriented strandboard																		
2015	42	7	2	51	16	67	21	5	26	94	0	3	1	5	99	1		
2016	43	7	2	53	16	69	21	4	25	94	0	3	1	4	99	1		
2017	45	6	3	54	15	69	22	3	25	95	0	3	1	4	99	1		
2018	44	6	2	52	15	67	20	3	23	90	0	3	1	6	96	4		
2019	44	6	2	53	15	69	22	4	26	94	0	3	1	2	97	3		
Coniferous (softwood) plywood																		
2015	18	3	1	21	38	59	14	5	18	77	5	9	19	2	98	2		
2016	20	3	1	23	39	62	13	4	17	79	5	8	17	2	98	2		
2017	22	3	1	26	38	64	13	3	16	80	4	8	16	2	97	3		
2018	21	3	1	25	38	63	13	3	16	79	4	8	16	2	97	3		
2019	21	3	1	25	37	63	13	5	18	81	4	8	17	2	99	1		
Total: structural panels ^c																		
2015	33	5	2	40	23	63	19	7	25	88	2	5	7	4	99	1		
2016	35	5	2	42	23	65	18	7	25	90	2	4	6	3	99	1		
2017	36	5	2	43	22	65	19	7	25	90	1	4	6	3	99	1		
2018	35	5	2	42	22	64	17	7	24	88	1	4	6	4	98	2		
2019	35	5	2	42	21	63	18	7	25	88	1	4	6	2	96	4		
Nonstructural panels																		
2015	13	4	1	18	14	33	9	0	9	42	22	23	44	1	88	12		
2016	14	5	1	20	14	34	9	0	9	43	22	22	44	1	89	11		
2017	14	6	1	21	14	35	9	0	9	44	23	22	44	1	89	11		
2018	14	6	1	22	14	36	9	0	9	45	23	22	44	2	92	8		
2019	14	6	1	22	14	36	9	0	9	45	23	22	44	2	92	8		

^a2015-2018 revised, 2019 estimate.^bIncludes glulam and laminated veneer lumber.^cIncludes insulation board, hardboard, medium-density fiberboard, nonconiferous (hardwood) plywood, and particleboard.

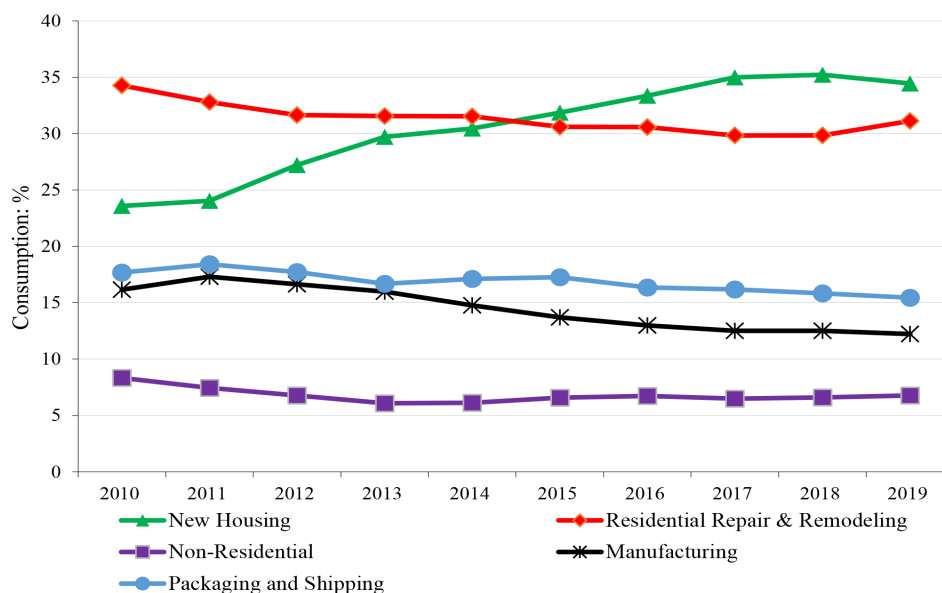


Figure 1. Solid wood timber products consumption market shares, 2010–2019 (total consumption 2010 to 2019: 132,186 x 10³ m³). Sources: AF&PA 2020a; APA 2020a, 2020b; CPA 2020a, 2020b; HMR 2020a; Wood Resources International 2020a; WWPA 2020a.

in 2019, a year-over-year increase of 0.7 percent from 2018 (59.3 million m³ nominal). The South produced 32.9 million m³ of softwood lumber, a 2.8 percent improvement from 2018. The West produced 24.2 million m³ of softwood lumber, a 1.1 percent decline from 2018. The remaining U.S. regions produced 2.6 million m³ of softwood lumber, a 6.0 percent decrease from 2018 (WWPA 2020a, 2020b, 2020c, 2020d). In the first half of 2020, U.S. softwood lumber production increased 2.0 percent (30.5 million m³) from the same period in 2019 (29.9 million m³) (WWPA 2020d).

Compared with 2018, 2019 U.S. sawn softwood imports decreased 3.4 percent to 34.0 million m³. Canadian exports to the United States constituted 89.6 percent of all 2019 U.S. sawn softwood imports (22.2 million m³ (nominal)). This was a decrease of 4.3 percent from 2018 (WWPA 2020a). The U.S. purchases about 65 percent of Canadian softwood lumber production in the #2 and better grades (Kosman 2020a). In 2019, U.S. sawn softwood exports decreased 21.3 percent, to 2.6 million m³, compared with 2018. Apparent consumption, in 2019, was 91.2 million m³, 0.4 percent more than in 2018. By sector, new residential construction consumed 26.5 million m³, R&R used 31.9 million m³, industrial and other consumed 16.2 million m³, and nonresidential construction used 7.7 million m³ in 2019 (WWPA 2020a).

The year 2020 was unique in many respects. A prime example is the aggregate softwood lumber price. Random Lengths' (2020a) framing lumber composite price rose from \$350 per thousand board feet (\$826 per m³) in mid-April to \$952 per thousand board feet (\$2,247 per m³) by September

11th. This is an astonishing 172 percent increase in a relatively brief time frame. Although primary producers benefited from the price escalation, other sectors in the supply chain did not. For instance, several analysts suggest the cost of a new house increased by \$14,000 to \$16,000 per unit as a result of COVID-19 effects. The stay-in-place or work-at-home orders issued by most states have been considered a key factor in the increase in 2020 lumber prices, as many have speculated that working from home has led homeowners to initiate home improvement projects. Additionally, the rapid price rise is attributed to many other factors, such as the near-shuttering of economies, the devastating effect of the mountain pine beetle (*Dendroctonus ponderosae* H.) on stumpage availability in the Canadian provinces of Alberta and British Columbia, U.S. logging contractors ceasing production, wood products production facilities closing, several mills decreasing second quarter production schedules anticipating decreased demand, supply chain disruptions (Taylor 2020a), Canadian wood products shipments delayed because of border closure, labor constraints caused by the pandemic, robust remodeling demand, stout new U.S. housing construction, and events in nature (e.g., hurricanes and wildfires).

World views of discrete actors concerning COVID-19's impact on differing wood products markets, including sawn softwood, are important to gain an understanding of the pandemic's effect on these markets. Taylor (2020a) proffered that even with the shuttering of economies and the curtailment of timber harvesting and wood products mills, "...demand for North American dimension softwood lumber ... was still on fire." Also, order files of production facilities

have been extended five to six weeks. The Southern Forest Products Association (Kessler 2020) reported that the Southern Pine lumber business “is doing well through the uncertain times of COVID-19.” Southern Pine shipments through the first half of 2020 exceeded those of the same period in 2019. Shipments of treated lumber, which is primarily Southern Pine, declined by 12.0 percent reflecting supply and demand effects noted in the previous paragraph and the consequent effect of escalated lumber prices.

RISI (2020a) suggested that if shelter- or work-at-home employees and distance learning are a component of the post COVID-19 normal, numerous current and future homeowners may relocate to less expensive and/or more spacious locales. This has implications for new housing construction, as a median-sized single-family home consumes nearly three times more lumber than a multifamily building of median size. The pertinent questions are will homeowners continue to invest in R&R and will shelter- or work-at-home orders and distance learning propel new construction away from cities?

Softwood Log Trade

Historically, U.S. softwood log exports have been an important component for softwood producers, with exports ranging from 3.2 to 13.1 percent of total U.S. softwood production (1965 to 2019). Notably, the years 1976 to 1991 recorded the greatest percentage of exports, averaging 11.0 percent per year. From 1992 to 2019, exports have averaged 5.9 percent of total U.S. softwood production (WWPA 2020a, 2020b, 2020c, 2020d).

From 2018 to 2019, U.S. softwood log exports decreased 27.1 percent, from 2.9 million m³ (nominal) to 2.3 million m³, which was the least since 1965. This was primarily caused by declines in shipments to China (WWPA 2020d). In the first half of 2020, U.S. exports decreased 15.8 percent (0.1 million m³) compared with the first half of 2019 (1.2 million m³). Exports to China were 1.1 million m³ in 2019, decreasing 40.9 percent compared with 2018. Similarly, a 67.5 percent decline was reported for Canada; 2019 exports were estimated at 0.2 million m³. For Japan, exports were 0.6 million m³ in 2019, decreasing 10.4 percent compared with 2018. Exports to other countries were 0.3 million m³ in 2019, increasing 2.5 percent compared with 2018 (WWPA 2020a, 2020b, 2020c).

U.S. softwood log imports typically have been a minor constituent of U.S. softwood consumption, with imports ranging from 0.04 to 0.96 percent of total U.S. softwood utilization (1965 to 2019). U.S. imports decreased 4.0 percent (24.7 million m³) in 2019 from 2018 (25.8 million m³) (WWPA 2020d). U.S. softwood log imports decreased 2.3 percent in the first half of 2020, declining to 0.07 million m³ compared with the same period in 2019. Canadian log exports to the U.S. were 0.13 million m³ in 2019, a 26.9 percent increase from 2018.

Log imports from other regions in the world increased 400.0 percent, rising to 0.03 million m³ in 2019 from 0.01 million m³ in 2018 (WWPA 2020a, 2020b, 2020c).

Coutu (2020) reported that coniferous sawlog consumption was essentially unchanged from February through June 2020, and even with some mill closures, the net effect of the closures did not impact regional demand for coniferous sawtimber. From mid-May through June 2020, sawmills could not produce enough lumber to meet market demand.

According to Taylor (2020b), the recent U.S.–China trade dispute provided an opportunity for European log exports to be cost-competitive compared with Australia, Canada, the United States, and New Zealand. Currently, even with tariffs for U.S. logs being waived in China, there is pressure on European log producers to find a market(s) for the increasing volume of beetle-killed timber. Because the outbreak will probably continue, it is expected that European logs will be a strong competitor in global markets in the foreseeable future. This will result in U.S. log exports to China, and other markets, being negatively affected.

Sawn Hardwood

The hardwood resource comprises 57.8 percent of U.S. timberland acreage, and nearly 72 percent of the eastern deciduous forest is owned by private landowners (Alig and Butler 2004). The number of U.S. temperate hardwood species exceeds that of other world regions. The United States has an abundant and growing hardwood resource, well-developed transportation systems, numerous seaports, a modern hardwood sawmilling industry (at larger facilities), and very few impediments restricting hardwood log and lumber exports. These, and other factors, afford the United States a comparative advantage in lumber production and exportation. From 1990 to 2000, Canada was the largest export market for U.S. sawn hardwood on a volume basis. By 2009, China imported the largest share of U.S. hardwood lumber, 45 percent. Similarly, on a value basis, Canada was the most important export market from 1990 to 2000. China was the largest value-based importer by 2013 (Luppold and Bumgardner 2020).

Sawn hardwood production was 17.9 million m³ (nominal) in 2019, 7.2 percent less than that in 2018 (19.3 million m³). During the first half of 2020, production declined 13.5 percent to 14.9 million m³ compared with 17.2 million m³ in 2019 (HMR 2020a). In mid-September, HMR (2020b) reported that sawmill and concentration yard operators indicated that business was “trending in a positive direction” and consumption was improving in several sectors (i.e., distribution yards, moulding/millwork, wood components, cabinetry, wood furniture, and pallets). Kitchen cabinets are one of the larger grade hardwood-consuming segments. The Kitchen Cabinet Manufacturers Association reported that in 2020, aggregate cabinet sales increased 3.0 percent year-over-year in July and year-to-

date cabinet sales declined 2.9 percent from the same period in 2019 (KCMA 2020). Johnson (2020a, 2020b) projected a 23 percent decline in sawn hardwood consumption in the industrial market (i.e., fracking mats and road board, containers and dunnage, cross ties, pallets, wood packaging, etc.). The industrial sector accounted for 58 percent of 2019 sawn hardwood production.

U.S. hardwood products are preferred worldwide for several factors, and hardwood product sales are a source of substantial trade volumes and revenues. From 1990 to 2020, three global regions have received substantial volumes of U.S. hardwood lumber: Europe (European Union and United Kingdom), North America (Canada and Mexico), and East Asia (China, Japan, Viet Nam, South Korea, and Taiwan) (Luppold and Bumgardner 2021). In 2018, \$848.877 million (nominal) worth of U.S. sawn hardwood lumber was exported worldwide. In 2019, 3.2 million m³ of sawn hardwood lumber was exported, 20.3 percent less than was exported in 2018 (4.1 million m³). Sawn hardwood imports were 0.8 million m³ in 2019, 18.6 percent less than was imported in 2018 (0.9 million m³) (Table 2) (FAS 2020).

Expectations for improved sawn hardwood demand and pricing were dashed by the rapid spread of COVID-19, even as China had eliminated tariffs on U.S. hardwoods in February. Grade lumber and industrial hardwood markets were disrupted and subsequently declined. The effects of COVID-19 were as abrupt and comprehensive as those from a severe economic downturn. Five months into the pandemic, the contraction in U.S. hardwood sawmill production was comparable with that during the early part of the Great Recession. As such, U.S. hardwood sawmill production declined to record low levels in quarter two 2020. Unlike the effects arising from the U.S.–China trade war and cyclical events that disrupt business within individual market sectors, government regulations aimed at mitigating COVID-19's spread affected the entire marketplace for U.S. hardwood lumber. The COVID-19 crisis created additional reductions in demand and production output, particularly of high-grade lumber and high-grade lumber products. A few hardwood sawmills have attempted to compensate for reduced demand by decreasing output volume or implementing a different production species mix focused on in-demand wood and avoiding low-demand wood species such as red oak (*Quercus rubra* L.), black cherry (*Prunus serotina* Ehrh.), and white ash (*Fraxinus americana* L.). In addition, several firms shifted from producing slow-moving, price sensitive grade lumber products to increasing the production of industrial lumber and timbers (Johnson 2020a).

Similarly, Inman (2020) stated that COVID-19's effects struck the Appalachian hardwood industry at a time when business was improving as a result of Chinese tariff reductions. As trade tensions eased, COVID-19's damage to

hardwood lumber sales occurred within weeks. Many primary manufacturers remained open as they provided essential lumber and chips to differing industry sectors. However, the secondary manufacturing sector was forced by several state governments to close. Lumber demand was reduced sharply in mid-April and has remained flat throughout the pandemic. Further, negative effects of COVID-19 included hardwood production and lumber inventories being minimal in midsummer 2020. Typically, volumes and inventories should be increasing for the fall and winter seasons.

Hardwood Log Trade

U.S. hardwood logs also are a valuable U.S. export product. However, hardwood log imports to the United States are minor in comparison. From 1990 to 2013, Canada imported the most U.S. logs on a volume basis. In 1990, Japan imported the most logs on a value basis, and from 2000 to 2013, Canada was the leader in log imports by value (Luppold and Bumgardner 2020). Hardwood log exports decreased by 17.7 percent during 2019 (1.8 million m³ (nominal)) compared with 2018 (2.2 million m³). Hardwood log exports also declined in the first half of 2020 by 11.3 percent (0.9 million m³) compared with the first half of 2019 (FAS 2020).

Historically, Canada has provided nearly 95 percent of total logs imported to the United States. Hardwood log imports in 2019 (0.38 million m³) declined by 5.8 percent compared with 2018 (0.39 million m³). Hardwood log imports decreased by 6.5 percent (0.17 million m³) through the first half of 2020 compared with the first half of 2019 (FAS 2020).

Pulpwood

The pulp, paper, and paperboard industries are the primary drivers for pulpwood demand. For the past few decades, demand for several categories of papers have declined progressively. Since the advent of electronic media, demand for newsprint, printing (including glossy paper for magazines), and writing paper demand has notably declined. Conversely, the upsurge of on-line shopping (i.e., e-commerce) has enhanced the demand for containerboard products. The panic purchasing of tissue and hygiene products during the COVID-19 pandemic was helpful and temporarily increased the sales of pulp (RISI 2020b). In the corrugated box sector, demand remains at extreme levels because of e-commerce. A relatively new player, the meal kit sector is contributing to this demand (meal kits are shipped in corrugated boxes) (RISI 2020c). But, effects from rising unemployment and corporate bankruptcies may unfavorably impact the printing and writing paper subsectors and specialty paper demand in the upcoming months, although specialty paper may not be hit as hard because of shipping labels on boxes (RISI 2020b).

In 2019, paper and paperboard production decreased by 4.4 percent to 68.4 million m³ compared with 2018 (71.6 million m³) (AF&PA 2020a). Exports of paper, paperboard, and converted products decreased by 6.9 percent to 12.6 million m³, whereas imports of paper and paperboard decreased by 6.1 percent to 11.6 million m³ during the first half of 2020 (AF&PA 2020b).

Total roundwood and residues consumed for wood pulp production in 2019 was estimated at 185.8 million m³ in 2019, a 2.9 percent decrease from 2018 (191.4 million m³), and 79.5 percent of pulpwood and residues used were from coniferous species. Roundwood consumption is projected at 186.4 million m³ in 2020, a slight increase of 0.4 percent from 2019. Residues (roundwood chips, forest, and manufacturing) consumption percentage continued to decrease relative to roundwood. This decrease may be attributed in part to declining residue production and competition from pellet and biomass manufacturers. Combined, these residues supplied 76.5 million m³ (41.2 percent) to total wood pulp production in 2019, a decrease of 4.0 percent from 2018. Residue consumption is forecast to decline in 2020 to 75.8 million m³ (AF&PA 2020d).

Changes in trade continue to affect paper and paperboard production and ultimately influence pulpwood consumption, which disrupts the supply chain and eventually forest management. The decline in U.S. paper and paperboard production and consumption that has occurred during the past decade was principally caused by the downturn in consumer spending that occurred with the U.S. and global recession and changes in consumer preferences and purchasing channels. AF&PA (2020d) reported that six paper and paperboard facilities and ten production lines were shuttered in 2019, for a total of 5,179 million m³ of production being eliminated from U.S. production. Further, in June and July 2020, Verso Corporation shuttered its Duluth, Minnesota, and Wisconsin Rapids, Wisconsin, paper mills because of “accelerated decline” in glossy magazine paper demand arising from the effects of COVID-19 (Biron 2020).

Coutu (2020) reported that raw U.S. wood material consumption between January and July 2020 decreased by 19.4 million metric tons (MT), a 6.7 percent decline from the same time period in 2019. From a monetary perspective, this equated to a \$1.8 billion reduction, which was a 13.0 percent decline from 2019. In the U.S. South, total pine fiber (i.e., pulpwood, primary chips, secondary chips) deliveries declined by about 7 percent and total hardwood fiber decreased by more than 20 percent from February through June 2020. Pine pulpwood harvests and deliveries were about 1.8 million MT less in the first half of 2020 compared with the first half of 2019. In the same time period, primary hardwood chips decreased by 25 percent, secondary hardwood chip deliveries declined by 15 percent,

and deliveries of hardwood pulpwood decreased by nearly 20 percent. This may be attributed to the temporary closures of three large southern pulp mills.

RISI (2020a) opined that COVID-19 has triggered behavior shifts and supply chain disruptions, which may permanently alter wood products markets. As such, the forest products industry may not return to previous levels; rather, it will adapt and transform toward a “next normal.” In the short-run, demand for masks, gowns, and personal protective equipment (which includes cellulose-based nonwovens); tissues; and paper-based cleaning products (e.g., disinfecting wipes) may remain elevated. This is because of governments, the health care industry, businesses, and consumers shifting to greater levels of hygiene and personal protection.

As a result of COVID-19’s impact, graphic paper has been confronted with decreased demand for commercial copying and printing paper, exacerbating a trend that has been occurring since the introduction of electronic media and e-commerce. Indications are that the sector may be approaching a new, permanent nadir (RISI 2020a). Recovered wastepaper (from casinos, churches, offices, schools, etc.) comprises a substantial percentage of recovered paper that typically is used to manufacture new forest-based products. The decrease in recovered paper supply, combined with the removal of nearly 10.9 million m³ of North American paper production by the end of 2021, will affect manufacturing, supply chains, and ultimately forest management (RISI 2020b).

The ramifications could be experienced throughout the forest products sector. In the upcoming two years, the interdependence of ostensibly unrelated markets will be revealed and will transpire in atypical manners. Disruptions in the supply chain may involve decreasing wood fiber and pulp demand, which will force suppliers to seek new customers. For instance, graphic paper mills consume nearly 30 percent of market pulp production, in addition to substantial volumes of recovered wastepaper, and wood chips from sawmills and other sources (RISI 2020a).

In addition, as demand declines for business and office hygiene products, traditional office products, and tissue products, the industry will have to transition to developing and marketing products to the expanding at-home product marketplace. Home-use products are manufactured and packaged differently, sold in smaller quantities, and usually require higher-quality fiber than do business and office products (RISI 2020a).

Furniture

Historically, U.S. furniture manufacturing was one of the larger consumers of grade hardwood lumber. The golden age of furniture making in the United States ran from the early 1970s through the mid-1990s. However, by 1985, the

industry's average net profit after taxes was 4 percent and decreasing. Many plants were obsolescent, and by 1995, furniture production was rapidly entering a profitless zone (Raymond 2019). Since 1999, U.S. furniture manufacturing output and employment have declined substantially. The rapid growth of the Chinese furniture manufacturing industry was the primary cause, in addition to the 2001 recession. Off-shoring of furniture manufacturing, cost advantages of foreign labor, and the sheer size of the Chinese furniture industry yielded a considerable comparative advantage that many U.S. manufacturers could not compete with (Lacy 2004). Furniture manufacturing off-shoring, then and now, has multiple negative effects on the wood products sector, one being declines in sawn hardwood lumber production and consumption. In 1999, 6.2 million m³ of sawn hardwood lumber was used by U.S. furniture industries. In 2013, 3.3 million m³ was used, and in 2019, about 1.2 million m³ was used, an 81.9 percent decline from 1999. Year-to-date, sawn hardwood consumption has decreased 29.8 percent to 0.7 million m³ (Johnson 2020a).

As a result of increased furniture imports, changing preferences, and effects from the Great Recession, the wooden household furniture industry has experienced the greatest decrease in employment amongst secondary wood products manufacturers. Luppold and Bumgardner (2016) postulated that the employment decline is counter to conventional economic expansion expectations and that the decrease was a function of escalating furniture imports from Asia (principally China and Viet Nam) (Figs. 2 and 3). From 1978 to 2000, the total number of workers in the nonupholstered wood household furniture industry declined by 15.4 percent, from 147,900 to 129,700 employees. Between 2000 and 2019, employment decreased by nearly five times the 1979 numbers (29,800 employees in 2019) (Fig. 4). North Carolina and Virginia were both once home to extensive manufacturing clusters for wooden and upholstered furniture manufacture. The aftermath of off-shoring has essentially reduced those clusters to nonentities. Both states have also undergone substantial losses in furniture employment. Since 2001, North Carolina and Virginia's employment losses were 89.5 and 91.8 percent, respectively (Fig. 5) (BLS 2020d, 2020e). Yet, there are slivers of hope as some furniture manufacturing is starting up and/or retuning to North Carolina. Simon (2019) reported that there are labor shortages and attempts are being made to address this situation for North Carolina and regional furniture manufacturing.

While furniture imports have dominated domestic production, the decline in total furniture demand is a critical issue. Imports have slowed but so has domestic production. In 2018, the ratio of furniture imports to domestic production was 3.14, increasing from 0.22 in 1990 (Fig. 2) (ITA 2020b). Furniture imports have damaged the domestic

furniture industry, but the decline in total furniture demand may be just as harmful. Furniture consumption, to date, has not recovered from the Great Recession. For instance, furniture consumption in 2007 was \$25.995 million. By 2009, consumption had declined to \$12.811 million, a 102.9 percent decrease. Since 2010, furniture consumption has averaged \$14.318 million per year, 60.6 percent less than reported for 2007 (Luppold 2020).

Since 2000, some furniture manufacturing has located to Viet Nam, as well as to other countries. Sasso (2020) wrote that Cambodia may be the newest country for international furniture manufacture because of rising labor costs and labor shortages in China and Viet Nam. Epperson (2020a) estimated that in 2019, 62 percent of all U.S. residential furniture (and mattresses) sold in the United States were imported. Wooden household furniture imports were around \$12.3 million in 2019 (furniture and cabinets combined were \$13.3 million) (Fig. 3), with about 57 percent originating from China, Hong Kong, and Viet Nam (Luppold and Bumgardner 2022, ITA 2020a).

Smith Leonard (2020a) reported that new furniture orders totaled \$28.712 million in 2019, a 1.6 percent decrease from 2018. New furniture shipments were valued at \$28.391 million in 2019, a minimal 0.2 percent increase from 2018 (Fig. 3). In the first half of 2020, new furniture orders totaled \$11.813 million, an 18.4 percent decrease from 2019. New furniture shipments in the first half of 2020 were valued at \$11.125 million, also an 18.4 percent decrease from the first half of 2019 (Smith Leonard 2020b). Smith Leonard (2020c) also reported that the 2020 "great surprise" was June new furniture orders being 30 percent greater than those of June 2019. Year-over-year, furniture shipments have declined 21 percent, and shipment backlogs increased 21 percent from May. Epperson (2020b) reported that retail furniture sales have been strong since mid-May, which caught some stores with their inventories down and with minimal inventory ordered.

Epperson (2020c) stated that "...due to COVID-19, the U.S. residential furniture and mattress industries, like everyone, were surprised by the various governmental dictates and had no time to prepare. Beginning in mid-February, our businesses ceased to operate; however, after some study, within days some of our retail stores found they could stay open. We estimate that 60 percent plus of our furniture stores closed, some voluntarily, but some because their state determined they were not essential. Government statistics showed our retail sales declined between 65 and 80 percent in March and April on a year-to-year basis. Some retailers kept accepting shipments until it was impractical to accept more because of a space or capital limitation. Many stores immediately canceled all orders that they could to save working capital."

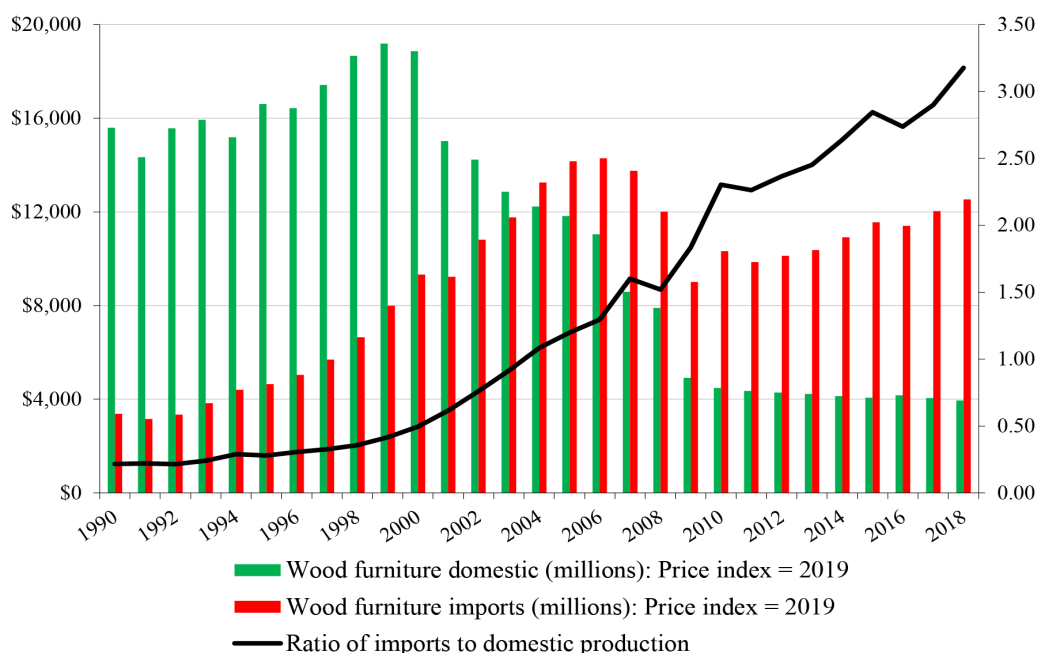


Figure 2. Wood furniture industries demand: Domestic production, imports, and ratio of domestic production to imports, 1990–2018 (in millions) (2017 data currently are not available; available data were extrapolated to produce the 2017 estimate and adjusted for inflation. Sources: Census Bureau 2020k, ITA 2020b, Luppold 2020).

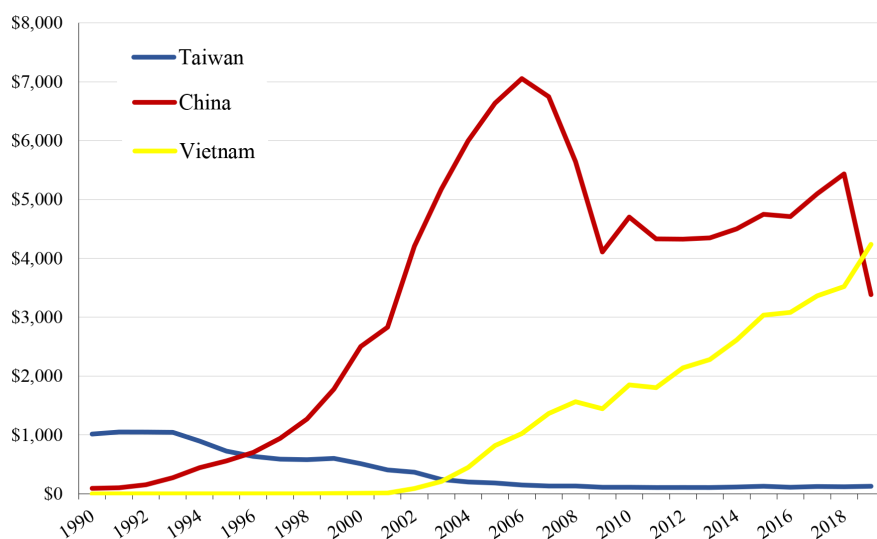


Figure 3. Wood and cabinet imports: Taiwan, China, and Viet Nam, 1990–2019 (in millions, nominal, not adjusted for inflation). Sources: ITA 2020a, Luppold 2020.

“Throughout this, the e-commerce retailers of furniture and mattresses like Wayfair, Amazon, Casper, and many others saw business grow as American consumers were sequestered in their dwellings. In mid-May, more states and cities loosened up on their restrictions and consumers appeared to appreciate the freedom. Sales surprised many being much stronger than expected fueled by the various government efforts like the \$1,200 individual payout and the

\$600 per week unemployment supplement. As this vigorous rebound continued through June, stores began to have problems finding enough merchandise and the manufacturers and vendors struggled to keep up,” (Epperson 2020c).

“In our opinion, furniture and mattresses are benefiting from many other consumer expenditures being limited to some degree like dining out, theaters, travel, sporting events, and

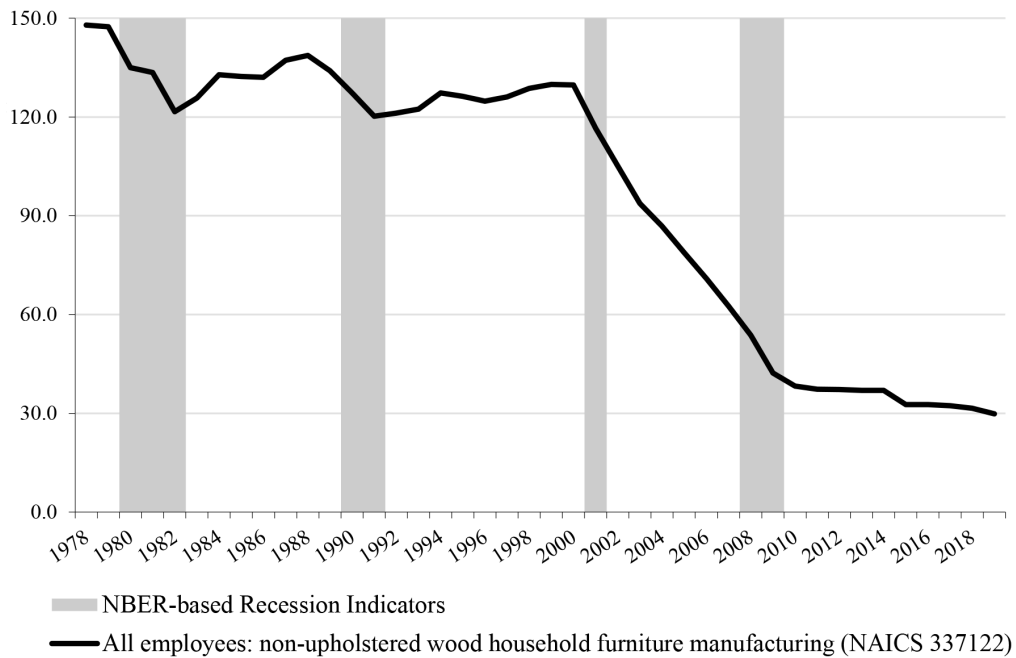


Figure 4. Total employment in the wood furniture industries, 1978–2019 (in thousands) (Sources: BLS 2020d, 2020e; FRED 2020b).

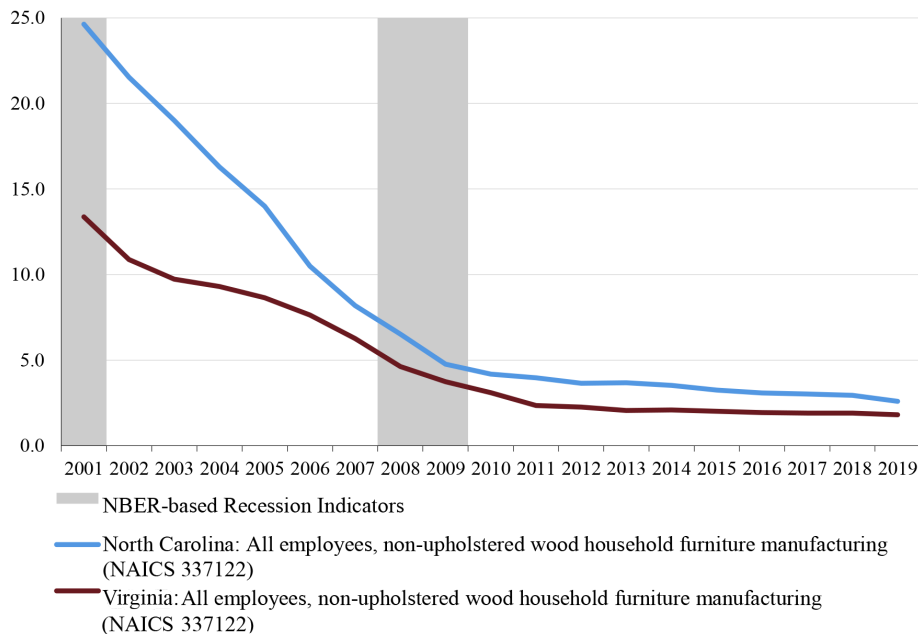


Figure 5. North Carolina and Virginia: Employment in the wood furniture industries, 2001–2019 (in thousands) (Sources: BLS 2020d, 2020e; FRED 2020b).

much more. This has created some additional discretionary income and worked to our benefit. People staying at home is likely providing a boost too. Some manufacturers are saying that business is strong enough now that they might have a record year for sales even having been closed two months. The most mentioned concern is the availability of labor.

Some workers make more staying on unemployment with the federal supplement than they do working in our factories. Of course, that supplement ran out in July, and we will have to see how the Congress addresses further stimulus,” (Epperson 2020c).

Structural Panels

Structural panels are value-added products commonly used in residential construction. Plywood and OSB are structural panel products and are available in three classifications: Exterior, Exposure I, and Interior. These classifications are based on moisture resistance. Plywood is manufactured from thin sheets of veneer. The sheets are laid perpendicular to each other (cross-lamination), adhesives are applied, and the product is bonded under heat and pressure. OSB is manufactured from rectangularly shaped wood strands. The strands are arranged in cross-oriented layers, waterproof glues are added, and the resultant mats undergo high heat and pressure to produce the panels.

Structural panel production in 2019 (23,911 thousand m³) was slightly less than (0.4 percent) that produced in 2018 (23,998 thousand m³) (APA 2020a, 2020b). In 2019, consumption (29,891 thousand m³) was 7.9 percent less than that of 2018 (31,367 thousand m³) (Table 2). In the first half of 2020, structural panel production was 10,317 thousand m³, which was 2.4 percent less than that of the first half of 2019 (10,573 thousand m³) (APA 2020a, 2020b, FAS 2020).

In 2019, imports of structural panels (8,129 thousand m³) declined by 15.6 percent compared with 2018 (9,637 thousand m³). In the first half of 2020, structural panel imports were 3,241 thousand m³, which was 29.9 percent less than in the first half of 2019. Two factors for decreased imports were a trade dispute regarding the structural integrity of Brazilian plywood (Forth 2020) and COVID-19 effects. Structural panel exports were 475.9 thousand m³ in 2019, a 13.7 percent decrease compared with 2018 (551.8 thousand m³). In the first half of 2020, structural panel exports were 211.8 thousand m³, which was 3.5 percent less than in the first half of 2019 (FAS 2020).

In 2019, 13.6 thousand m³ of OSB were produced, a 1.5 percent increase from 2018 (13.4 thousand m³). Apparent OSB consumption totaled 19.8 thousand m³ in 2019, a 1.9 percent decrease from 2018 (20.5 thousand m³) (Table 2) (APA 2020a, 2020b, FAS 2020). Apparent OSB consumption decreased 3.7 percent in the first half of 2020 (9.4 thousand m³ in 2019 to 8.9 thousand m³ in 2020) (FAS 2020).

OSB imports decreased in 2019 (6,368 thousand m³) by 12.9 percent compared with 2018 (7,313 thousand m³). OSB exports decreased by 3.7 percent (190.1 thousand m³) compared with 2018 (183.3 thousand m³) (Table 2). In the first half of 2020, OSB imports decreased by 2.1 percent (2,453 thousand m³) and exports decreased by 34.3 percent (3,732 thousand m³) compared with the first half of 2019 (FAS 2020).

Softwood plywood production was 8,557 thousand m³ in 2019 (Table 2), a 3.5 percent decrease from 2018 (8,869 thousand m³) (APA 2020a, 2020b). In the first half of 2020, softwood plywood production was 3,648 thousand m³, which was 4.6 percent less than in the first half of 2019 (3,822 thousand m³). Softwood plywood production has declined since 2008, although some years showed improvement, yet the aggregate yearly decline has averaged 0.7 percent. The primary reasons for the decline are OSB continuing to increase market share, the gradual return of the U.S. new housing construction market to historical averages, and the shuttering of plywood plants. Apparent softwood plywood consumption totaled 10,032 thousand m³ in 2019, a 7.3 percent decrease from 2018 (10,825 thousand m³) (Table 2). Softwood plywood consumption in the first half of 2020 was 4,320 thousand m³, a 6.2 percent decrease from the first half of 2019 (4,607 thousand m³) (APA 2020a, 2020b; FAS 2020).

Softwood plywood imports decreased in 2019 (1,761 thousand m³) by 2.4 percent compared with 2018 (2,324 thousand m³) (Table 2). In the first half of 2020, softwood plywood imports decreased by 11.8 percent (788.7 thousand m³) from 894.1 thousand m³ in the first half of 2019. Softwood plywood exports declined in 2019 (121.2 thousand m³) by 4.6 percent compared with 2018 (127.6 thousand m³) (FAS 2020).

Elling (2020) stated that “the anticipation of a decline in home sales, and in residential construction, reduced output in industrial applications such as furniture and recreational vehicles due to temporary closures of manufacturing facilities, and a slowdown in nonresidential construction activity, prompted producers of engineered wood products either to shut down their mills or slow production in one form or another in the second quarter. This was evidenced in the second quarter production statistics. Compared to the first quarter of 2020, U.S. OSB and softwood plywood production fell 6.8 and 7.2 percent in the second quarter, respectively. Single-family starts in the U.S., in the second quarter, declined 23.5 percent on a seasonally adjusted basis from the first quarter. The worst of the decline in single-family construction was in April and early May. Anecdotes and Census Bureau data show residential construction started to improve in the second half of May and gained momentum in June. Stay at home mandates and the ability of building material retailers to remain open throughout the second quarter provided boosts to repair and remodeling activity, helping to soften the blow on the construction side”.

Engineered Wood Products

Glulam, I-joists, and laminated veneer lumber (LVL) are some examples of engineered wood products. Glulam is a stress-rated engineered wood beam composed of wood

laminations, also known as “lams, laminating stock, or lamstock.” Layers of dimensional lumber are bonded together with durable, moisture-resistant adhesives, and the grain of the laminations is parallel with the length of the member. I-joists are “I” shaped engineered wood structural members comprised of top and bottom flanges joined with webs. The flange material is typically LVL or solid sawn lumber (the manufacturing method in Canada) and the web is plywood or OSB. I-joists are used extensively in residential flooring and roof framing. LVL is a structural composite lumber product produced by bonding thin wood veneers into a large billet, and the grain of all veneers is parallel to the long direction. Next, the LVL billet is sawn to the dimensions required for the end-use application (Table 2) (APA 2020b).

In 2019, 476.2 thousand m³ of glulam was produced, a 0.03 percent increase from 2018. Glulam production decreased 1.8 percent in the first half of 2020, declining from 229.970 thousand m³ in 2019 to 225.214 thousand m³ in 2020 (APA 2020a, 2020b).

I-joist production was 464.0 million linear feet (LF) in 2019, a 9.8 percent decrease from 2018 (514.4 million LF). I-joist production decreased 3.2 percent in the first half of 2020, declining from 233.7 million LF in 2019 to 226.1 million LF in 2020 (APA 2020a, 2020b).

Elling (2020) reported that in 2019, the consumption of LVL in I-joist production ranged from 5.8 to 6.1 thousand m³.

LVL production was 1.954 million m³ in 2019, a 5.5 percent decrease from 2018 (1.909 million m³). LVL production decreased 6.6 percent in the first half of 2020, declining from 0.979 million m³ in 2019 to 0.914 million m³ in 2020 (APA 2020a, 2020b).

Elling (2020) stated that “I-joist and structural composite lumber (SCL) demand is more dependent on single-family construction, which led to bigger declines in output. Single-family starts in the U.S., in the second quarter, were down 23.5 percent on a seasonally adjusted basis from the first quarter. The worst of the decline in single-family construction was in April and early May. In turn, U.S. I-joist production fell roughly 22.0 percent and SCL output was off 23.5 percent. Production of glulam products dropped 19.0 percent in the second quarter.”

In the future, this category of wood products may expand because of the potential rise of cross-laminated timber (CLT) and mass plywood building; both are mass timber products. Mass timber is a term used for innovative wood product systems that utilize large, solid wood panels for wall, floor, and roof construction. These panels are 6 ft (1.83 m) or more in width and length and are manufactured with resin, nails, or dowels. Each layer of boards is oriented perpendicular to the adjacent layer and dowelled, glued, or nailed on the wide face of each board in a symmetric

manner resulting in the outer layers having the same orientation. Panels can be used in CLT, dowel-laminated timber, glue-laminated timber, nail-laminated timber, and mass plywood systems. Mass timber products can be used to build traditional houses, office buildings, and high-rise structures (Think Wood 2020).

Hardwood Plywood

Hardwood plywood is a panel product comprised of three or more thin layers of wood veneer placed on top of each other and glued with the grain of each layer, or ply, running perpendicular to the one adjacent to it. The outer layers (face and back) surround a core, which is usually lumber, veneer, particleboard, or MDF. Hardwood plywood may be pressed into panels or plywood components (e.g., curved hardwood plywood, seat backs, chair arms, etc.). Hardwood plywood is used for interior applications such as furniture and cabinet products, architectural millwork, paneling, flooring, store fixtures, doors, and other products including chair backs and seats, domes, and bowling alley channels (Howlett 2020). U.S. hardwood plywood demand is primarily dependent on U.S. production of down-stream products including kitchen cabinets, recreational vehicles, manufactured housing, fixtures, underlayment, and furniture. Cabinets are an especially important end-use, with large quantities of domestically produced and imported hardwood plywood consumed in cabinet manufacture (U.S. International Trade Commission 2017).

Hardwood plywood production was estimated at 2,149 thousand m³ in 2019, an increase of 2.7 percent from 2018 (2,093 thousand m³) (USDA FS estimates). Hardwood plywood imports decreased 6.9 percent in 2019, declining to 2,447 thousand m³, and exports also declined 21.0 percent to 96 thousand m³. Total consumption was estimated at 4,500 thousand m³ in 2019, a 2.2 percent decrease from 2018 (4,603 thousand m³) (Table 2) (USDA FS estimates, FAS 2020). The Working Forest (2020) reported that the main exporters (in 2019) of hardwood plywood and veneer to the United States were, in descending order, Viet Nam (487 thousand m³), Indonesia (479 thousand m³), Russia (382 thousand m³), and Canada (364 thousand m³).

In February, the DOC determined that countervailable subsidies were being provided to producers and/or exporters of certain hardwood plywood products from the People’s Republic of China and a countervailing rate was applied to a pair of Chinese firms (ITA 2020a).

Howlett (2020) wrote that, in the United States, the decorative hardwood industry operates in the Northeast, upper Midwest, Appalachian South, and Pacific Northwest and in more than two dozen states. COVID-19 effects varied by firm type and region. As an essential industry, manufacturing operations were not directly impacted, except in those states that temporarily closed facilities down, such as Pennsylvania. Downstream customers were impacted in

varying degrees. For example, some states forced kitchen cabinet and furniture manufacturing plants to close, which are major markets for the industry. Even upon re-opening, Decorative Hardwood Association (DHA) plants serving those markets were slower to re-open because of the federal extra unemployment payment, which disincentivized employees to return to work by allowing them to earn more by staying at home and receiving the higher government relief payments.

Retail establishments have largely stayed open, except in some states that had restrictions on small businesses but allowed “big box” retailers to stay open. DHA producers sell through both channels. The stay-at-home orders boosted the do-it-yourself remodel market, which was a benefit. New home construction generally remained strong with mortgage interest rates dropping to record lows, and construction was considered an essential industry (Howlett 2020).

With an overall economic downturn, aggregate demand in the hardwood plywood sector dropped. Capacity utilization correspondingly declined and is now recovering slowly. With all the stimulus funding, the third and fourth quarters should continue the recovery, but the election results and the pandemic’s path raise continued uncertainties (Howlett 2020).

Particleboard and Medium-Density Fiberboard

Particleboard is a composite wood product and is a general term for a group of products that are comprised of cellulose-based materials (generally forest products). Wood products are processed into cellulosic fibers – distinct pieces or particles that are pressed and extruded. Then the materials are combined with synthetic resins or other adhesives. As a result of its uniformity, shape, and dimensional stability, particleboard is used primarily in cabinet components, as a flooring underlayment, in furniture components, and for kitchen counter underlayment. Medium-density fiberboard (MDF) also is a composite wood product manufactured by fracturing mill residuals into cellulosic fibers that are combined with resin(s) or other binders and then pressed together under heat and pressure. Particleboard and MDF account for well over half of all nonstructural panels consumed in the United States.

Composite Panel Association (CPA) data indicate that both particleboard and MDF production decreased in 2019 compared with 2018. Particleboard production was 3,962 thousand m³, a decrease of 4.2 percent, and MDF production was 2,954 thousand m³, a decrease of nearly 3.0 percent from 2018. Imports and exports of particleboard increased in 2019 compared with 2018; 11.2 and 10.1 percent, respectively. Total apparent particleboard consumption in 2019 versus 2018 decreased by 2.0 percent.

MDF imports and exports were opposite, both declining in 2019 compared with 2018; 7.9 and 39.3 percent, respectively. Total apparent MDF consumption in 2019 versus 2018 decreased by 1.9 percent (Table 2) (CPA 2020a, 2020b; FAS 2020).

According to CPA President Andy O’Hare, “...the industry is beginning to slowly recover, and... the financial health of the association [CPA] remains sound in 2020” (CPA 2020c).

Hardboard

Hardboard is a composite wood product, somewhat similar to particleboard and MDF. However, because of the manufacturing process (i.e., wood fibers are exploded) and greater compression, hardboard is more dense, structurally stronger, and extremely hard compared with particleboard and MDF. Hardboard is used primarily in furniture manufacture and in the construction industry.

CPA data indicate that 571 million m³ of hardboard were produced in 2019 and 614 million m³ in 2018, a 15.8 percent decrease. Because of disclosure agreements, U.S and Canadian hardboard production data, by country of origin, are suppressed to avoid revealing sources (CPA 2020a, 2020b). In 2019, 182 million m³ were imported, a 28.1 percent decrease from 2018. In 2019, 203 million m³ were exported, a 9.1 percent increase from 2018 (186 million m³) (Table 2) (FAS 2020).

Insulation Board

Historically, insulation board was used for insulating new housing. Insulation board production peaked in the mid to late 1970s because of the introduction of substitution products such as dry, spray-applied, stabilized, and low-dust cellulose-based products; fiberglass; spray and biobased foams; and recycled cotton–denim. Traditional insulation board production and consumption has declined dramatically. The AF&PA (2020a) estimated that 670,000 MT of insulation board were produced in 2019, which was a decrease of 0.1 percent from 2018. Imports declined by 43.3 percent and exports by 13.3 percent in the same time frame (Table 2).

Fuelwood

Fuelwood was the primary source of nearly all U.S. energy needs up to the 1870s (EIA 2020e). In modern times, the majority of fuelwood is used for home heating, although some use is for aesthetic enjoyment of a fire. The 2020 data indicate that 0.52 quadrillion (quads) Btu of fuelwood were consumed by residences in 2018 and 0.53 quads were consumed in 2019, a 1.9 percent increase from one year to the other. The 2020 projection is 0.49 quads of fuelwood consumption, and the long-term projections indicate consumption of fuelwood declining to 0.30 quads by 2050.

Numerous forest products manufacturing facilities use mill residues rather than roundwood for fuel, and a small percentage of roundwood (i.e., fuelwood) is used for electric power production. Fuelwood consumption for industrial heat and/or electricity production currently is limited by the low cost of natural gas and coal (although coal is a declining source of energy). Renewable fuel standards, and other biomass-related energy policies, may not increase the growth rate for fuelwood production and consumption, yet the consumption of other forms of wood energy may increase, such as wood pellets.

Forest Products Prices

Forest products wholesale prices vary across all wood-producing sectors, including lumber and wood products (e.g., lumber and wood-based panels) and pulp and paper products (Fig. 6). Beginning in 1993, the producer price index (PPI) of lumber and wood products has been relatively stable, averaging 181.2 per year, until peaking at 194.5 in 1997 (not seasonally adjusted) (BLS 2020e).

The PPI for lumber and wood products (LWP) decreased from 2000 to 2007 by 36.1 percent, and the LWP PPI bottomed at 82.9 in 2011. The Great Recession's effects on new building construction, furniture manufacturing, and remodeling are major factors for the decline. Since 2012, the LWP index has fluctuated, rising to 115.0 in 2018 and recording a 105.3 reading in 2019. In contrast, the unadjusted pulp and paper PPI has exhibited considerably less volatility. The PPI for pulp, paper, and allied (PPA) products (excluding building papers) also has fluctuated since 2000, with less variability than LWP. The PPA index was 121.6 in 2000, declining to 105.0 in 2008, rising again to 116.7 in 2016, and finishing 2019 with a 113.8 reading

(BLS 2020d). Many paper and paper products are essential for daily living, and therefore, production prices remained relatively steady. This is one reason for less variability in the PPI for PPA. Conversely, electronic media and e-commerce have negatively affected paper and paper products production, and subsequently, prices have declined because of less demand.

Energy Policy Initiatives

Wood Energy

Until the 1870s, wood was the source of nearly all U.S. energy needs. In 2019, 2.3 percent of total energy consumption was derived from wood (Fig. 7) (EIA 2020e). Beginning with the Public Utility Regulatory Policies Act (PURPA) of 1978, woody materials for energy production received renewed interest. Since then, public policy has been focused on promoting biomass for electricity production. In recent years, there has been a shift to greater support for the production of liquid fuels for transport (i.e., biodiesel and jet fuel). The wood energy market in the United States is composed of four major sectors: industrial (63.9 percent), residential (23.2 percent), electricity (9.3 percent), and commercial (3.6 percent) (EIA 2020b). The industrial sector represents the wood products and pulp and paper industries, and the amount of wood energy it consumes has been mainly linked to wood product output rather than public policies. Public policy has been focused on the other three sectors at the state and federal levels.

The federal incentives introduced since 2004 include (a) the renewable energy production tax credits, (b) clean renewable energy bonds, (c) qualified energy conservation bonds, and (d) investment tax credits (Aguilar and others 2011). These incentives are tailored to the electricity

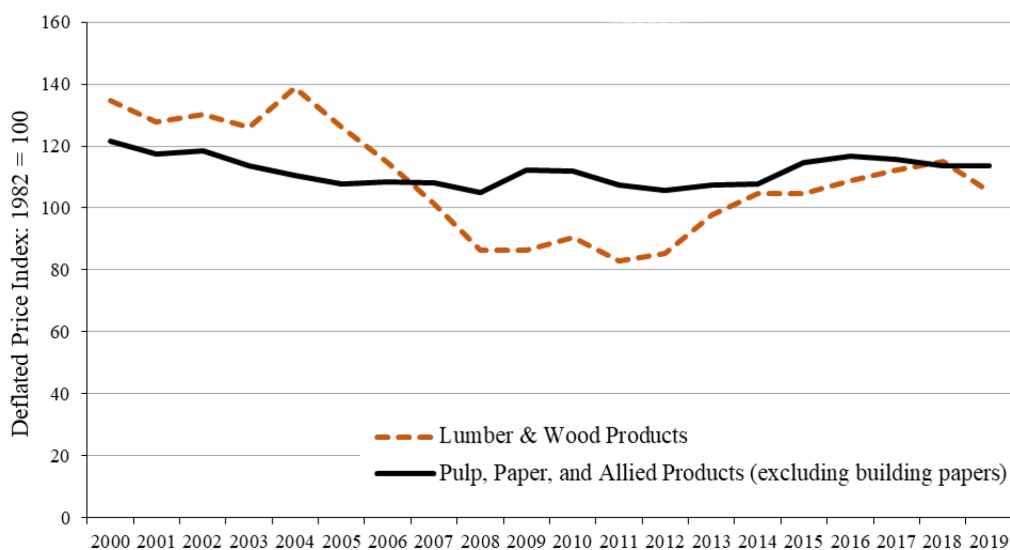


Figure 6. Wholesale prices of select forest products, 2000–2019 (Source: BLS 2020e).

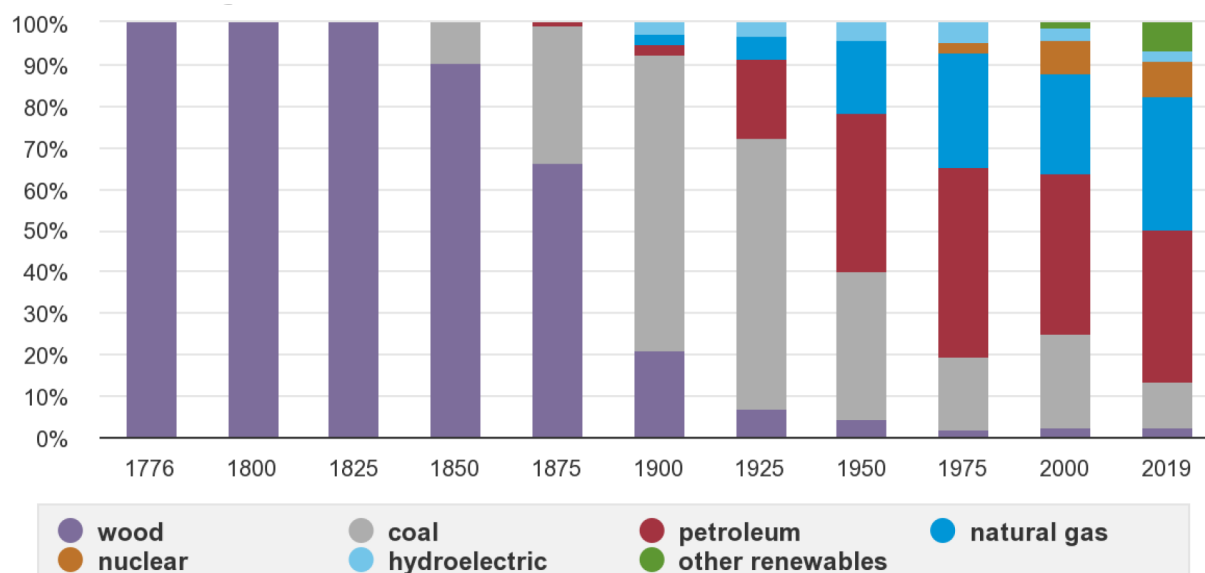


Figure 7. Total U.S. energy consumption shares by major sources in selected years, 1776–2019 (Wood includes wood and wood waste; other renewables includes biofuels, geothermal, solar, and wind. Source: EIA 2020e).

generation sector. Recent publications suggest that open-loop biomass plants also are eligible (i.e., not relying on bio-energy-dedicated crops but rather on material harvested from working forests and industry coproducts) (Howard and Liang 2019). The Biomass Crop Assistance Program (BCAP) was established to aid in meeting U.S. federal renewable fuel standards. BCAP mandates increased national blended biofuel production (excluding ethanol from corn starch) at 36 billion gallons by 2022, with 21 billion gallons in the form of advanced biofuels (Spaeth 2008).

The expansion of the U.S. wood pellet manufacturing sector continues owing in part to steady domestic and increasing foreign demand. As such, industrial pellet production capacity for exports to the European Union (EU) and other countries has expanded. EU bioenergy supply and demand are influenced by policies that seek a reduction of greenhouse gas emissions (GHG) and do not threaten existing bioenergy feedstock production.

In 2020, the U.S. Energy Information Administration (EIA) reported there were 84 densified biomass manufacturing facilities in the United States: 33 in the East (capacity: 1,872 thousand MT per year), 35 in the South (8,179 thousand MT per year), and 16 in the West (711 thousand MT per year). Total production of wood pellets was 8,837 thousand MT in 2019, a 15.1 percent increase from 2018 (7,469). In the first half of 2020, 4,037 thousand MT were produced, a 0.8 percent decrease from the first half of 2019 (4,159 thousand MT). Total exports of wood pellets were 6,163 thousand MT in 2019, a 10.5 percent increase from 2018 (5,579 thousand MT). In the first half of 2020, 3,043 thousand MT were exported,

an 8.7 percent increase from the first half of 2019 (2,800 thousand MT) (EIA 2020c). The majority of U.S. overseas pellet exports were to the United Kingdom (62 percent of Britain's imports), followed by Belgium and then Denmark (Wood Resources International 2020b, 2020c).

Biomass Energy

Biomass energy includes wood and wood processing residues (e.g., firewood, wood pellets, wood chips, lumber and furniture mill sawdust and waste, and black liquor from pulp and paper mills), agricultural crops and residue materials (e.g., corn, soybeans, sugar cane, switchgrass, woody plants, algae, and crop and food processing residues), biogenic materials in municipal solid waste (e.g., paper, cotton, wool, food, and yard and wood residues), and animal manure and human sewage. In 2019, biomass provided nearly 5 quads Btu of energy and nearly 5.0 percent of the total primary energy use in the United States. This percentage is around 46.0 percent wood and wood-derived biomass, 45.0 percent biofuels (mainly ethanol), and 9.0 percent municipal waste biomass (EIA 2020e).

The utilization of biomass for energy and the simultaneous reduction of GHGs are positives for the forest products industry. Biomass is viewed favorably in conjunction with potentially reducing GHGs and other environmental and sustainable energy goals. Thus, biomass complements U.S. environmental and sustainable energy interests. The electricity-producing sector is a major beneficiary of federal public policy support, as is undergoing analysis of GHG emissions. Power generation using woody feedstock is considered carbon neutral. However, this postulation is still

being debated. Although, the Biomass Power Association (2020) stated that 30 million tons of carbon dioxide are removed annually by the use of biomass energy. In April 2018, the U.S. Environmental Protection Agency (EPA 2020a) issued the following policy statement: “EPA’s policy in forthcoming regulatory actions will be to treat biogenic CO₂ emissions resulting from the combustion of biomass from managed forests at stationary sources for energy production as carbon neutral.” The potential implementation of this carbon neutral policy is viewed as a positive development by several in the forest products industry. The EPA (2020b) “finalized volume requirements under the Renewable Fuel Standard (RFS) program for 2020 for cellulosic biofuel, biomass-based diesel, advanced biofuel, and total renewable fuel, and biomass-based diesel for 2021.” Cellulosic biofuel targets required 0.59 billion gallons of production (BGD) in 2020, increasing from 0.42 BGD in 2019. Biomass-based diesel was 2.43 BGD in 2020 and 2021, advanced biofuel was 5.09 BGD in 2020, and renewable fuel was 20.09 BGD in 2020.

In 2019, 4.8 quads of energy from woody biomass were produced, a 2.9 percent increase from 2018. EIA projects woody biomass energy production of 4.7 quads in 2020, a 1.7 percent decrease from 2019. However, from 2021 onward, production is forecast to increase, peaking at 5.5 quads in 2050. The residential sector consumed 0.53 quads in 2019, an increase of 20.4 percent from the 2018 estimate (0.44 quads). For 2020, 0.50 quads are projected to be consumed. The residential sector forecast indicates consumption at 0.31 quads in 2050. The commercial sector consumed 0.13 quads in 2019, a 7.1 percent decline from 2018. The commercial sector is projected to consume 0.13 quads in 2050 (EIA 2020a, 2020b, 2020d).

The EIA’s September Short-Term Energy Outlook (STEO) (EIA 2020f) is uncertain because of mitigation and reopening efforts related to COVID-19. The reduction in economic activity has caused changes in energy demand and supply patterns. In 2020, electricity generation from renewable energy sources (including wind and solar) is forecast at 20 percent, and that for 2021 is forecast at 22 percent.

Softwood Lumber Agreement

The Canada–U.S. softwood lumber disagreement had its beginnings in 1982. U.S. softwood lumber producers claim/claimed that the Canadian softwood lumber industry’s access to Crown timber is subsidized (through reduced stumpage fees) by their respective federal and provincial governments. Between 1982 and 1996, U.S. producers sought relief through the U.S. DOC, U.S. International Trade Commission, and the World Trade Organization (WTO). Canadian producers have appealed to the North

American Free Trade Agreement (NAFTA) Chapter 19 dispute settlement mechanism and the WTO. In 1986, a memorandum of understanding (MOU) between Canada and the United States created phased-in tariffs. Canada withdrew from the MOU in 1991; however, the United States applied countervailing duties from 1992 to 1996. The Softwood Lumber Agreement (SLA) was enacted in 1996, and there were several iterations to the initial SLA before 2015.

The SLA terminated in October 2015, resulting in Canadian producers having access to U.S. markets without the imposition of tariffs. In April 2017, the DOC applied tariffs to Canadian softwood lumber producers at an average rate of 20.2 percent. However, the DOC was to reduce duties to 8.2 percent in August 2020. Because of COVID-19, the DOC delayed the decision for 50 days and increased the delay to 60 days in July 2020, with a final determination to be made by November 23, 2020 (Random Lengths 2020b, Kosman 2020b). In August 2020, the WTO ruled in favor of Canadian producers’ countervailing duties appeal and sided with Canada on several other points. U.S. producers prevailed on some points, including provincial electricity subsidies, income tax regulations, and the Maritimes stumpage benchmark (WTO 2020a). On September 28, 2020, the United States appealed the WTO panel’s ruling regarding U.S. duties applied to imported Canadian softwood lumber. According to the WTO (2020b), there is not agreement among WTO members regarding the filling of Appellate Body vacancies, and as such there is no Appellate Body Division available, at present, to address the appeal.

Summary

The U.S. began 2020 on firm economic footing, but by June, COVID-19’s effects on world health and the U.S. and world economies were becoming apparent. The FOMC revised their 2020 U.S. GDP forecast to –3.7 percent, and the FRBP-SPF projected it at –5.2 percent. COVID-19’s negative effects on employment were greater than those from the Great Recession. By the end of April 2020, 25 million people were unemployed, resulting in an unemployment of nearly 15 percent. The U.S. economy is slowly recovering, and the unemployment rate declined to 11 percent in June 2020. Total consumer spending declined \$1,102 billion in the first half of 2020 compared with the first half of 2019. The industrial production index improved to 101 in August 2020. However, it was still 7 percent less than recorded in February 2020.

U.S. housing markets continued their steady but gradual recovery in 2019 and into the first half of 2020. In spite of COVID-19’s devastating effects, new housing construction is a bright spot for the U.S. economy. In the first half of 2020, total starts were 2.3 percent greater and single-family starts were minimally less (0.3 percent) than those reported

for the same period in 2019. New house sales in the first half of 2020 were nearly 690,000 units, and this was 2.8 percent more than that for the first half of 2019. R&R's expenditure volume surprised most and improved more than 15 percent from the first half of 2019. The shelter-in-place or work-at-home orders resulted in a positive effect on the R&R subsector and may lead to changes in residential design and nonresidential construction. Select architects are beginning to design new houses with office space. Some existing homeowners are expanding their office areas, resulting in another boon for R&R. There is conjecture that the demand for office buildings may decline going forward, as many firms noted that worker productivity actually increased with work-at-home employees. Several sources have noted a mini-exodus from large metros to suburban and/or rural areas as a result of COVID-19. This has resulted in decreasing housing supply and increasing median house prices in several locations, another potential advantage for future new housing construction.

Housing's improvement is projected to have a positive effect on many wood products markets. The shelter- or work-at-home orders are a double-edged sword — consumer paper products recorded large purchase increases, whereas office paper products were the opposite. In 2019, several wood product categories production and consumption volumes were negligibly less than in 2018, and other categories reported moderate declines. Softwood lumber production and consumption both increased year-over-year in 2019. Composite panel products, hardwood plywood, and furniture consumption also increased from 2017 to 2018. Wood pellet production and sales continue to increase. One factor for the increase is that several European nations have invested substantially in pellet facilities for the generation of electricity.

Conversely, sawn hardwood production and consumption decreased for the second consecutive year, structural panel production and consumption was minimally less than 2018, paper and paperboard production remain in a decade-long decline, pulpwood consumption decreased for the fifth year in a row, and furniture production declined from 2018 to 2019. Softwood lumber exports decreased in 2019, caused by trade tensions, decreasing demand, and a surge in central European exports.

In closing, the near-term effects of COVID-19 are the main factors that affected U.S. economic and wood products activity in 2020. This also holds true for world economies. Reduced global demand as a result of COVID-19, trade tensions, events in nature, and geopolitical events also are critical to forest products production and trade and global economies.

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