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STATUS AND TRENDS FOR THE U.S. FOREST PRODUCTS SECTOR

A Technical Document Supporting the Forest Service 2020 RPA Assessment

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ABSTRACT

According to the latest available forest resource estimates, approximately 40 percent of the roundwood harvested in the United States is utilized in the production of solid wood products and 38 percent in the production of wood pulp for paper and paper products (Oswalt and others 2019). The demand for solid wood products is motivated by activity in end-use markets such as new housing construction and furniture manufacturing. The demand for paper and paperboard products arises by activity in a wide range of industries, from businesses that need to print paper to the retailer's demand for wrapping paper and boxes used in shipping, among others. This report provides trends in U.S. forest products consumption, production, and trade to assess the forest products sector status to date. We find the U.S. construction sector remains the leading consumer of solid wood products, accounting for nearly 66 percent of all solid wood products consumption in 2019. As such, we observe the production of solid wood products closely following trends in the construction sector activity. Consumption of pulp and paperboard products shows a persistent downward trend primarily due to the increasing adoption of electronic media in place of newsprint, writing papers, and printing papers. Paper products consumption per capita during 2019 was nearly 60 percent below the level observed in 1999. Paperboard consumption per capita has declined as well, but at a slower rate.

Keywords: Forest products, forest sector, lumber, paper and paperboard, trade, wood energy, wood panels.

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EXECUTIVE SUMMARY

The United States is the world's leading producer and consumer of industrial roundwood (i.e., roundwood or wood in rough form, either whole or chipped logs, used for industrial manufacturing), the leading producer of wood pulp and wood pellets, and the second largest consumer and producer of sawn wood, wood-based panels, and paper and paperboard (FAO 2020). Approximately 40 percent of harvested roundwood is utilized in the production of solid wood products and 38 percent in the production of wood pulp for paper and paper products (Oswalt and others 2019, table 39). Additionally, our estimates indicate net imports of solid wood products contributing a nearly 24-percent share of consumption in 2019, while pulp and paper products estimates reveal a small trade surplus.

Our objective is to provide trends in U.S. forest products consumption, production, and trade to assess the forest products sector status to date. This report, an adjunct to the RPA 2020 Assessment, updates Skog and others (2012), which was associated with the RPA 2010 Assessment, by extending data coverage through 2019. As such, we present general trends for U.S. timber products as well as trends for solid wood products use by major end-use market; observed trends in production, consumption, and trade for paper and paperboard products; and wood for energy. Throughout the report we bring attention to the forest sector status following the economic recession that started in the fourth quarter of 2007 and lasted through the second quarter of 2009 (FRED 2020).

Solid Wood Products Consumption

In 2019, approximately two-thirds of solid wood products were consumed in (1) new housing units; (2) housing repair and remodeling; (3) nonresidential buildings; (4) nonresidential, non-building structures (including highways, dams, and other structures); and (5) nonresidential alterations and renovations (fig. 8). These end-uses accounted for about 70 percent of all lumber, 79 percent of total structural panels, and 29 percent of all non-structural panels consumed.

New residential construction increased steadily over the past decade (2011 to 2019). For instance, total housing starts increased 111 percent during the past decade (single-family starts improved 106 percent; and multi-family starts increased 126 percent). Even with these impressive improvements, new housing construction starts remained under historical averages. In the same timeframe, total private residential spending increased 56 percent; single-family 86 percent; multi-family 202 percent; and repair and remodeling 12 percent.

(continued)

The U.S. is the world's second largest producer and consumer of lumber.



Wood chips make up over one-third of the roundwood consumed in wood pulp manufacture.

In 2019, nonresidential construction in the United States was valued at US\$ 783 billion (private and public), with US\$ 454 billion being spent for nonresidential buildings and US\$ 329 billion for "other" nonresidential construction. In 2019, nonresidential construction consumed an estimated 6 percent of total wood products production, about 7 percent of all lumber, 6 percent of all structural panels, and 6 percent of all non-structural panels. In 2019, total wood products use per \$1,000 constant (2019) expenditures was estimated to be 0.012 m³, with slightly more expenditures going to the nonresidential building construction sector. Nonresidential buildings, their alterations and renovations, and "other" nonresidential construction projects consumed an estimated 9.7 million m³ of wood products. This volume consisted of 6.9 million m³ of lumber, 1.7 million m³ of structural panels, and 1.1 million m³ of non-structural panels.

Non-construction related wood products consumption, including manufacturing, packaging and shipping, and other uses, averaged 40 percent of total solid wood products consumption in all sectors from 2009 to 2019. The manufacturing sector saw little change through the 2010s, averaging 18 million m³ of lumber and panel products consumed from 2009 to 2019. After experiencing substantial loss of market share to foreign competition in the early 2000s and additional losses in domestic production and consumption due to the economic recession at the end of the decade, furniture manufacturing experienced modest gains post-recession. In contrast, wood products consumption in packaging and shipping reached an all-time high in 2019, after a decade of growth.

(continued)

Paper, Paperboard, and Pulpwood Consumption

Paper and paperboard consumption continued to exhibit the general downward trend that began in the 1990's. Most of this decline is linked to changes in consumption of newsprint, and printing and writing papers, as consumer preferences continue shifting from printed to electronic media (Latta and others 2016). In contrast, the consumption of paperboard products improved slightly over the 2010–2019 period. The relative recovery and stability of the paperboard industry follows the growth in electronic retail sales and associated demand for containerboard products.

Pulpwood consumption for wood pulp production declined slightly, with approximately 3 percent less pulpwood consumed in 2017 compared to 2008. However, different U.S. regions experienced varying levels of change. In the South, pulpwood consumption was almost 3 percent higher in 2017 compared to 2008, while in the North and West regions' pulpwood consumption was 26 percent and 37 percent lower, respectively.

Wood for Energy Consumption

Data on current use of wood for domestic energy production does not exhibit any notable trends up or down. However, because wood energy is susceptible to impacts from policies related to energy security and/or carbon and climate, this could change if major policies were implemented to promote the use of wood for energy or to prohibit the use of wood for energy. Changes in market prices for alternative energy sources, such as oil, natural gas, solar, or wind could also lead to changes in the use of wood for energy.

The use of U.S. timber to produce wood pellets for non-domestic utility consumption is a still-growing wood products sector in the U.S. South. Current growth projections in this sector show that additional plants are expected to be built, and because these plants have annual wood requirements comparable to a small paper mill, continued impacts on southern forest resources are expected. To date, this sector is entirely policy driven, primarily through the European Union (EU) Renewable Energy Directive. If these policies were to change, however, this industry would also change.

INTRODUCTION

The United States is the world's leading producer and consumer of industrial roundwood, the leading producer of wood pulp and wood pellets, and the second largest consumer and producer of sawn wood, wood-based panels, and paper and paperboard (FAO 2020). The U.S. forest products sector is supported by abundant forest resources and available mill capacity. Forest inventory estimates indicate timberland average annual net growth volumes surpassing harvests by approximately 90 percent (Oswalt and others 2019, table 36). The U.S. Federal Reserve Board reported capacity utilization for 2019 at 76 percent and 85 percent for solid wood products (North American Classification System, NAICS 321) and paper products (NAICS 322), respectively (FRB 2020a). Solid wood products and paper and paperboard products accounted for nearly 4 percent of manufacturing gross domestic product (GDP) in 2018 (BEA 2020a), supporting 752,000 full-time equivalent jobs, or 6 percent of all manufacturing employment (BEA 2020c).

Approximately 40 percent of harvested roundwood is utilized in the production of solid wood products and 38 percent in the production of wood pulp for paper and paper products (Oswalt and others 2019, table 39). Additionally, our estimates indicate net imports of solid wood products contributing a nearly 24-percent share of consumption in 2019, while pulp and paper products estimates reveal a small trade surplus. The demand for solid wood products is motivated by activity in end-use markets such as new housing construction and furniture manufacturing. The demand for paper and paperboard products arises by activity in a wide range of industries, from businesses that need to print paper to the retailer's demand for wrapping paper and boxes used in shipping, among others.

The objective of this paper is to provide trends in U.S. forest products consumption, production, and trade to assess the forest products sector status to date. This report, an adjunct to the

RPA 2020 Assessment, updates Skog and others (2012), which was associated with the RPA 2010 Assessment, by extending data coverage through 2019. As such, we present general trends for U.S. timber forest products as well as trends for solid wood products use by major end-use market; observed trends in production, consumption, and trade for paper and paperboard products; and wood for energy. Throughout the report we bring attention to the forest sector status following the economic recession that started in the fourth quarter of 2007 and lasted through the second quarter of 2009 (FRED 2020).

Solid wood products are broadly divided into the following categories:

- **Softwood and hardwood lumber**, which also includes a variety of engineered wood products such as cross-laminated timber (CLT); glued laminated timber (Glulam); structural composite lumber (SCL), such as laminated veneer lumber (LVL), parallel strand lumber (PSL), and oriented strand lumber (OSL); and wood I-joists
- **Structural panels**, including softwood plywood and oriented strand board (OSB)
- **Non-structural panels**, including hardwood plywood, insulation board, particleboard, medium-density fiberboard (MDF), and hardboard.

Information on paper and paperboard products is also provided by product category. Paper products include newsprint, printing and writing, packaging and specialty papers, and tissue (including sanitary) papers. Paperboard products cover containerboard and boxboard.

Unless otherwise noted, all statistics are reported in metric units and pricing information is provided in constant 2019 U.S. dollars. Readers are advised that most data provided herein constitute estimates of production and consumption, carrying some measure of error. Consequently, small changes from year to year may not be statistically significant in some instances.

DRIVERS OF CONSUMPTION OF TIMBER PRODUCTS

Timber forest products, including solid wood products and paper and paperboard products, are inputs of production to various end-use sectors such as construction, furniture manufacturing, and packaging and shipping, among others. Gross domestic product (GDP) is often used to assess expected economic activity and, consequently, used as an indicator of forest products' industry activity. In general, U.S. solid wood products consumption has maintained a similar trend to that of GDP, with an upward trend observed on both series over the 2011–2019 period (fig. 1). However, we also observe U.S. solid wood products consumption starting to decline in 2006, albeit with a relatively stable GDP between 2002 and 2007. This effect can be explained by a decline in construction activity, which started in 2006 with the contraction in housing demand and extended through the 2007–2009 economic recession. In effect, the 2007–2009 economic recession (also referred to as the Great Recession or the 2008 recession) developed from the collapse of a housing bubble, caused by an expansion of subprime mortgages, that started in the early 2000s and burst in early 2007 (Anundsen 2015).

The U.S. construction sector is a major consumer of solid wood products, with private residential construction accounting, on average, for nearly 32 percent of all U.S. solid wood consumption over the 1990–2009 period (McKeever and Howard 2011). Private residential construction, measured by housing starts of both single and multi-unit structures, declined from a housing bubble peak of 2.07 million units in 2005 to 554,000 units in 2009, the lowest level observed during the recession (U.S. Census 2020i). Figure 1 shows the downward trend experienced in U.S. solid wood products consumption in response to the economic recession and decrease in construction. Solid wood products consumption increased gradually through the 2010–2019 period, as construction and GDP rose steadily.

The relationship between paper and paperboard products consumption and GDP has shifted over time, with GDP no longer indicative of consumption as historically observed (Skog and others 2012). Trends in U.S. paper and paperboard consumption and real GDP displayed diverging paths through the 2011–2019 period (fig. 1). U.S. paper and paperboard consumption is also linked to general manufacturing activity

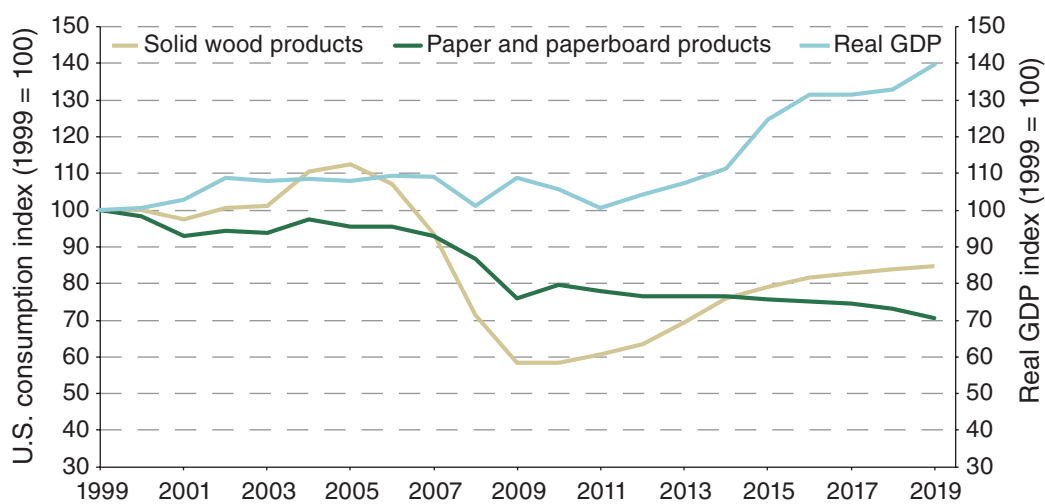


Figure 1—Trends in U.S. consumption of major forest products and real GDP, 1999–2019. Sources: AFPA (2019, 2020); APA (2019); BEA (2020a); CPA (2019); Howard and Liang (2019); WWPA (2020).

(Ince and others 2007). However, the relationship between U.S. paper and paperboard consumption and U.S. industrial productivity (IP) has changed over time as well, as shown in figure 2. Paper and paperboard consumption had similar trends as IP up to 2004 (fig. 2). From 2005 to 2007, the levels of paperboard consumption were relatively stable, but paper consumption declined, alongside increasing industrial productivity. The three series realigned during the 2007–2009 economic recession, all showing some degree of recovery by 2010. However, paper consumption and industrial productivity continued moving further apart from 2011 forward. In contrast, paperboard consumption moved upwards from 2010–2017, paralleling the IP trend, although paperboard consumption remained below the 1999 base level throughout this period. U.S. paperboard consumption decreased during 2018–2019 under growing IP, which could indicate future divergence between these two series as well.

The demand for end-use products and services is determined by consumer needs and preferences, which are in turn affected by factors such as prices, income growth and distribution, and social

influences. Increasing population and wealth (GDP) should lead to increased demand for goods and services, including those products utilizing forest products. We examined the influence of population growth on paper and paperboard consumption by analyzing trends in consumption per capita. The analysis shows a declining rate of consumption per capita across both paper and paperboard products, although to different extents (fig. 3). Paper products consumption per capita declined sharply between 1999 and 2019, with 2019 levels nearly 60 percent below the 1999 per capita consumption levels. This change in paper consumption per capita is due in part to changing consumer preferences, with declining use of newsprint and writing and printing papers in favor of electronic media (Latta and others 2016). Paperboard consumption per capita declined as well but at a slower pace, with 2019 consumption nearly 20 percent below the 1999 base level. Unlike newsprint and printing and writing papers, paperboard consumption has benefitted from consumers’ adoption of electronic media and the growing use of electronic commerce (Virgin 2020).

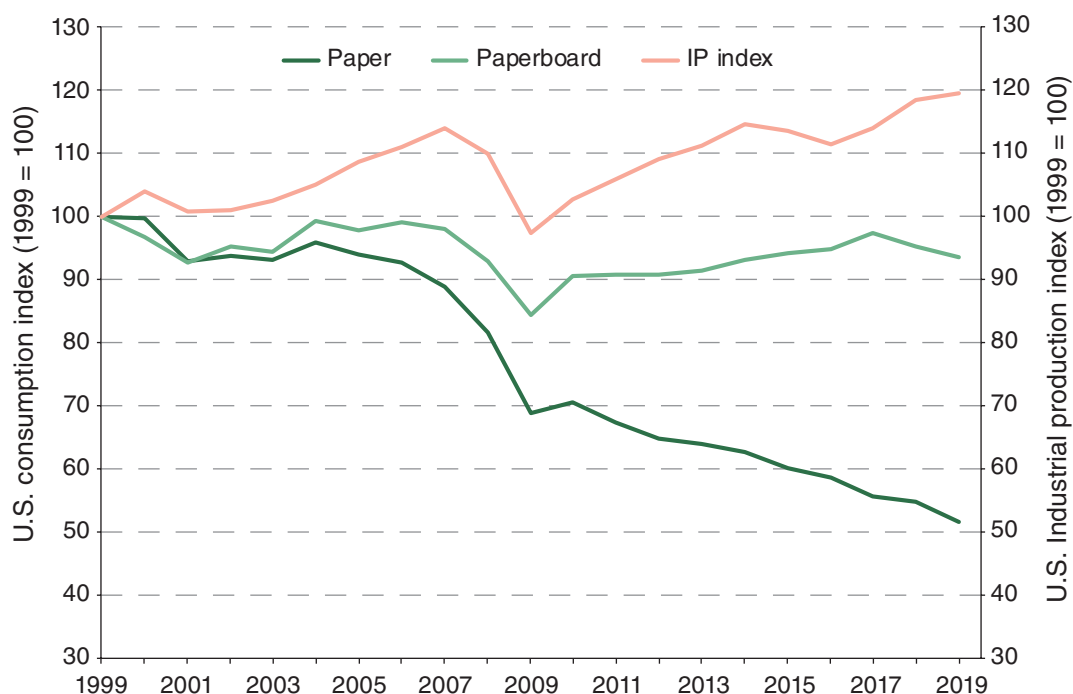


Figure 2—U.S. consumption index for paper and paperboard products and total industrial production index, 1999–2019. Sources: AFPA (2019, 2020); FRB (2020b).

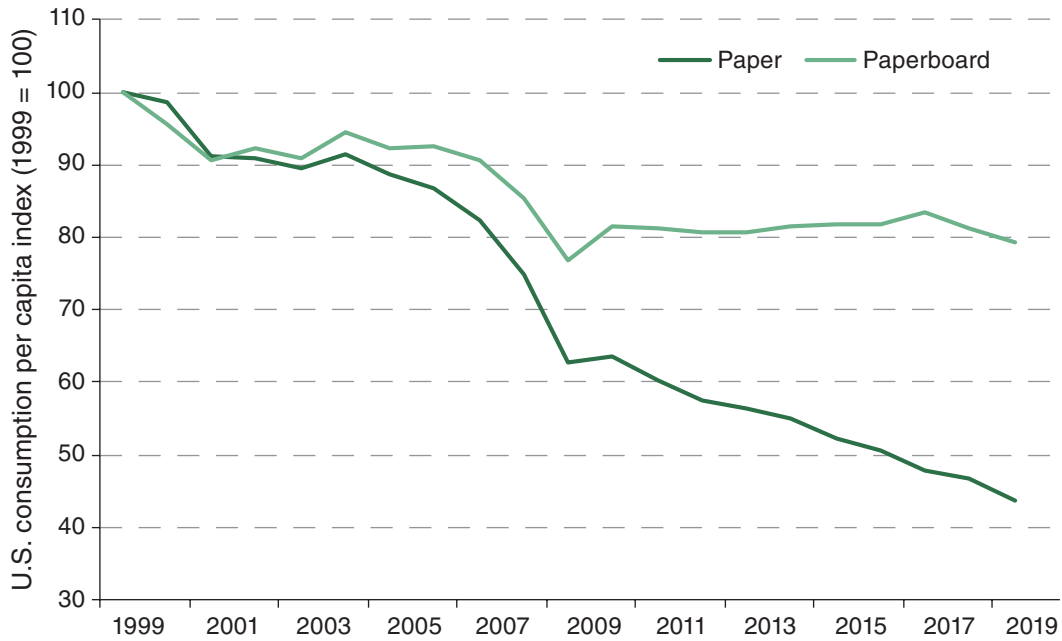


Figure 3—U.S. consumption per capita index for paper and paperboard products, 1999–2019. Source: AFPA (2019, 2020).

Among paper products, newsprint and printing and writing papers experienced the largest decline (fig. 4). Newsprint and printing and writing papers consumption per capita was 60 percent and 85 percent below the 1999 base levels, respectively. These two paper products accounted for 58 percent of all U.S. paper consumption in 2019, a decrease from their 80-percent share in

1999 (AFPA 2019, 2020). Tissue paper products (e.g., toilet paper, facial tissue, napkins, etc.) show a slight decline in consumption per capita through the 1999–2019 period, with 5 percent lower consumption in 2019 compared to 1999. The tissue paper share of total U.S. paper consumption increased from 12 percent in 1999 to 25 percent in 2019 (AFAP 2019, 2020).

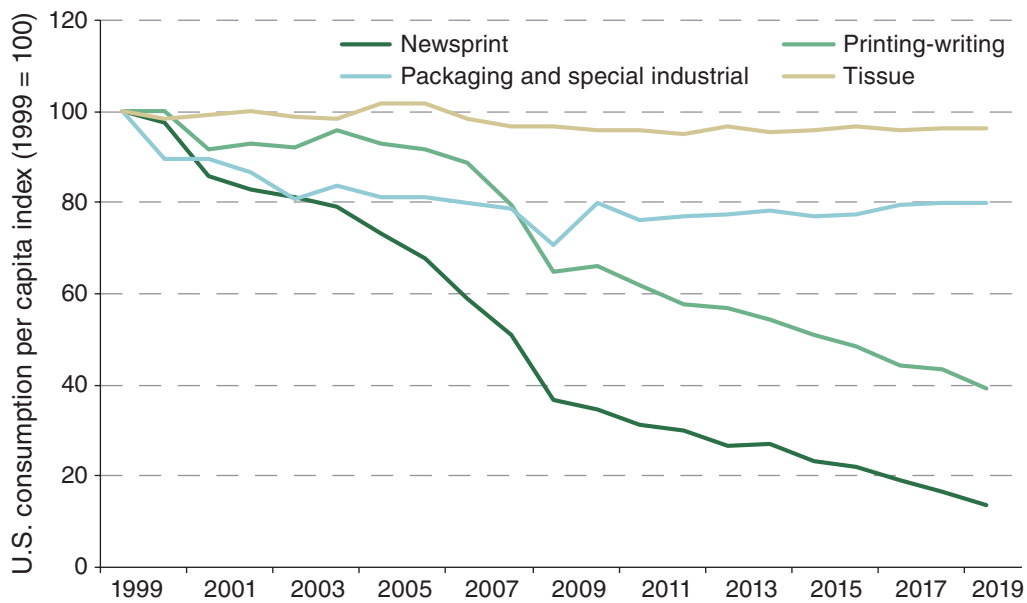


Figure 4—Trends in U.S. consumption per capita for major paper products, 1999–2019. Source: AFPA (2019, 2020).

DRIVERS OF PRODUCTION OF TIMBER PRODUCTS

U.S. production of forest products is driven by patterns of consumption in both the United States and elsewhere as well as patterns of global production. Under a global economy, production by U.S. industries depends not only on their ability to generate products at competitive prices, but also on trade factors, such as tariffs and exchange rates.

Net imports (imports minus exports) as a share of total consumption for solid wood products (NAICS 321) increased over the 2000–2005 period, along with a relatively strong real trade-weighted U.S. dollar (fig. 5). This increase in solid wood products consumption resulted from higher construction activity motivated by the housing bubble. In effect, net imports share of

consumption reached 33 percent in 2005, the highest level observed over the past two decades (2000–2019). Net imports of solid wood products, as well as the real trade-weighted U.S. dollar index, decreased from 2006 to 2011, paralleling the slowdown in economic activity experienced within this period. Solid wood products net imports share of consumption reached the lowest level at 16.8 percent in 2011 and recovered gradually from that point forward up to 2016. The U.S. dollar strengthened throughout this period as well (fig. 5). Net imports share of consumption declined slightly in 2017 and remained relatively stable at roughly 23 percent through the 2017–2019 period. However, net imports vary across different solid wood products (fig. 6). We observe softwood lumber and OSB net imports representing a larger share of consumption compared to softwood

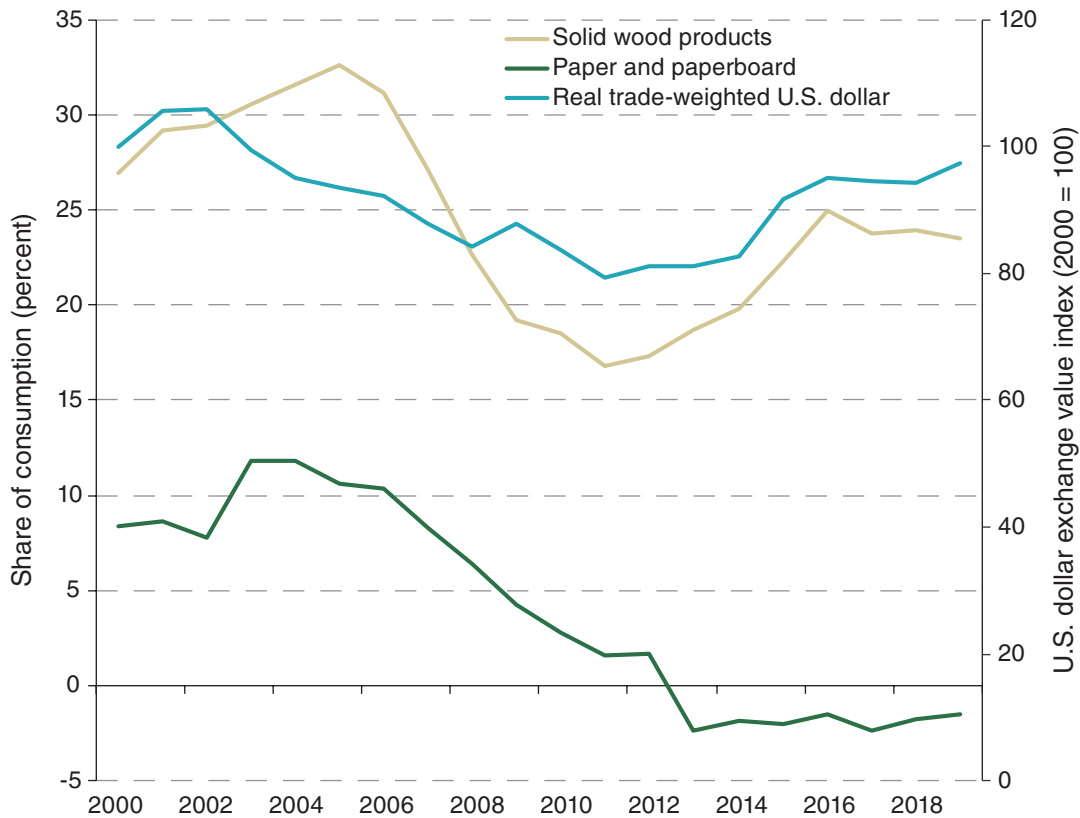


Figure 5—Solid wood products and paper products net imports as a share of consumption and real trade-weighted U.S. dollar value index, 2000–2019. Sources: APA (2019); CPA (2019); FRB (2020c); Howard and Liang (2019); USITC (2020); WWPA (2020). Note: A negative share of consumption indicates a trade surplus.

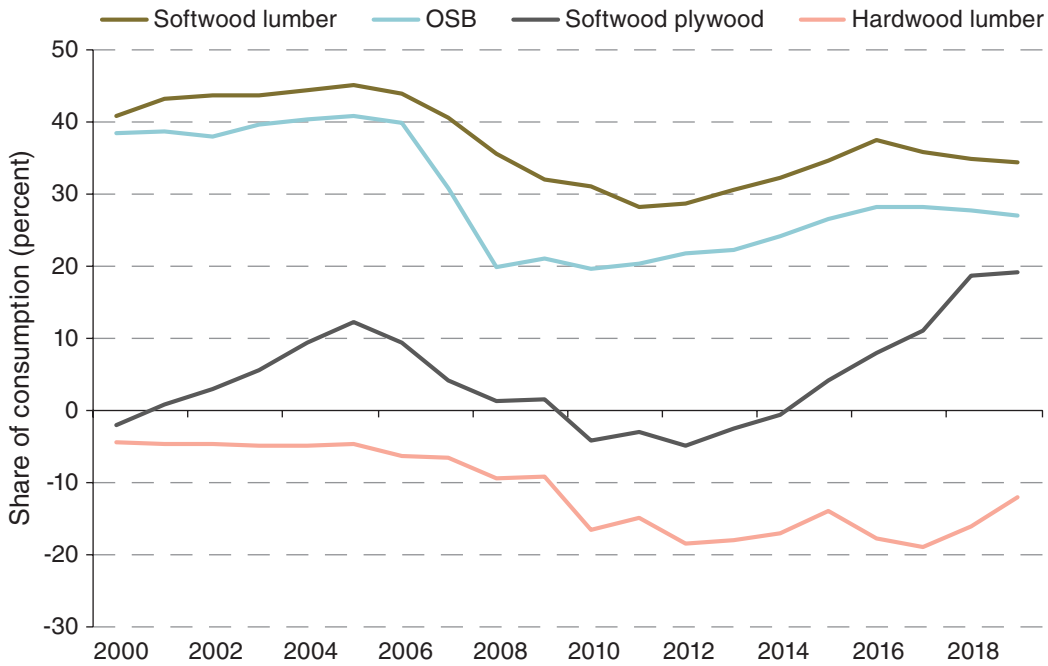


Figure 6—U.S. imports share of consumption by major solid wood products, 2000–2019. Sources: APA (2019); CPA (2019); Howard and Liang (2019); WWPA (2020). Note: A negative share of consumption indicates a trade surplus.

plywood and hardwood lumber across all years (2000–2019). The share of softwood lumber and OSB consumption covered by imports decreased over the 2017–2019 period, with the softwood lumber and OSB imports share of consumption 8 percent and 4 percent lower, in 2019 compared to 2016.

Paper and paperboard products (NAICS 322) imports share of consumption declined throughout most of the 2000–2019 period (fig. 5), although at different rates across the various major products (fig. 7). The proportion of U.S. paper products consumption that was

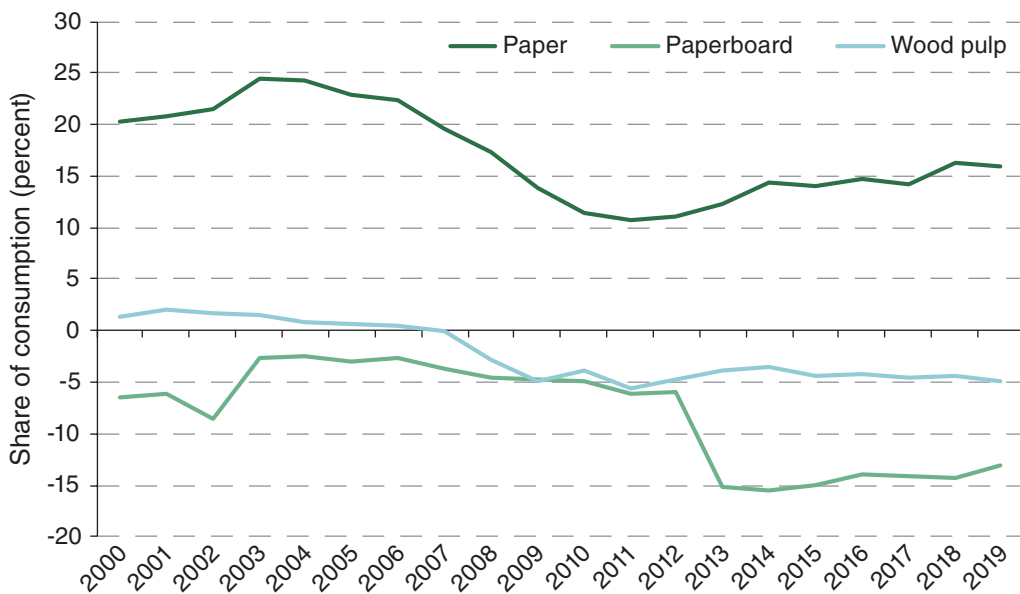


Figure 7—U.S. net imports share of consumption for paper, paperboard, and wood pulp, 2000–2019. Sources: AFPA (2019, 2020). Note: A negative share of consumption indicates a trade surplus.



Paper products consumption per capita has declined sharply, as consumer preferences shift towards electronic media.

met by net imports ranged from a 25-percent peak in 2004 to a low of nearly 11 percent in 2011. Imports of paper products increased from 2012 forward, reaching a 15-percent share of consumption by 2019. Recent (2018) U.S. countervailing and antidumping duties imposed on newsprint imports from Canada could help maintain low net imports and increase production (Buongiorno 2018). Conversely, wood pulp and

paperboard consumption were mostly covered by production during the past two decades (2000–2019). Between 2000 and 2007, < 2 percent of U.S. wood pulp consumption corresponded to net imports. Paperboard production consistently surpassed consumption during the observed period, indicating sustained competitiveness, although this trend might change under a stronger U.S. dollar.

SOLID WOOD PRODUCTS CONSUMPTION, TRADE, PRODUCTION, AND PRICES

Solid wood products are an important component of the economy of the United States and used extensively in the construction, manufacturing, and transportation sectors. This report provides annual estimates of solid wood products consumption for the past seven decades (1950–2019) by major end-use markets (i.e., new residential construction by type of structure, new nonresidential construction, furniture and other manufacturing, and packaging and shipping).

End-use market studies provide base information to assess changes in patterns of solid wood products consumption, which can arise from changes in consumer preferences, technological advancements, and/or other factors. End-use market studies, however, are not available on a periodic basis or for all end-use markets in a consistent fashion. In this report, we extend McKeever and Howard’s (2011) solid wood products end-use market estimates with data covering 2010 through 2019. We incorporate information from the latest solid wood products end-use market studies covering new residential construction (McKeever and Elling 2015), new nonresidential construction (Adair and others 2013), and residential repair and remodeling markets (Elling and McKeever 2018). We follow the methodology described by McKeever (2009) when possible and use time series analysis as needed. Major end-use markets included in this report capture the majority of the U.S. solid wood products consumption every year. Following McKeever (2009), we account for any consumption volume not covered by these major end-use markets by balancing total end-use volumes for each wood product with respective annual U.S. estimates of apparent consumption. Annual U.S. apparent consumption data for 2007–2017 come from Howard and Liang (2019). Apparent consumption values for 2018 and 2019 are estimated using U.S. wood products production data obtained from various

private and public sources (cited on tables and figures, as applicable) and corresponding U.S. trade data, obtained from the U.S. International Trade Commission trade database (USITC 2020). For additional information on methodology or listing of past end-use market studies, see McKeever (2002, 2009).

Solid Wood Products Consumption: Overview

The largest consumer of solid wood products in the United States has historically been the construction sector (McKeever and Howard 2011) and this remains true to present. New single-family houses and low-rise multi-family residences are typically framed and sheathed with wood. Together with wood consumed in the production of manufactured housing, new housing construction represented approximately one-third of all solid wood products manufactured and imported into the United States in 2019. Residential repairs and remodels consume roughly an equivalent amount (one-third) of solid wood products as new house construction, with smaller amounts used in new nonresidential construction (fig. 8). The percentage share represented by the

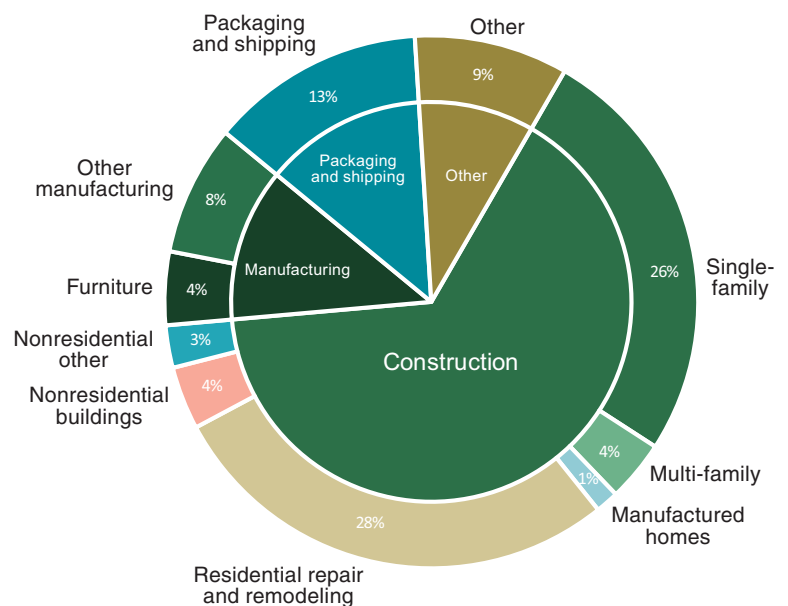


Figure 8—Solid wood products consumption by end-use market, 2019. Sources: APA (2019); CPA (2019); Howard & Liang (2019); MHI (2019); U.S. Census (2020b, 2020i); WWPA (2020).

construction sector was 66 percent, up from a low of 54 percent in 2011, when the U.S. economy was still recovering from the economic recession of 2007–2009.

The final third of solid wood products were consumed by other manufacturing, packaging and shipping, and miscellaneous uses. In 2019, furniture manufacturing used 36 percent of the total wood products consumed in the manufacturing sector. Solid wood products consumption in furniture remained at low but steady levels during the past decade (2009–2019), ending at 6.750 million m³ of lumber and wood

panels consumed in 2019. Packaging and shipping reached an all-time high of 19.753 million m³ of wood consumed in 2019, the majority of which went into new and recycled pallets. The packaging and shipping sector used 13 percent of all lumber consumed in 2019, 49 percent of which was hardwood. The use of softwood lumber in pallet production and other shipping products as the major species group first occurred in 2007 and stayed above 50 percent through the 2010s. In 2019, other uses not accounted for in the construction, manufacturing, and packaging and shipping sector made up the final 9 percent of wood products consumption (table 1).

Table 1—Total solid wood products consumption in the United States, by end use, selected years, 1959–2019

Year	Total wood products consumption	New housing				Res. R&R	New nonresidential			Total construction	Manufacturing			Packaging and shipping	Total, all end uses	Other
		New single family	New multi-family	Manu-factured housing	Total		New nonres. bldgs.	New nonres. other	Total		Furni-ture mfg.	Other mfg.	Total			
<i>million m³</i>																
1959	93.776	28.203	3.453	0.514	32.169	8.572	4.689	4.394	9.083	49.824	8.008	3.754	11.762	10.080	71.666	22.110
1969	104.474	25.866	9.602	2.397	37.865	11.796	6.951	5.590	12.541	62.202	10.323	4.184	14.507	12.252	88.961	15.513
1979	127.819	41.964	6.616	2.845	51.424	20.169	7.730	5.847	13.577	85.170	9.708	9.160	18.868	17.080	121.118	6.701
1989	153.679	39.804	4.591	2.638	47.032	38.072	9.801	4.125	13.927	99.031	13.992	8.707	22.699	14.635	136.364	17.314
1999	178.840	51.059	4.754	6.077	61.891	35.698	10.708	3.293	14.001	111.589	19.996	10.270	30.265	16.268	158.123	20.717
2000	178.894	48.674	4.787	4.810	58.270	37.415	11.471	3.420	14.891	110.576	19.302	10.557	29.859	16.385	156.821	22.074
2001	174.312	50.610	4.835	4.022	59.467	37.447	10.975	3.500	14.476	111.389	16.582	9.545	26.128	13.930	151.447	22.865
2002	180.151	53.011	5.030	3.809	61.850	40.223	9.735	3.508	13.243	115.315	15.471	9.163	24.634	14.254	154.204	25.948
2003	180.829	57.629	5.059	2.930	65.618	39.920	9.383	3.250	12.633	118.171	13.658	9.119	22.777	13.716	154.665	26.164
2004	197.539	61.679	4.995	3.317	69.991	43.545	9.815	3.185	13.001	126.537	13.068	9.383	22.451	14.572	163.560	33.980
2005	201.116	66.603	5.315	3.766	75.685	45.196	10.255	3.275	13.530	134.411	11.670	9.940	21.610	15.194	171.215	29.902
2006	191.695	56.866	5.146	3.161	65.173	46.411	11.477	3.518	14.994	126.578	10.310	10.185	20.495	16.163	163.236	28.459
2007	167.416	42.188	4.629	2.369	49.186	46.597	12.880	3.590	16.470	112.252	9.329	9.166	18.495	17.513	148.260	19.156
2008	127.563	24.682	4.157	1.832	30.672	35.492	13.385	3.437	16.823	82.987	8.778	9.154	17.932	17.098	118.017	9.546
2009	104.249	17.993	1.558	1.106	20.657	32.465	7.920	3.650	11.570	64.692	5.804	8.740	14.545	15.041	94.278	9.971
2010	104.356	18.693	1.519	1.578	21.789	31.684	5.152	3.036	8.188	61.661	5.067	11.082	16.149	15.657	93.467	10.889
2011	108.638	17.980	2.352	1.431	21.763	29.706	4.596	2.564	7.160	58.629	5.060	12.206	17.267	15.951	91.847	16.791
2012	113.797	20.999	3.286	1.524	25.810	30.038	4.020	2.844	6.863	62.711	5.070	12.463	17.532	16.115	96.358	17.438
2013	124.366	25.452	4.001	1.577	31.030	32.989	4.040	2.744	6.784	70.803	6.342	12.536	18.878	16.648	106.329	18.037
2014	135.694	27.695	4.843	1.544	34.082	35.317	4.379	2.929	7.308	76.707	6.163	12.503	18.666	18.067	113.440	22.254
2015	141.174	31.343	5.357	1.616	38.316	36.816	5.020	3.403	8.423	83.556	7.019	11.717	18.736	19.404	121.696	19.478
2016	146.011	34.519	5.621	1.836	41.976	38.521	5.459	3.515	8.973	89.470	7.297	11.305	18.601	19.299	127.370	18.641
2017	148.081	37.924	5.059	1.960	44.943	38.333	5.560	3.245	8.805	92.081	6.521	11.622	18.143	19.492	129.715	18.366
2018	150.155	38.956	5.402	2.060	46.417	39.338	5.703	3.450	9.153	94.908	6.511	12.093	18.604	19.604	133.116	17.038
2019	151.401	39.081	5.605	2.122	46.807	42.304	5.790	3.900	9.690	98.802	6.750	11.984	18.734	19.753	137.289	14.113

Sources: APA (2019); CPA (2019); Howard & Liang (2019); MHI (2019); U.S. Census (2020b, 2020c, 2020d, 2020h); WWPA (2020).

Some highlights of wood product consumption in the past decade (2009–2019) include:

- Lumber consumption increased 4 percent year-over-year, with softwood lumber experiencing stronger growth than hardwood lumber. Total lumber consumption in 2019 (103.010 million m³) increased 48 percent from 2010 (69.761 million m³).
- Oriented strand board (OSB) continued to increase its market share over softwood plywood. After the emergence by the mid-1980s of OSB as an acceptable sheathing material in new construction, its usage steadily rose. OSB overtook plywood as the dominant structural panel in 1998 and experienced a similar resurgence in growth with the recovery of the housing construction market post-recession (fig. 9), representing 69 percent of all structural panel usage in 2019.

- Non-structural panel usage in new housing fell over the course of the decade but experienced growth in the residential repair and remodel sector, up 53 percent from 2010 to 2019 at 4.265 million m³ of the total 19.716 million m³ of panels consumed in 2019.

Solid Wood Products Trade, Production, and Prices

The most important sources for imported lumber in 2019 were Canada, Germany, and Brazil, which together comprised 85 percent of all lumber imported into the United States in 2019. For lumber exports, China, Canada, and Mexico were the largest purchasers of U.S. lumber, with hardwoods representing 69 percent of the exported value in 2019. For wood panel products, including structural and non-structural panels, nearly US\$ 2 billion of the total \$5 billion imports in 2019 came from Canada. Canadian wood panel imports were more than triple that of

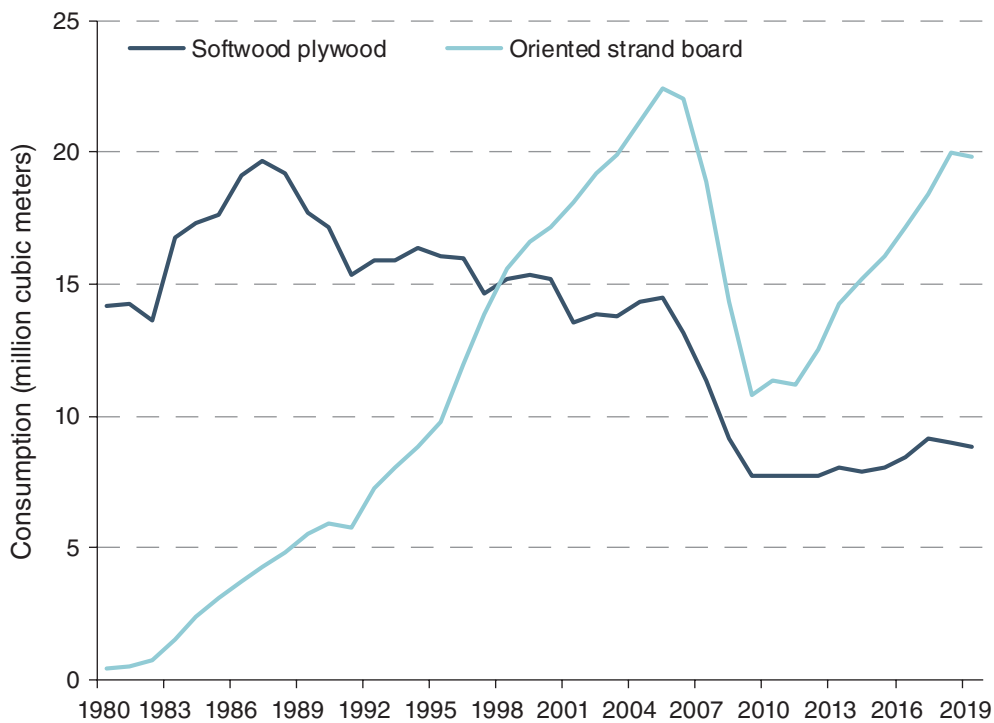


Figure 9—Softwood plywood and oriented strand board (OSB) consumption, 1980–2019. Source: APA (2019).

the next largest trading partner in China, whose sales of wood panel products to the United States decreased by 28 percent from 2009 to 2019. The U.S. exported US\$ 598 million worth of wood panel products in 2019, 76 percent of which went to Canada and Mexico. The trading relationships for solid wood products with major partners were largely unchanged through the 2010s (USITC 2020).

In 2019, softwood species constituted 83 percent of the total lumber consumed in the United States (table 2). For decades, softwood lumber mills in the United States have expressed concern

over Canadian policies on timber pricing, an important consideration as Canada represented an average of 93 percent of all softwood lumber volume imported into the United States from 2000 to 2019 (USITC 2020). Most of the timber harvested in Canada comes from government-owned timberlands whereas most timber sales in the United States occur on private land. This entails that stumpage paid by private firms is comparatively lower in Canada than the United States due to the provincial government's subsidization of timberlands, which results in lost domestic market share for U.S. producers (Hoover and Fergusson 2017).

Table 2—Solid wood products consumption in the United States by product, selected years, 1959–2019

Year	Lumber ^a			Structural panels			Non-structural panels ^b	
	Softwood	Hardwood	Total	Softwood plywood	OSB	Total		Total
	<i>million m³</i>							
1959	59.549	20.467	80.015	6.864	0.000	6.864	6.896	93.776
1969	58.716	21.363	80.079	11.957	0.000	11.957	12.438	104.474
1979	72.225	21.993	94.218	17.061	0.106	17.168	16.434	127.819
1989	86.865	27.230	114.094	17.693	5.501	23.194	16.391	153.679
1999	96.319	29.303	125.622	15.350	16.623	31.973	21.245	178.840
2000	95.604	28.528	124.132	15.176	17.125	32.301	22.461	178.894
2001	95.027	26.559	121.586	13.516	18.103	31.619	21.106	174.312
2002	98.855	26.585	125.440	13.866	19.198	33.064	21.647	180.151
2003	100.605	24.801	125.406	13.808	19.946	33.754	21.669	180.829
2004	111.074	26.886	137.960	14.334	21.173	35.507	24.072	197.539
2005	114.038	26.376	140.414	14.461	22.444	36.905	23.797	201.116
2006	106.897	25.710	132.607	13.144	22.044	35.188	23.900	191.695
2007	93.015	23.424	116.439	11.308	18.876	30.183	20.794	167.416
2008	71.961	14.635	86.596	9.182	14.354	23.536	17.431	127.563
2009	55.069	15.498	70.567	7.745	10.774	18.519	15.163	104.249
2010	58.275	11.516	69.791	7.766	11.370	19.136	15.429	104.356
2011	60.847	13.459	74.306	7.716	11.176	18.892	15.440	108.638
2012	64.674	13.032	77.706	7.759	12.487	20.246	15.846	113.797
2013	70.008	14.701	84.709	8.079	14.256	22.335	17.322	124.366
2014	75.200	16.769	91.969	7.904	15.208	23.112	20.613	135.694
2015	78.611	17.139	95.750	8.079	16.037	24.116	21.308	141.174
2016	83.645	16.637	100.282	8.478	17.185	25.663	20.066	146.011
2017	84.771	15.989	100.760	9.156	18.413	27.569	19.752	148.081
2018	85.887	16.334	102.222	9.026	20.014	29.040	18.892	150.155
2019	85.857	17.153	103.010	8.825	19.850	28.675	19.716	151.401

^a Cubic volumes of softwood and hardwood lumber are based on the actual solid wood content of the lumber.

^b Includes hardwood plywood, particleboard, MDF, hardboard, and insulation board.

Sources: APA (2019); CPA (2019); Howard & Liang (2019); MHI (2019); U.S. Census (2020b, 2020c, 2020d, 2020h); WWPA (2020).

The United States and Canada have come to multiple agreements since the 1980s to countervail these concerns through duties and quotas on Canadian imports to the United States. The 2006 Softwood Lumber Agreement (SLA) expired in 2015, and after negotiations failed to draft a new agreement, the U.S. Department of Commerce instituted antidumping (AD) and countervailing duties (CVD) on Canadian softwood imports in 2017 (USITA 2017). These duties, and the many SLAs since the 1980s, have resulted in an increased market share for U.S. softwood producers as well as higher lumber prices (Parajuli and Zhang 2016). When the producer price index for lumber is indexed to the date that the 2006 SLA began, softwood lumber prices experience initial gains then decline due to the economic recession from 2007 to 2009. After the recession, lumber prices experienced substantial gains, and additional gains were seen after the institution of AD and CVD on Canadian imports in 2017. Hardwood lumber prices have been less volatile and have not seen the same pattern of growth that softwood lumber prices experienced in recent years. Hardwood lumber prices were at a high in 2014 before falling

by 2019 to a level similar to that experienced during the economic recession of 2007–2009 (fig. 10).

Canadian lumber companies also have expanded their influence in the United States through the acquisition of U.S.-based sawmills and other primary wood processors. This is especially true in the Southeastern United States where low log costs coupled with an expanding housing market in the region after the economic recession of 2007–2009 represented a strong potential for growth in U.S.-based softwood lumber production. Canadian firms in British Columbia and Alberta also struggled with log availability due to a widespread tree mortality event caused by the mountain pine beetle (*Dendroctonus ponderosae*) (Bennett 2015). In 2004, two sawmills in the United States were owned by a Canadian company. By early 2018, the number of sawmills in the United States with Canadian ownership had grown to 45 (Williams 2018).

Stronger domestic markets resulted in increased production during the past decade (2009–2019). In 2019, an estimated 84.9 million m³ of lumber was produced in the United States,

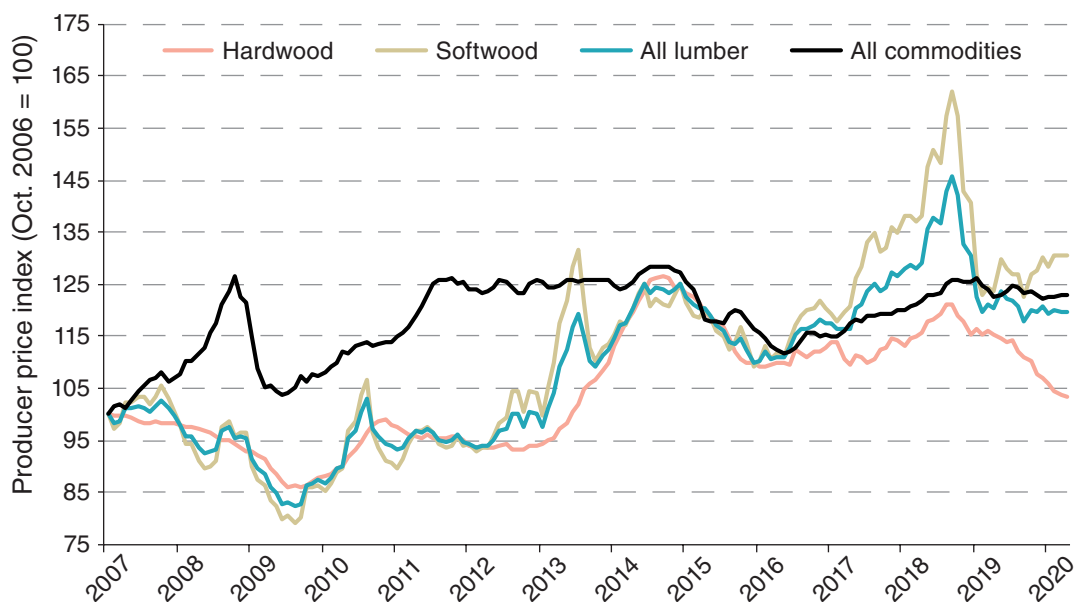


Figure 10—Producer price index for lumber and all commodities, October 2006 to January 2020. Source: USBLS (2020b).

including 62.5 million m³ of softwood lumber (WWPA 2020) and a projected 22.4 million m³ of hardwood lumber.¹ The United States also produced 25.2 million m³ of structural panel products and 9.5 million m³ of non-structural panel products. This is up from a low point in production in 2009, when the United States produced 57.6 million m³ of lumber, 25.2 million m³ of structural panel products, and 11.5 million m³ of non-structural panel products.

Consumption in Construction: Overview

In 2019, approximately two-thirds of solid wood products were consumed in (1) new housing units; (2) housing repair and remodeling; (3) nonresidential buildings; (4) nonresidential, non-building structures (including highways, dams, and other structures); and (5) nonresidential alterations and renovations (fig. 8). These utilized about 70 percent of all lumber, 79 percent of total structural panels, and 29 percent of all non-structural panels consumed. Wood use consumption changes in construction during the past several decades include:

- (1) Non-wood product substitution for solid wood building products (e.g., vinyl for wood siding and laminate vinyl for solid wood flooring);
- (2) Substitution of new wood products for existing wood and non-wood products (e.g., OSB for softwood plywood and structural panels for lumber);
- (3) Changes in architectural characteristics of buildings and in building codes that favor one type of building product over another (though this may change with mass timber receiving code approval); and
- (4) Changes in methods of structure fabrication.

These, and other changes, resulted in a decline of solid wood products share utilized in construction rather than other end uses from record-high levels achieved in the mid-1980s. In 1979, new housing and nonresidential construction accounted for 51 percent of all solid wood products used in the United States. In 2019, the share of solid wood products had declined to 37 percent (table 1).

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 feet or more in width and length and are manufactured with glue, nails, or the use of 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 in order that the outer layers have the same orientation. These panels can be used in cross-laminated timber, dowel-laminated timber, glue-laminated timber, mass plywood panels, and nail-laminated timber systems. Mass timber products can be used to build traditional houses, office buildings, and high-rise structures (Think Wood 2020).

The new residential housing construction market is still growing from the economic recession experienced in the sector from 2007 to 2011. The recovery has been steadily advancing. However, in the new residential housing sector, contractors focused on higher valued, larger sized single-family houses. Reasons proffered are increased margins and credit availability for purchasers of higher valued houses. This caused the production of smaller houses (≤ 130 m² of floor area), or “starter” houses, to decline precipitously, much less than this size classification’s historical average (U.S. Census 2020e). Notwithstanding these changes, construction remains the principal market for lumber and panel products. Reported

¹Based on projections produced by William Luppold, Economist, U.S. Department of Agriculture, Forest Service, Northern Research Station. Forest Inventory and Analysis. Princeton WV 24740.

consumption includes onsite waste and loss: 10 percent for lumber, 5 percent for structural and non-structural panels, and 2 percent for engineered wood products.

Consumption in New Residential Construction

Historically, new housing construction has been the largest single market in the United States for solid wood products using about 33 percent of the lumber, 50 percent of the structural panels, and about 20 percent of the non-structural panels. From 1958 to 2008, total housing starts averaged 1,534,100 units and single-family starts mean was 1,092,200 units (fig. 11). Multi-family starts averaged 447,800 units from 1964 to 2008 (Alderman 2016). From 2011 onward, the increase in housing starts resulted in housing consuming 32 percent of lumber, versus 18 percent in 2009 and 49 percent of structural panels, compared to 27 percent a decade earlier. Consumption of non-structural panels was 1.4 percent, versus 3.8 percent in 2009. In total, new residential construction was 31 percent of total solid wood products consumption (fig. 8). The quantities of solid wood products consumed in new residential construction depend on the

number and type of units built, average size, and wood products use per unit.

The composition of solid wood products used in new residential construction also has changed over time. In 1962, lumber made up 82 percent of the solid wood products utilized in new housing; structural panels (11 percent), and non-structural panels (7 percent) comprised the remainder. By 2019, lumber’s share decreased to 67 percent, structural panels nearly tripled to 32 percent, and non-structural panels decreased to 0.6 percent (table 3).

New Housing Unit Production—In 2019, 1,386,000 new housing units were produced in the United States (fig. 11). This is only 62 percent of the number of units produced in 2005 and 47 percent of the record production of 1972. Of these new units, 888,000 were single-family houses, 403,000 multi-family units, and 95,000 modular and mobile houses (U.S. Census 2020d, 2020e, 2020h). Housing production fluctuates year to year, depending on economic growth, interest rates, consumer real disposable income, demographics and household formations, housing vacancy and replacement rates, conversion

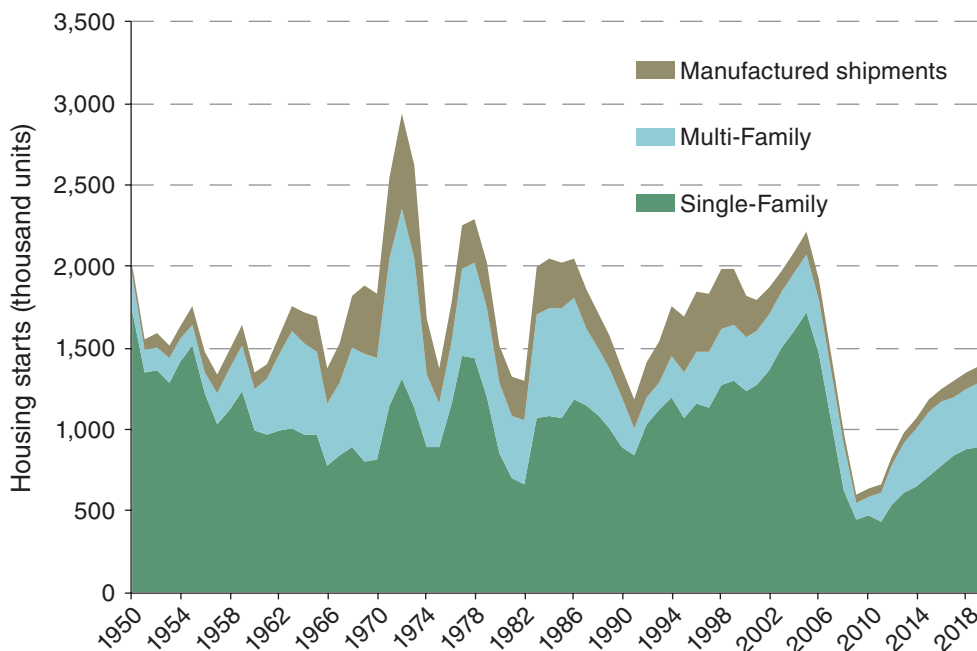


Figure 11—Housing starts in the United States by type, 1950–2019. Source: U.S. Census (2020g).

Table 3—Production of timber products used in new housing by product and type of unit, selected years, 1975–2019

Type and year	Units produced $\times 10^3$	Floor area per unit m^2	Lumber ^a			Structural panels ^b			Non-structural panels ^c			Total, all wood products		
			Total use $\times 10^3 m^3$	Per m^2 ---	Per unit ---	Total use $\times 10^3 m^3$	Per m^2 ---	Per unit ---	Total use $\times 10^3 m^3$	Per m^2 ---	Per unit ---	Total use $\times 10^3 m^3$	Per m^2 ---	Per unit ---
1975														
Single-Family	892.2	152.8	20,806.7	0.153	23.3	4,892.8	0.036	5.5	4,496.5	0.033	5.0	30,196.0	0.221	33.8
Multi-Family	268.3	92.9	2,541.2	0.102	9.5	657.9	0.026	2.5	285.2	0.011	1.1	3,484.2	0.140	13.0
Manufactured	212.7	88.4	1,028.0	0.055	4.8	242.7	0.013	1.1	684.4	0.036	3.2	1,955.2	0.104	9.2
Total	1,373.2		24,375.9			5,793.4			5,466.1			35,635.4		
1985														
Single-Family	1,072.4	165.8	26,733.4	0.150	24.9	7,976.6	0.045	7.4	5,542.3	0.031	5.2	40,252.3	0.226	37.5
Multi-Family	669.5	85.7	5,672.9	0.099	8.5	1,583.7	0.028	2.4	593.8	0.010	0.9	7,850.4	0.137	11.7
Manufactured	283.5	100.3	2,173.5	0.076	7.7	399.0	0.014	1.4	963.0	0.034	3.4	3,535.5	0.124	12.5
Total	2,025.4		34,579.7			9,959.4			7,099.1			51,638.2		
1995														
Single-Family	1,076.2	194.6	26,895.9	0.128	25.0	11,614.8	0.055	10.8	2,453.4	0.012	2.3	40,964.0	0.196	38.1
Multi-Family	277.9	100.3	2,272.0	0.081	8.2	895.0	0.032	3.2	392.6	0.014	1.4	3,559.6	0.128	12.8
Manufactured	339.9	126.3	3,420.6	0.080	10.1	1,646.8	0.038	4.8	595.3	0.014	1.8	5,662.7	0.132	16.7
Total	1,694.0		32,588.5			14,156.5			3,441.4			50,186.3		
2005														
Single-Family	1,715.8	226.1	43,741.8	0.113	25.5	17,032.5	0.044	9.9	5,828.7	0.015	3.4	66,603.1	0.172	38.8
Multi-Family	352.5	115.9	3,493.9	0.086	9.9	1,154.2	0.028	3.3	667.3	0.016	1.9	5,315.3	0.130	15.1
Manufactured	146.8	148.2	2,384.0	0.110	16.2	958.5	0.044	6.5	423.9	0.019	2.9	37,664.4	0.173	25.7
Total	2,215.1		49,619.7			19,145.1			6,920.0			75,684.8		
2009														
Single-Family	445.1	227.5	12,048.8	0.119	27.1	5,550.0	0.055	12.5	394.5	0.004	0.9	17,993.3	0.178	40.4
Multi-Family	108.9	113.9	1,134.7	0.091	10.4	362.8	0.029	3.3	60.3	0.005	0.6	1,557.8	0.126	14.3
Manufactured	49.8	142.1	690.3	0.098	13.9	298.3	0.042	6.0	117.7	0.017	2.4	1,106.3	0.156	22.2
Total	603.8		13,873.8			6,211.0			572.5			20,657.3		
2019														
Single-Family	888.2	234.5	27,162.4	0.130	30.6	11,871.6	0.057	13.4	47.1	0.000	0.1	39,081.1	0.188	44.0
Multi-Family	403.1	103.0	4,077.3	0.098	10.1	1,526.7	0.037	3.8	0.7	0.000	0.0	5,604.6	0.135	13.9
Manufactured	94.7	135.2	1,383.6	0.108	14.6	516.3	0.040	5.5	221.7	0.017	2.3	2,121.5	0.166	22.4
Total	1,386.0		32,623.2			13,914.6			269.5			46,807.2		

^a Includes hardwood and softwood dimension and boards and the lumber equivalent of engineered wood products.

^b Includes softwood plywood and OSB.

^c Includes hardwood plywood, particleboard, MDF, hardboard, and insulation board.

Sources: McKeever (2009); U.S. Census (2020e, 2020g).

of existing structures to alternative uses, and changing home ownership attitudes (Prestemon and others 2018). In 2019, incremental growth occurred in U.S. housing starts, which remain less than historical averages (fig. 11). Yet, forecasts are for a continued and gradual recovery (Buehlmann and Alderman 2020). Solid wood products consumption also is affected by the types of units

produced. For instance, single-family houses are larger and utilize more solid wood products than multi-family and mobile/modular homes.

Solid Wood Products Use per Housing Unit—

In 2019, the average single-family house used nearly 45.4 m³ of solid wood products (table 3). Included are 30.4 m³ of lumber, 15.0 m³ of

structural panels, and 0.1 m³ of non-structural panels. Quantities utilized per single-family unit increased when compared to 2009 and reflect consumption levels for the past 30 years. Multi-family units, on average, consumed about 17 percent of solid wood products. Manufactured housing, which includes mobile and modular housing units, as a result of their greater average size than multi-family units, consumed 28 percent of solid wood products in 2019.

Structural and architectural characteristics of new housing units can greatly affect both total amounts of solid wood products required to build the unit as well as amounts needed per unit of floor area. This includes foundation type, number of stories, exterior wall covering, presence and size of garages, and presence of porches and decks. Change in the frequency of renovations in which these characteristics are modified over time, assist in explaining some variation in solid wood products use per m² of floor area.

Additionally, and more importantly, the size of a housing unit directly affects the amount of solid wood products required to build the structure. New single-family houses averaged

228 m² of floor area in 2009 and almost 235 m² in 2019 (table 3). The long-term trend for single-family units had been increasing in average size; however, in 2016 the average size began to incrementally decline (fig. 12). Growth in average size, in part a reflection of steadily rising real disposable personal income, contributed to the increases in the use of all wood products per house over the past 60 years.

The average size of multi-family units has varied over the years. Since 1995, floor area has been slightly above 100 m²; in 2019, the floor area was 103 m². In 2019, the average mobile/modular unit contained 135 m² of floor area, 31 percent greater than the average multi-family unit. Manufactured housing fabrication has fluctuated, and the average floor area also has increased since 1950. Production is projected to increase in the near-term (Vitner and others 2020). Much of the size increase is attributable to changes in the types of units being produced. Single-wide unit production declined, and manufacture shifted to double-wide and multi-sectional units (U.S. Census 2020d, 2020e). As size increased, more conventional construction practices were used, resulting in greater quantities of wood

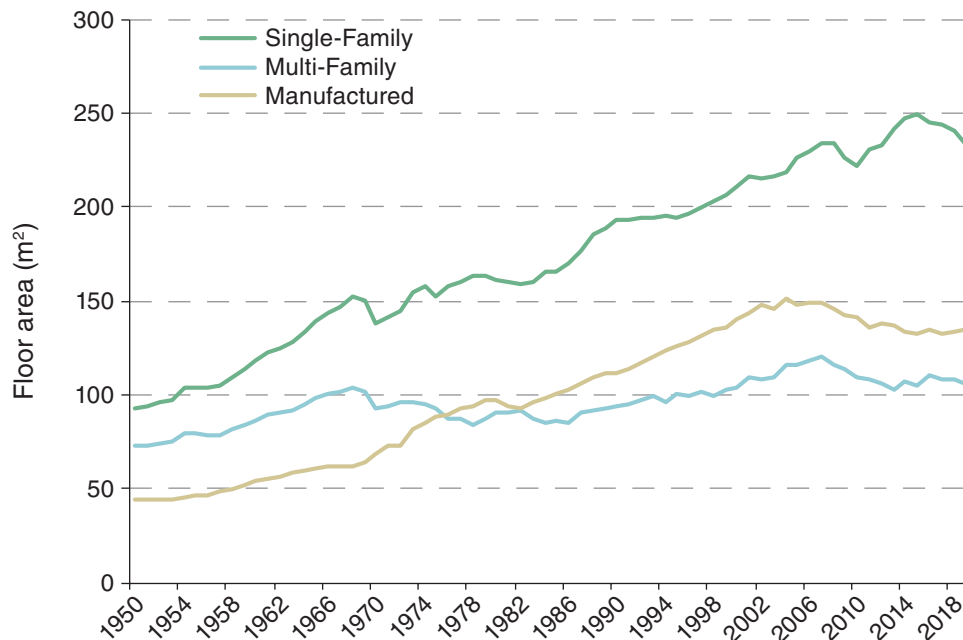


Figure 12—Average floor area of new housing units in the United States by type, 1950–2019. Source: U.S. Census (2020d, 2020e, 2020g).

use. Lumber consumption may change in the future, as modular unit production is expected to increase—and the implementation of lean manufacturing systems is forecast. The adoption of lean manufacturing may lead to a slight decline in wood consumption due to more efficient production methods.

In sum, the average new single-family unit required 0.19 m³ of solid wood per m² of floor area; multi-family units averaged 0.14 m³; and manufactured housing utilized 0.17 m³ of solid wood products, in 2019 (table 3).

Total Solid Wood Products Use in New Housing—In 2019, new residential construction required 46.8 million m³ of solid wood products to build (table 3, fig. 13). This total comprised 32.6 million m³ of lumber, 13.9 million m³ of structural panels, and 0.3 million m³ of non-structural panels. These volumes include estimated quantities of each wood product utilized in combination with onsite waste estimates. In addition, the volumes of engineered lumber are included with the softwood lumber estimates. Engineered lumber in 2012 accounted for about 12 percent of total softwood/engineered lumber in new single-family construction

and nearly 19 percent in new multi-family construction (McKeever and Elling 2015). These quantities have improved moderately since the end of the financial crisis.

Consumption in Residential Repair and Remodeling

Current U.S. Census (2020c, table 8) statistics place the total size of U.S. housing stock at approximately 140 million units. Repair and remodeling (also referred to as upkeep and improvements and/or renovation) of this existing residential housing stock is a vital market sector for solid wood products. Significance arises, primarily, due to the aging U.S. housing stock, and some portion of senior generations' preference for aging-in-place (Aging in Place 2020). For instance, 82 percent of the U.S. housing stock was built before the year 2000 (U.S. Census 2020a). Additionally, many seniors may prefer to upgrade their existing home rather than move into a retirement facility or purchase a smaller house due to affordability issues, as many seniors are cost burdened (Molinsky 2017). The median age of housing units is 39 years and increasing; and 1977 is the median year a residential structure was built (U.S. Census 2020a). Repair and remodeling

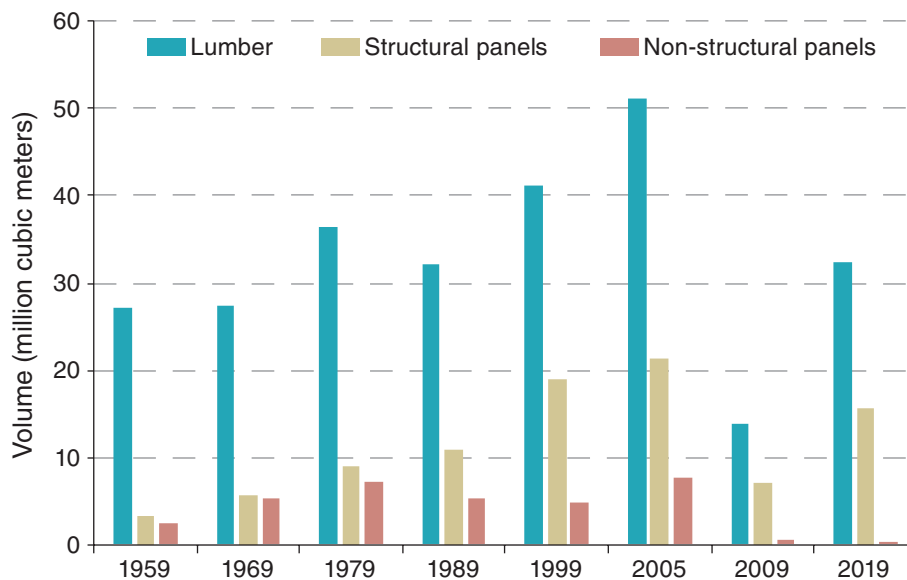


Figure 13—Solid wood products used for new residential construction in the United States by product, selected years, 1959–2019. Sources: McKeever (2009); U.S. Census (2020h).

extend to varied projects, some that require substantial amounts of solid wood products and other projects which do not consume as much. In total, 28 percent of all solid wood products were used in residential repair and remodeling in 2019 (fig. 8); or 31 percent of all lumber, 23 percent of all structural panels, and 22 percent of all non-structural panels consumed in the United States (fig. 14).

Annual activity in the residential repair and remodeling market is measured in terms of dollars of expenditures. The U.S. Census Bureau does not report this valuation monthly; it can be estimated. Expenditures totaled more than US\$ 214 billion in 2019 (U.S. Census 2020k), which was \$35.6 billion more than 2009 expenditures when adjusted to constant 2020 dollars (BEA 2020b) (fig. 15). Solid wood

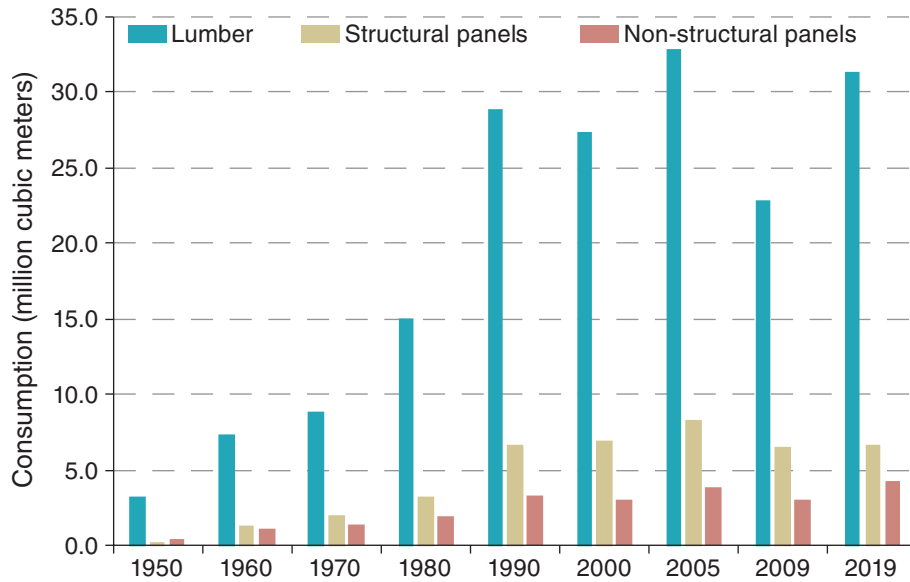


Figure 14—Solid wood products used for residential repair and remodeling in the United States by product, selected years, 1950–2019. Sources: McKeever (2009); U.S. Census (2020d, 2020g).

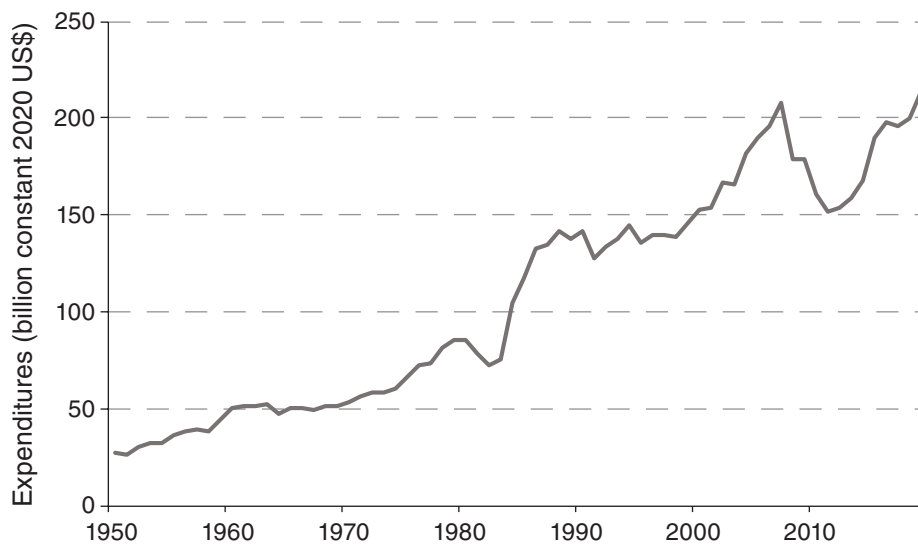


Figure 15—Residential repair and remodeling in the United States, 1950–2019. Sources: BEA (2020b); U.S. Census (2020k).

The construction sector accounts for two-thirds of all U.S. solid wood products consumption.



products expenditures are not only affected by total spending, but also by the types of expenditures in a given year. Three major repair and remodeling activity types exist: maintenance and repairs, additions and alterations, and major replacements. Maintenance and repair expenditures are for the 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 project defines its classification. Of these three expenditure types, additions and alterations are the most wood intensive and important in determining overall levels of solid wood products consumption (Skog and others 2012).

Solid Wood Products Consumption per \$1,000 of Residential Repair and Remodeling Expenditures—Solid wood products consumption per \$1,000 of constant dollar expenditures, measures the relative amount of a discrete solid product consumed per unit of repair and remodeling activity. In 2019, consumption per \$1,000 of constant 2019-dollar expenditures was estimated at 0.097 m³ for lumber, 0.021 m³ for

structural panels, and 0.013 m³ for non-structural panels (table 4). Utilization factors changed moderately between 2009 and 2019 and are not dependent on absolute dollars of expenditures, but rather by the types of projects undertaken. For instance, in normal economic periods, existing homeowners may purchase a new house rather than renovate their existing home. This has changed recently, as many homeowners prefer to remodel rather than purchase a new house. Currently, this is primarily due to the lack of available houses and the affordability of houses on the market (Fleming 2020).

Total Solid Wood Products Consumption in Residential Repair and Remodeling—The repair and remodeling of residential structures and properties consumed 42.3 million m³ of solid wood products in 2019 (table 4). This total comprises 31.4 million m³ of lumber (including engineered wood products), 6.7 million m³ of structural panels, and 4.3 million m³ of non-structural panels (table 4, fig. 14). In 2019, the total use of 42.3 million m³ was nearly 90 percent of that reported for 2007, but considerably greater than in the 1960s and 1970s, when repair and remodeling was not yet a major wood products market sector (table 4).

Table 4—Expenditures and timber products used in residential repair and remodeling, selected years, 1962–2019

Year	Expenditures		Lumber ^a			Structural panels ^b			Non-structural panels ^c			Total, all wood products		
	Current	2019 base ^d	Total use	Current	2019	Total use	Current	2019	Total use	Current	2019	Total use	Current	2019
	-- Million US\$ --		1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$	
1962	11.0	51.1	7,737	0.702	0.151	1,478	0.134	0.029	1,239	0.112	0.024	10,454	0.948	0.205
1975	25.2	66.4	10,380	0.411	0.156	2,624	0.104	0.040	1,787	0.071	0.027	14,792	0.586	0.223
1985	82.1	117.8	23,904	0.291	0.203	5,425	0.066	0.046	3,329	0.041	0.028	32,658	0.398	0.277
1995	125.0	135.7	26,859	0.215	0.198	6,177	0.049	0.046	2,885	0.023	0.021	35,921	0.287	0.265
2005	215.0	190.3	32,877	0.153	0.173	8,362	0.039	0.044	3,953	0.018	0.021	45,192	0.210	0.237
2009	232.8	178.7	22,866	0.098	0.128	6,534	0.028	0.037	3,061	0.013	0.017	32,462	0.139	0.182
2015	272.5	190.0	27,806	0.102	0.146	5,526	0.020	0.029	3,481	0.013	0.018	36,813	0.135	0.194
2019	322.7	322.7	31,371	0.097	0.097	6,664	0.021	0.021	4,265	0.013	0.013	42,300	0.131	0.131

^a Includes hardwood and softwood dimension and boards and the lumber equivalent of engineered wood products.

^b Includes softwood plywood and OSB.

^c Includes hardwood plywood, particleboard, MDF, hardboard, and insulation board.

^d Based on Table 1.1.9. Implicit Price Deflators for Gross Domestic Product BEA (2020b).

Sources: McKeever (2009); U.S. Census (2020c).

Consumption in Nonresidential Construction

Nonresidential construction consists of nonresidential building construction and “other” nonresidential construction. The nonresidential building construction sector includes lodging, office, commercial, healthcare, educational, religious, public safety, amusement and recreation, and manufactured buildings, while the “other” nonresidential constructions sector includes other construction, such as transportation, communication, power, highway and street, sewage and waste disposal, water supply, and conservation and development projects (U.S. Census 2020b). In 2019, nonresidential construction consumed about 7 percent of total solid wood products (4 percent for nonresidential buildings and 3 percent for nonresidential “other”), 7 percent of all lumber, 6 percent of all structural panels, and 6 percent of all non-structural panels domestically (table 5). Consumption of wood products in nonresidential construction is dependent on economic activity and on the types of nonresidential projects undertaken. Due to this diversity of projects inherent in nonresidential construction, activity in this sector is measured as the total value of construction put in place annually.

Value of Nonresidential Construction—In

2019, the total value for private and public nonresidential construction in the United States was estimated at US\$ 783 billion (fig. 16), of which US\$ 454 billion was for nonresidential buildings (58 percent of total nonresidential construction spending) and US\$ 329 billion for “other” (42 percent of total nonresidential construction spending) (fig. 16, table 5).

Total nonresidential construction spending decreased during the economic recession of 2007–2009, albeit less than residential construction spending. Nonresidential projects require long-term planning and are, typically, of longer duration than residential projects. Hence, such nonresidential projects experience less volatility than do residential construction projects. Also, public spending is often used to counter economic recessions, as was done during the 2007–2009 economic recession. The new administration, in the White House since 2016, promised to ramp up infrastructure spending to address the aging U.S. infrastructure and deficit (Anonymous 2019). However, no laws to that end have been signed as of the time of this writing. Yet, should an infrastructure spending package become law, conceivably it may boost public nonresidential spending and hence wood products consumption.

Table 5—Solid wood products consumption for nonresidential construction in the United States, selected years, 1962–2019

Type and year	Expenditures		Lumber ^a			Structural panels ^b			Non-structural panels ^c			Total, all solid wood products		
	Current	2019 base ^d	Total use	Current	2019	Total use	Current	2019	Total use	Current	2019	Total use	Current	2019
-- Billion US\$ --			1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$		1,000 m ³	m ³ /1,000 US\$	
Buildings														
1962	19.0	126.7	4,057	0.214	0.032	1,018	0.054	0.008	707	0.037	0.006	5,781	0.304	0.046
1970	39.4	205.8	4,259	0.108	0.021	1,053	0.027	0.005	974	0.025	0.005	6,286	0.160	0.031
1976	53.0	189.6	3,867	0.073	0.020	960	0.018	0.005	955	0.018	0.005	5,782	0.109	0.030
1986	150.5	303.7	6,465	0.043	0.021	2,151	0.014	0.007	1,261	0.008	0.004	9,877	0.066	0.033
1996	216.0	330.9	7,093	0.033	0.021	1,851	0.009	0.006	1,005	0.005	0.003	9,949	0.046	0.030
1998	263.1	392.1	8,095	0.031	0.021	2,110	0.008	0.005	1,099	0.004	0.003	11,304	0.043	0.029
2005	311.8	396.7	6,607	0.021	0.017	2,668	0.009	0.007	1,466	0.005	0.004	10,741	0.034	0.027
2009	377.5	446.0	5,832	0.015	0.013	1,807	0.005	0.004	281	0.001	0.001	7,920	0.021	0.018
2015	385.8	413.6	3,738	0.010	0.009	1,276	0.003	0.003	6	0.000	0.000	5,020	0.013	0.012
2019 ^e	453.9	453.9	4,321	0.010	0.010	1,462	0.003	0.003	7	0.000	0.000	5,790	0.013	0.013
Other construction														
1962	16.4	109.3	4,130	0.252	0.038	443	0.027	0.004	81	0.005	0.001	4,653	0.284	0.043
1970	29.5	154.1	4,958	0.168	0.032	623	0.021	0.004	79	0.003	0.001	5,659	0.192	0.037
1976	49.6	177.4	5,024	0.101	0.028	730	0.015	0.004	104	0.002	0.001	5,858	0.118	0.033
1986	89.3	180.2	4,193	0.047	0.023	575	0.006	0.003	75	0.001	0.000	4,844	0.054	0.027
1996	111.4	170.7	2,815	0.025	0.016	315	0.003	0.002	40	0.000	0.000	3,170	0.028	0.019
1998	128.9	192.1	2,885	0.022	0.015	365	0.003	0.002	38	0.000	0.000	3,288	0.026	0.017
2005	173.4	220.6	2,910	0.017	0.013	402	0.002	0.002	53	0.000	0.000	3,365	0.019	0.015
2009	273.5	323.2	3,148	0.012	0.010	407	0.001	0.001	95	0.000	0.000	3,650	0.013	0.011
2015	315.7	338.5	2,812	0.009	0.008	234	0.001	0.001	357	0.001	0.001	3,403	0.011	0.010
2019 ^e	328.7	328.7	2,569	0.008	0.008	196	0.001	0.001	1,134	0.003	0.003	3,900	0.012	0.012
Total nonresidential														
1962	35.4	236.0	8,187	0.231	0.035	1,460	0.041	0.006	788	0.022	0.003	10,434	0.295	0.044
1970	68.9	359.8	9,217	0.134	0.026	1,675	0.024	0.005	1,053	0.015	0.003	11,945	0.173	0.033
1976	102.6	367.0	8,891	0.087	0.024	1,690	0.016	0.005	1,059	0.010	0.003	11,640	0.113	0.032
1986	239.8	483.9	10,658	0.044	0.022	2,726	0.011	0.006	1,336	0.006	0.003	14,721	0.061	0.030
1996	327.4	501.6	9,908	0.030	0.020	2,166	0.007	0.004	1,045	0.003	0.002	13,119	0.040	0.026
1998	392.0	584.2	10,980	0.028	0.019	2,475	0.006	0.004	1,137	0.003	0.002	14,592	0.037	0.025
2005	485.2	617.4	9,517	0.020	0.015	3,070	0.006	0.005	1,519	0.003	0.002	14,106	0.029	0.023
2009	651.0	769.3	8,980	0.014	0.012	2,213	0.003	0.003	377	0.001	0.000	11,570	0.018	0.015
2015	701.5	752.1	6,550	0.009	0.009	1,510	0.002	0.002	364	0.001	0.000	8,423	0.012	0.011
2019 ^e	782.6	782.6	6,890	0.009	0.009	1,658	0.002	0.002	1,141	0.001	0.001	9,690	0.012	0.012

^a Includes hardwood and softwood dimension and boards and the lumber equivalent of engineered wood products.

^b Includes softwood plywood and OSB.

^c Includes hardwood plywood, particleboard, MDF, hardboard, and insulation board.

^d Based on table 1.1.9. Implicit Price Deflators for Gross Domestic Product from the Bureau of Economic Analysis BEA (2020b).

^e Preliminary data.

Sources: Skog and others (2012); U.S. Census (2020c).

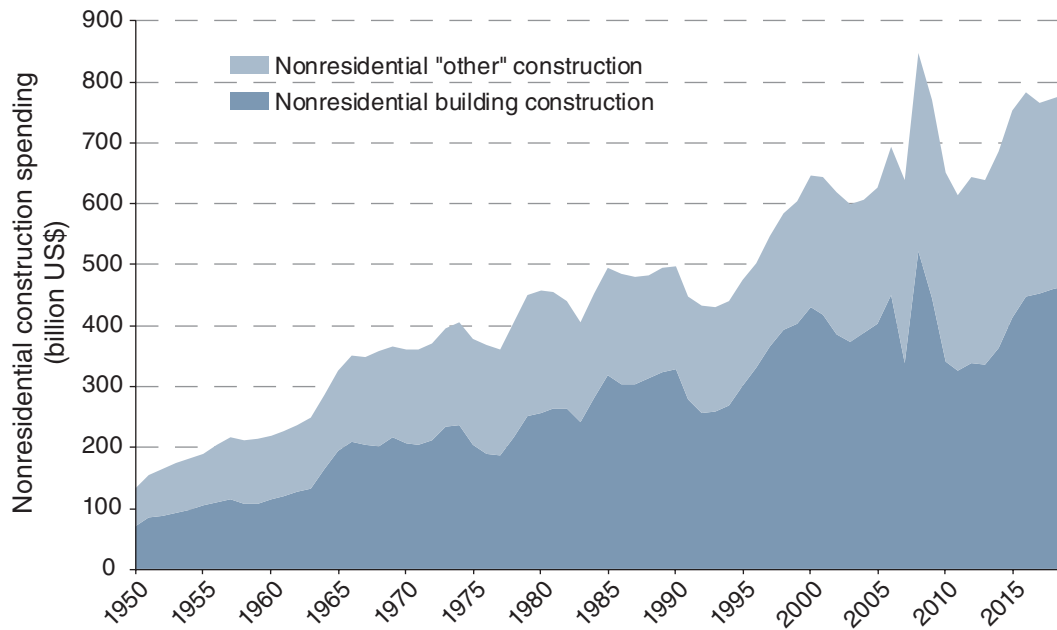


Figure 16—Nonresidential construction spending in the United States by type, 1950–2019. Source: U.S. Census (2020b).

Wood products use per \$1,000 of constant (2019 US\$) nonresidential construction value—

In 2019, total wood products use per \$1,000 of expenditures was estimated to be 0.012 m³, with slightly more expenditures going to nonresidential building construction compared to “other” nonresidential construction (table 5). Total wood products use per \$1,000 of expenditures was lower in 2019, compared to the 2009 estimated 0.015 m³ per \$1,000 of expenditure.

For 2019, the consumption of wood products per \$1,000, expenditures for lumber, structural panels, and non-structural panels was 0.009 m³, 0.002 m³, and 0.001 m³, respectively. Lumber use for nonresidential buildings was 0.01 m³, slightly higher than for the “other” nonresidential construction category (0.008 m³). Structural panels use for nonresidential building construction was more than three times higher than the “other” nonresidential construction category (0.003 m³ vs. 0.001 m³). Non-structural panel use was 150 times smaller for nonresidential buildings than for the “other” nonresidential

construction sector (0.00002 m³ vs. 0.003 m³). These numbers, measured in constant dollars, allow for observing the success of a product in the marketplace, with an increasing value over time indicating that the product is successfully defending its position and, possibly, gaining ground against substitute products.

Wood products use per \$1,000 of nonresidential construction value—

In 2019, construction of nonresidential buildings, their alterations and renovations, and “other” nonresidential construction projects consumed an estimated 9.7 million m³ of wood products (fig. 17, table 5). This volume consisted of 6.9 million m³ of solid lumber, 1.7 million m³ of structural panels, and 1.1 million m³ of non-structural panels. All estimates include allowances for onsite loss and waste.

In the past decade (2009–2019), nonresidential building and “other” construction did not consume a similar quantity of wood products as the sector consumed from the second half

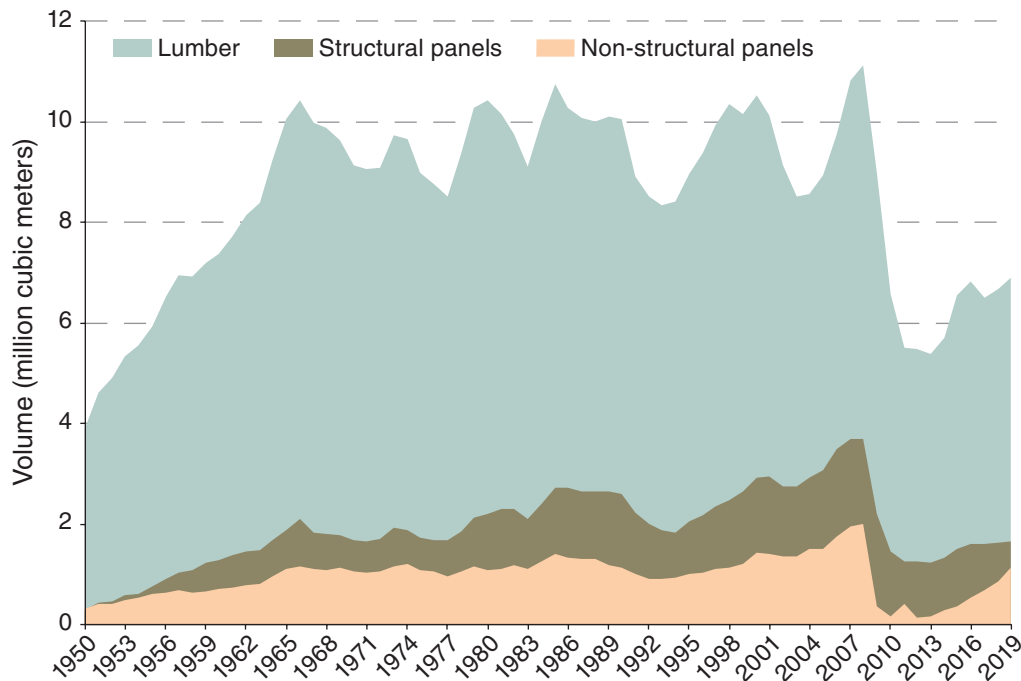


Figure 17—Solid wood products used in nonresidential construction, 1950–2019. Source: Estimated by authors based on U.S. Census (2020a).

of the 1960s to the mid-2000s. As such, the economic recession of 2007–2009 was too severe and the recovery was shallow (fig. 17). Hence, in the last decade, consumption of wood products declined. Between 1950 and 2019, lumber comprised 76 percent, structural panels 19 percent, and non-structural panels 8 percent of the total annual wood products consumption, respectively. Beginning in 2000 and through 2009, the lowest share of lumber used for nonresidential construction (68 percent) for the period of 1950 to 2019 was reported. Conversely, structural panels (22 percent) and non-structural panels (10 percent) recorded their greatest share ever in the 2000–2009 decade. Interestingly, the trend to more panel use and less lumber consumption reversed after the economic recession of 2007–2009, with lumber’s share rising to 77 percent, while structural panels (18 percent) and non-structural panels (6 percent) declined to multi-year lows. In fact, non-structural panel usage in nonresidential construction decreased to its lowest share since 1950.

Consumption in Manufacturing

The manufacture of solid wood products represented 12 percent of all wood product usage in 2019, including 8 percent of all lumber used, 9 percent of all structural panels, and 37 percent of all non-structural panels. Solid wood products manufacturing in the United States is divided into two categories: (1) furniture production, which encompasses household, commercial, and institutional furniture, and (2) a broad “Other Manufacturing” category. Furniture manufacturing represented 36 percent of total wood products manufacturing in 2019, an increase from 2010 when wood products usage in furniture comprised just 31 percent of all wood products manufacturing. During the height of furniture manufacturing in the 1990s, the industry used two-thirds of all wood products used in manufacturing (fig. 18). Due to higher domestic labor costs and the loss of market share to globalization, consumption of domestically produced furniture has been outpaced by

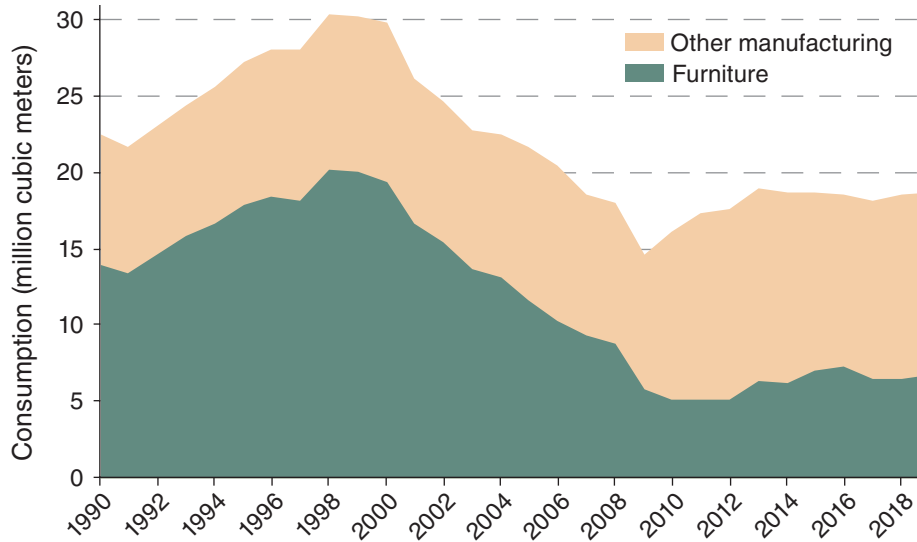


Figure 18—Solid wood products consumption in manufacturing, 1990–2019. Source: estimated by authors based on U.S. Census (2020a).

imported furniture (fig. 19), though there have been gains in the industry since a low period of domestic wood products consumption in the early 2010s.

Trends in U.S. Furniture Production, Consumption, and Trade—Solid wood products usage in the furniture industry includes kitchen cabinets and countertops (NAICS 337110); upholstered household furniture (NAICS 337121); non-upholstered household furniture

(NAICS 337122); institutional furniture (NAICS 337127); office furniture (NAICS 337211); custom architectural woodwork and millwork (NAICS 337212); showcases, partitions, shelving, and lockers (NAICS 337215); and blind and shades (NAICS 337920). Beginning in the early 2000s and continuing to present, the U.S. wood furniture manufacturing industry experienced a substantial decline, resulting in plant closures and mass layoffs (Quesada and

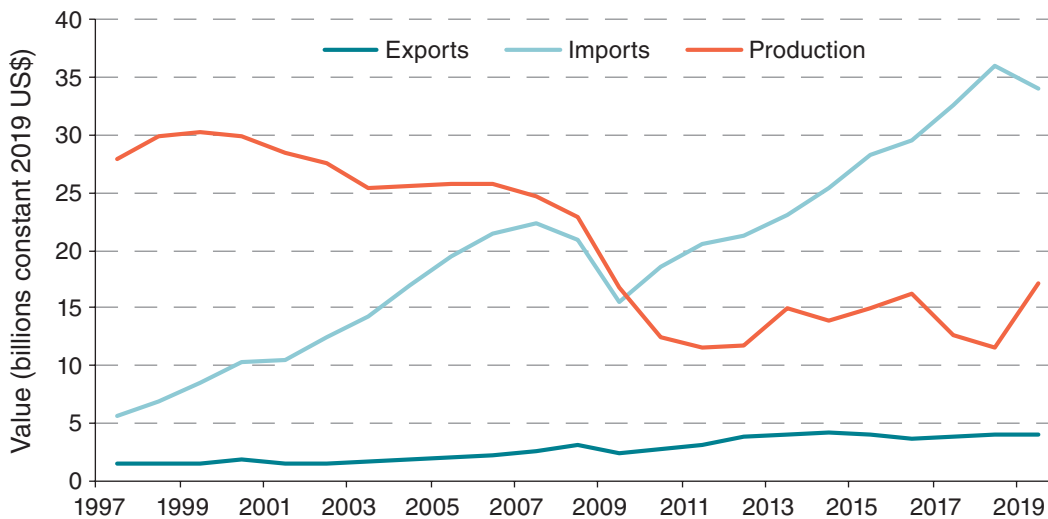


Figure 19—Value of wood furniture exports, imports, and production, 1997–2019. Sources: production data estimated by authors based on U.S. Census (2020a); trade information from USITC (2020).

Gazo 2006). At the height of the furniture and fixtures manufacturing industry in the late 1990s, furniture products represented 12 percent of all wood products consumption and nearly 40 percent of non-structural panel consumption, totaling an annual consumption of over 20 million m³ of solid wood products in 1998. By 2019 the industry had shrunk to just 4.5 percent (down from 5 percent at the beginning of the decade) of total wood products consumption at under 7 million m³ of solid wood products usage. For non-structural panels, furniture manufacturing represented 16 percent of the total annual consumption in 2019, down from 21 in 2010. From the height of furniture manufacturing in the United States in the late 1990s through 2019, total wood products consumption in the industry declined by two-thirds (fig. 20).

This downturn was the result of competition from international furniture manufacturers, who gained an increasingly larger proportion of the U.S. furniture market share after the turn of the millennium. Competition from international manufacturers, especially from Asia, became the primary cause of the downturn in domestic furniture production due to the reduction in import tariffs. In 1999, tariffs for furniture

(Harmonized Tariff Schedule Code 9403) were removed for World Trade Organization members from an average of 1.6 percent in 1997 (USITC 2020). Lower labor costs compared to the United States, coupled with decreasing import tariffs, posed stiff competition for the domestic industry, which never recovered from the employment and production losses of the early 2000s. This downward trend was further exacerbated by the economic recession of 2007–2009 (fig. 19).

While data from the Bureau of Labor Statistics show that this was generally true for furniture industry codes (NAICS 337), the one sub-industry that did not experience a similar decline at the outset of the 2000s was kitchen cabinet and countertop manufacturing (NAICS 337110). Although furniture for residential, office, and institutional applications became increasingly vulnerable to international competition, cabinetry maintained its status as a higher value product associated with residential construction, repairs, and remodeling, which experienced strong growth through the early- and mid-2000s. The cabinetry market was more resilient to globalization and allowed manufacturers to maintain domestic production and consumption trends beyond the decline of the rest of the furniture manufacturing

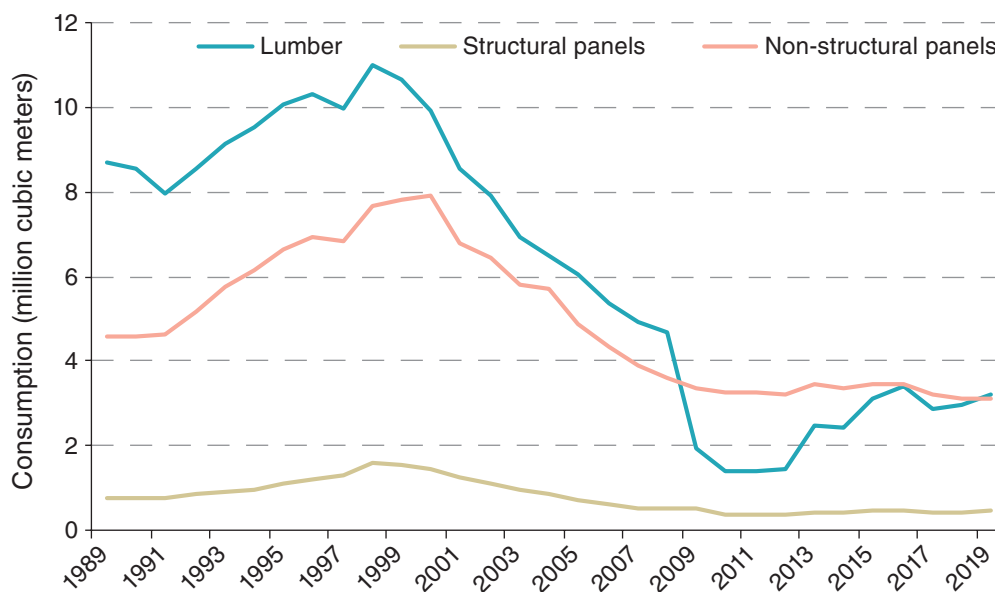


Figure 20—Solid wood products consumption in furniture manufacturing, 1989–2019. Source: estimated by authors from U.S. Census (2020a).



Furniture production in the U.S. has declined considerably under growing competition from international manufacturers.

industry. However, cabinetry also experienced a rapid decline with mass layoffs beginning in 2007, as the housing crisis developed (U.S. Census 2020a). The furniture industry has not shown much improvement after the economic recession of 2007–2009 and up to present (fig. 19), a period in which many other industries experienced a recovery.

All sub-sectors within furniture manufacturing, including home, office, and institutional furniture, shelving, and cabinetry, experienced minimal growth during the 2010s. During the latter part of the decade, the United States and China entered a period of heightened trade tensions, with escalating tariffs between the two countries that included tariffs on furniture imports from China; the tensions had a significant effect on trade because China was the top exporter of furniture products to the United States in the 2010s (USITC 2020). While the long-term effects of these trade tensions on the industry remain to be seen, it is unlikely that a revitalization of domestic furniture manufacturing industry will occur, given the availability of cheaper labor and raw materials outside of the United States and China. The

furniture manufacturing industry has seen some slow recovery after the economic recession of 2007–2009; however, industry expenditures and value of shipments have not returned to their high point at the end of the 1990s due to global competition.

Other Manufacturing—This category represents a wide variety of products made from wood. The U.S. Census (2020e) conducts annual surveys of manufacturers and reports statistics on employment, value of shipments, and other key metrics, organized by NAICS codes. Products in “Other Manufacturing” are not readily captured by specific NAICS codes and include an array of items such as musical instruments; sporting and athletic goods; dolls, toys, and games; brooms, brushes, and mops; wooden caskets; and other wood products. The manufacturing sector also employs many wooden jigs, patterns, and models integral to the manufacture of wood and non-wood items.

Given the challenges of organizing the diversity of these products into a single category, a broader approach was taken using the annual values of shipments for all NAICS manufacturing

codes (31–33) as a predictive variable. These codes were amalgamated, removing Wood Product Manufacturing (NAICS 321) and Furniture Manufacturing (NAICS 337) to avoid double counting with other sections of this report. This overall manufacturing value of shipments minus wood product and furniture values represented 97 percent of the total of all NAICS manufacturing codes in 2019. Wood products consumption in the “Other Manufacturing” category was then modeled using this broad manufacturing value of shipments. Overall, “Other Manufacturing” used 5.9 million m³ of lumber (including 3.5 million m³ of softwood lumber), 2 million m³ of structural panels, and 4.1 million m³ of non-structural panels in 2019. These levels of wood product usage were relatively steady over the course of the decade.

Consumption in Packaging and Shipping

In 2019, packaging and shipping represented 13 percent of all wood products consumption in the United States, which has been consistent since the country experienced a downturn in wood products usage during the economic recession of 2007–2009. Prior to the economic recession, packaging and shipping comprised around 8 percent of all wood products consumption. The construction sector, which uses most solid wood products, experienced a greater than 20-percent decline in wood products consumed year-over-year from 2007 to 2009. This resulted in a larger share of solid wood products used in the packaging and shipping sector, which underwent just a single year of declining wood product use (-12 percent) from 2008 to 2009 but otherwise experienced growth post-recession.

In the past decade the sector has continued to grow, with 46 percent growth in wood products consumption from 2009 to 2019 and an average of 5 percent growth in expenditures year-over-year for the decade. This resulted in a total of 19.8 million m³ of wood products used in 2019, which was primarily lumber (88 percent) with smaller amounts of structural panels (9 percent) and non-structural panels (3 percent). In 2019, these proportions of wood products consumption represent 17.4 million m³ of lumber, 1.7 million m³ of structural panels, and 0.6 million m³ of non-structural panels (fig. 21). Each category, as well as the total volume of wood products used for packaging and shipping, reached an all-time high in 2019.

The packaging and shipping sector include the manufacture and consumption of products such as pallets, wood boxes, crates, hampers, baskets, and other wooden containers; and dunnage, blocking, and bracing for transportation, handling, and storage of agricultural, industrial, and military goods. Wooden pallets are by far the largest product in the sector and their production



Wood pallets accounted for almost all the lumber used in packaging and shipping in 2016.

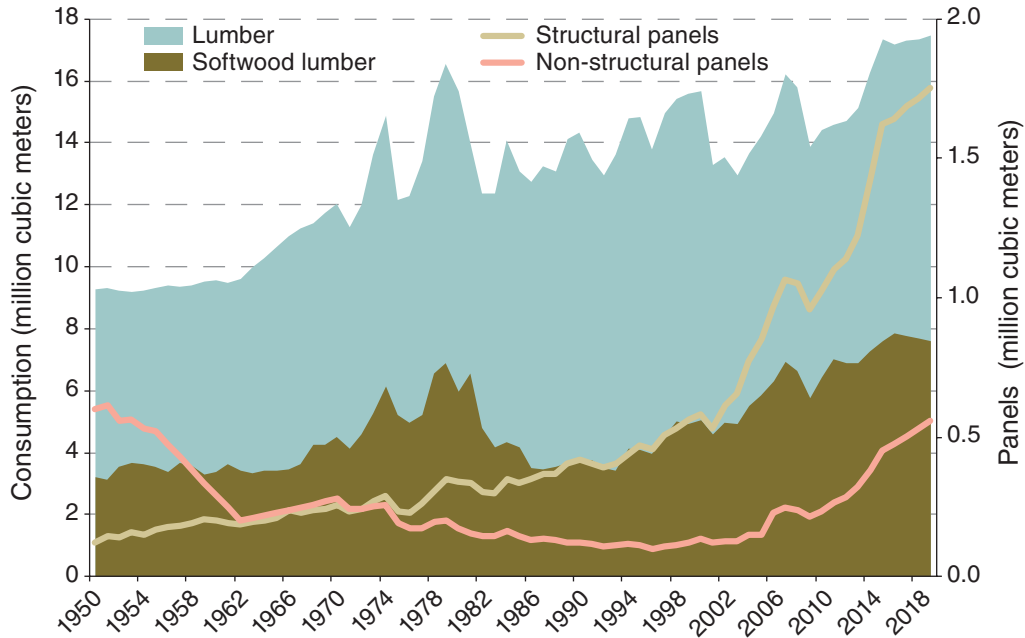


Figure 21—Wood products consumption in shipping and packaging, 1950–2019. Source: estimated by authors from U.S. Census (2020a).

represented 92 percent of all lumber used in packaging and shipping in 2016 (Gerber and others 2020). The growth of pallet production has continued since the industry was first measured in the 1950s, although the introduction of recycled pallets into the product stream in the 1990s resulted in a slowed growth for the manufacture of new pallets (fig. 22).

The prevalence of recycling pallets in the mid-1990s can be attributed to both legislatures from municipalities and States banning the landfilling of pallet as well as efforts to reduce the economic losses associated with pallets going to landfills instead of being repurposed or converted into another product. These two drivers

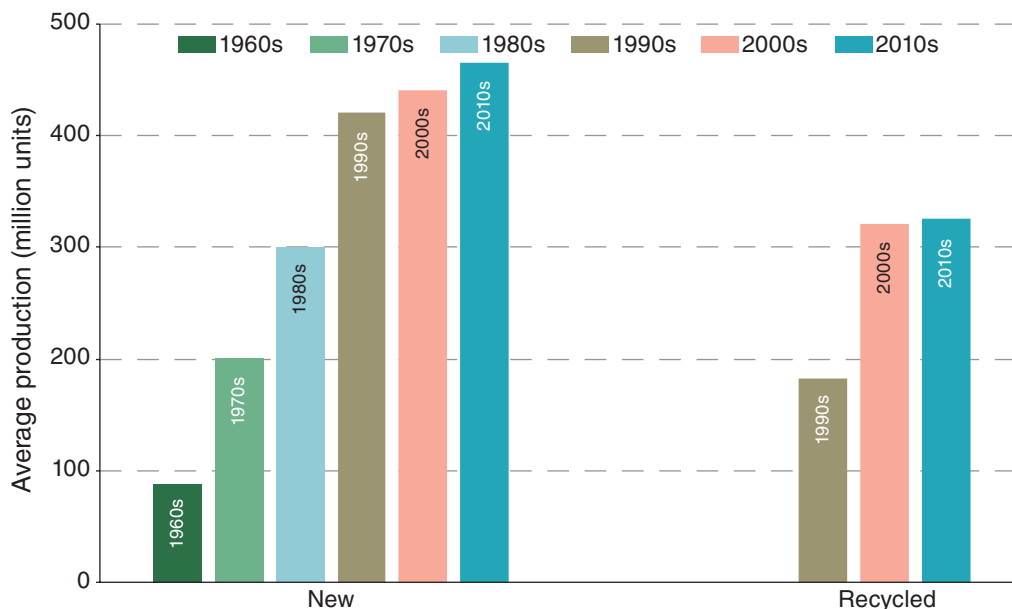


Figure 22—Average wooden pallet production by decade, 1960s–2010s. Source: Gerber and others (2020).

of change ultimately resulted in the recovery of millions of board feet of lumber that would have otherwise ended up in the waste stream. It also resulted in additional effects for other industries as pallets that cannot be repurposed are typically downcycled into products such as landscape mulch, biofuel, animal bedding, and other uses (Bush and Araman 2009). In 2016, 25 million pallets were landfilled, which represented just 3 percent of the total pallet production for that year (Shiner and others 2018).

Softwood use in packaging and shipping increased from 2009 to 2019 (Gerber and others 2020, U.S. Census 2020e). An average of 52 percent of all lumber used in packaging and shipping in the 2010s came from softwoods, the first decade where most of the lumber came from conifers. In the 2000s, the majority of lumber in the sector was low-grade hardwoods, with 46 percent of lumber used in packaging and shipping from softwoods. In the 1990s, only 35 percent of packaging and shipping lumber was softwood. In the 2000s, most of the softwood used in the manufacture of pallets and other wood packaging and shipping products was southern yellow pine; however, the softwood species mix

diversified in the 2010s to include the spruce, pine, and fir classification as well as Douglas-fir and other softwood species, whose use was largely dependent on regional availability (Gerber and others 2020).

Consumption in Other Uses

There are various other pathways in which solid wood products are consumed in the United States outside of the sections detailed in this report. These include wood usage by hobbyist woodworkers and do-it-yourself projects; advertising and display structures; bolts for boxes, excelsior, wood shingles, and other products; cooerage logs; fencing; hewn ties; poles and piling; roof supports and wood construction in the mining industry; wood flour used in wood-plastic composites; certain wood used in nonresidential construction such as millwork, flooring, cabinetry, and nonstructural wood; and other miscellaneous items that do not readily fit into the other sections of the report.

In 2019, these other uses accounted for 14.1 million m³ of wood, including 5.6 million m³ of lumber, 2.2 million m³ of structural panels, and 6.2 million m³ of non-structural panels (fig. 23).

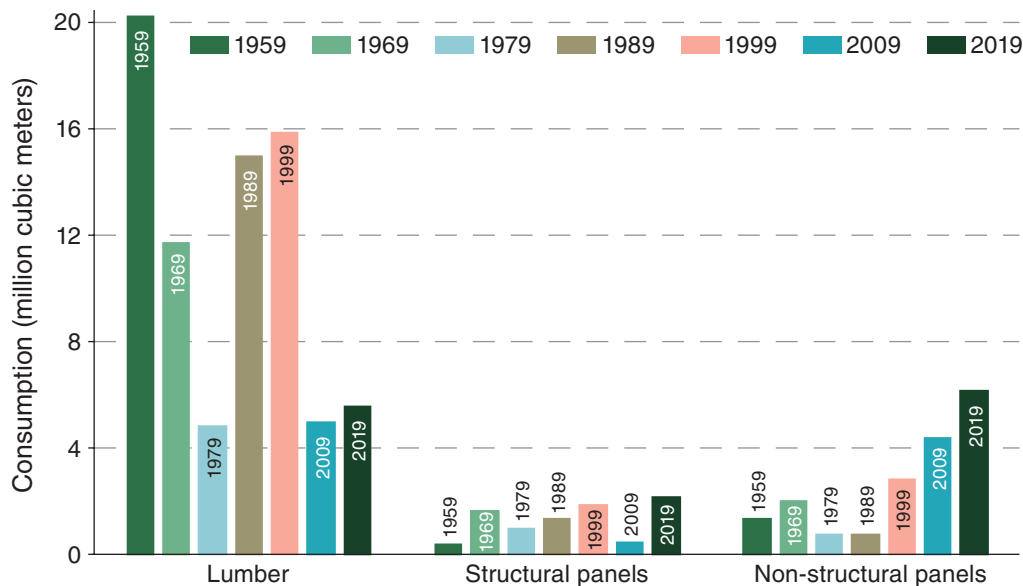


Figure 23—Solid wood products used for purposes other than construction, manufacturing, and packaging and shipping in the United States by product class, selected years, 1959–2019. Source: estimated by authors based on U.S. Census (2020a).

In total, other uses represented 9 percent of all solid wood products used in 2019.

Given the breadth of potential uses, the estimate for all other uses is calculated by subtracting the sums of the volumes from the previous sections for lumber, structural, and non-structural panels, respectively, from an estimated total for wood products usage for each of the three types of solid wood products. These estimated totals for lumber, structural, and non-structural panels are derived separately from the totals for the sections in this report using statistics on total production and net imports. This method allows for variances, corrections, and anomalies in the other datasets. It also entails that some unknown portion of the volume is erroneously included in “Other Uses” and belongs in another section.

The source data used to create the estimates contained in this report are derived from a limited number of studies that are, in some instances, conducted on a non-annual or intermittent basis. In these instances, the data for non-surveyed years are imputed or forecasted. Due to the irregularity of some of the studies that inform the datasets for this report, the length of time between studies is an important factor to consider with respect to the relationships between solid wood products consumption and factors that significantly affect their usage. Agents of change, such as globalization, international trade disagreements, and shifting preferences for different types of products, have substantial short-term effects on solid wood products consumption, which may or may not be reflected given the intermittency of studies that detail their utilization.

Summary of Solid Wood Products Consumption and Production

Solid wood products are an important component of the U.S. economy and their consumption represents billions of dollars of economic value annually. Post-recession growth was a trend across all solid wood products markets, from new houses to shipping pallets, and the 151.4 million m³ of solid wood products consumed in 2019 was the highest level since 2007. In the late 2000s, solid wood products consumption experienced substantial declines, dropping from 201.1 million m³ consumed in 2005 during a construction boom spurred by the housing bubble, to 104.2 million m³ consumed in 2009 during an economic recession, a level of consumption not seen since the early 1980s. Nevertheless, all solid wood product markets experienced a recovery through the 2010–2019 period, with the greatest growth occurring in the new housing sector. New housing, including single- and multi-family residential and manufacturing housing, experienced 115 percent growth from 2010 to 2019, using 46.8 million m³ of lumber and wood panels in 2019, the highest since the start of the 2007–2009 economic recession. Throughout the economic recession, and despite the losses experienced in the number of housing starts, the construction sector remained the major consumer of solid wood products. In 2019, new construction coupled with residential repairs and remodels used 66 percent of all solid wood products in the United States, up from a low of 54 percent in 2011. Manufacturing, packaging and shipping, and miscellaneous other uses made up the final third (52.6 million m³) of solid wood products consumed in 2019.

PULP, PAPER, AND PAPERBOARD CONSUMPTION, TRADE, PRODUCTION, AND PRICES

Paper and Paperboard Consumption, Production, and Trade

Paper and paperboard consumption continued to exhibit the general downward trend that began in the 1990s, as noted by Skog and others (2012). Most of this decline is linked to changes in paper consumption (fig. 24), specifically newsprint and printing and writing papers, as consumer preferences continue shifting from printed to electronic media (Latta and others 2016). Decline in the paper industry was somewhat less pronounced over the last decade, however, with an average annual rate of change of -3 percent in the 2010–2019 period compared to -4 percent over the 2000–2009 period (fig. 24). In contrast, consumption of paperboard products improved slightly over the 2010–2019 period, after the drop observed during the 2007–2009 economic recession (fig. 24). The relative recovery and stability of the paperboard industry follows the growth in electronic retail sales and associated demand for containerboard products. E-commerce’s share of total retail sales more

than doubled over the past decade, growing from 4 percent to 11 percent between 2010 and 2019, respectively, with sales of US\$ 183 billion in 2010 and US\$ 589 billion in 2019 (U.S. Census 2020f).

Changes in demand for paper and paperboard have resulted in structural changes, motivating industry consolidations and readjustments, with the number of paper and paperboard mills dropping 26 percent during the 2000–2016 period (U.S. Census 2020j). Paper production capacity dropped close to 41 percent between 2000 and 2018 (fig. 25) mostly due to capacity reduction in newsprint and writing and printing paper. Production capacity for tissue paper has expanded in recent years, however, with nearly 18 percent capacity growth between 2000 and 2018. Tissue paper is a market with expected future growth, as hygiene awareness and purchasing power increases throughout the world. Paperboard production capacity fluctuated slightly over the 2000–2018 period, with slight increases in containerboard balanced out by decreases in boxboard production capacity (fig. 26).

Notwithstanding the decline in production and domestic consumption, the United States

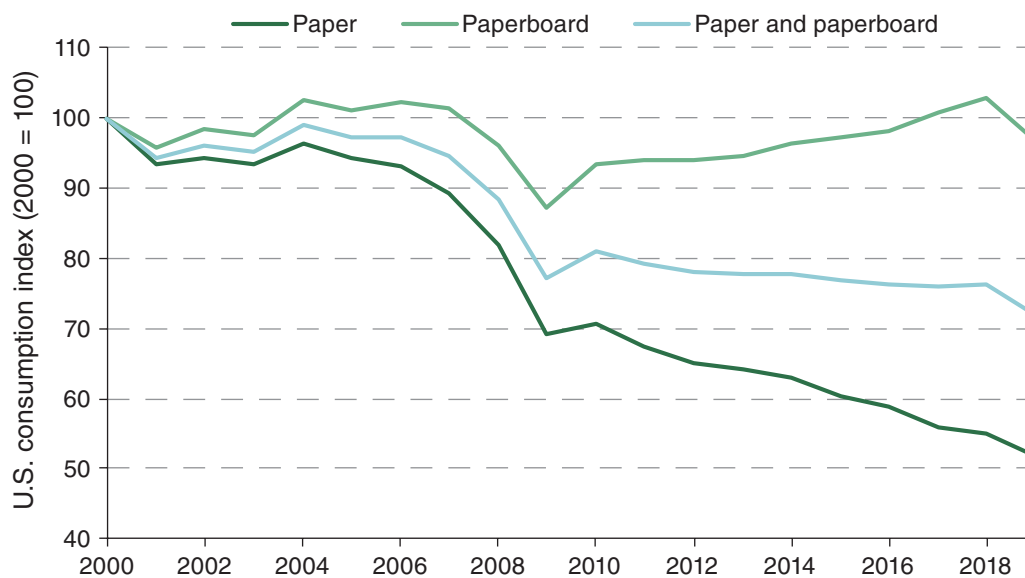


Figure 24—U.S. Paper and paperboard consumption index, 2000 to 2019. Source: AFPA (2019, 2020).

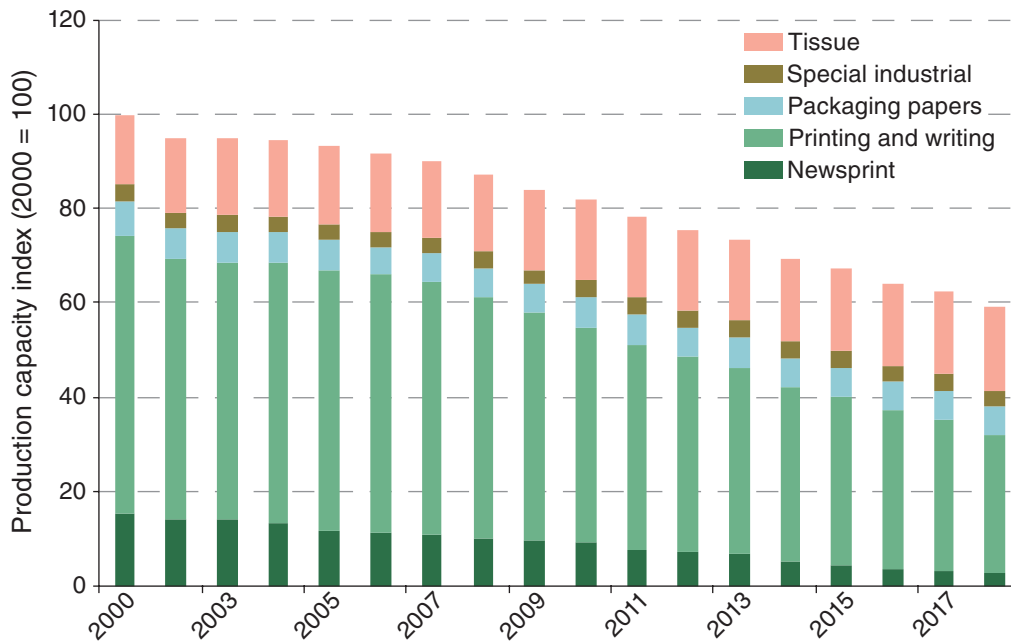


Figure 25—U.S. production capacity index for paper by major paper products share of production, 2000–2018. Source: AFPA (2018).

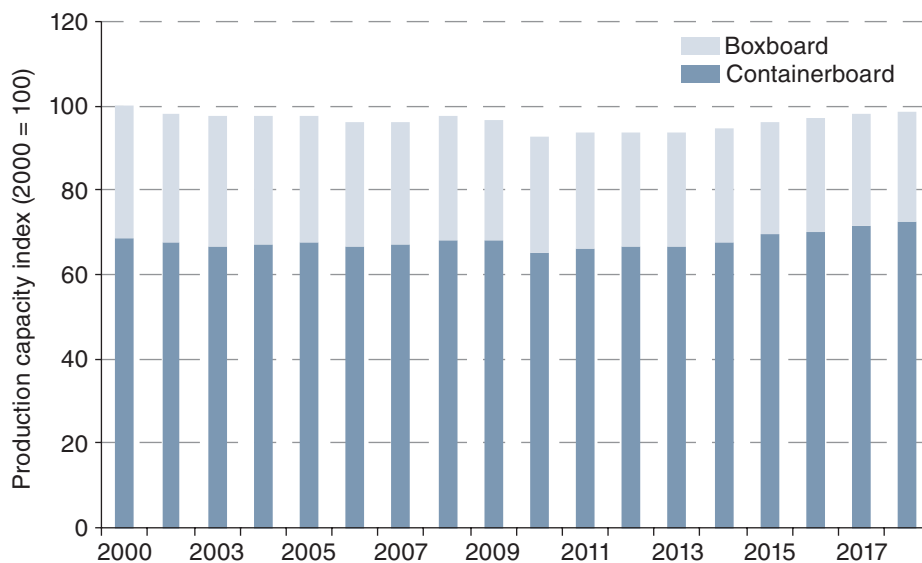


Figure 26—U.S. production capacity index for paperboard by major paperboard products share of production, 2000–2018. Source: AFPA (2018).

has maintained a trade surplus for paper and paperboard over the recent decade (2009–2019) (fig. 27). Net imports surpassed exports in the early 2000s, but the gap between imports and exports narrowed during 2007–2008 and turned into the first surplus in decades during 2009. This positive trade balance coincided with a weak trade-weighted dollar index, which continued to decline up to 2011. From 2012 forward the

trade-weighted dollar index started strengthening, but the United States remained a net exporter. However, the trade balance narrowed in recent years (2018–2019), with exports surpassing imports by approximately 12 percent. Net exports of paper and paperboard peaked in 2011 at over 15 million metric tons, while net imports were lowest in 2019 at nearly 10.5 million metric tons over the 2009–2019 period.

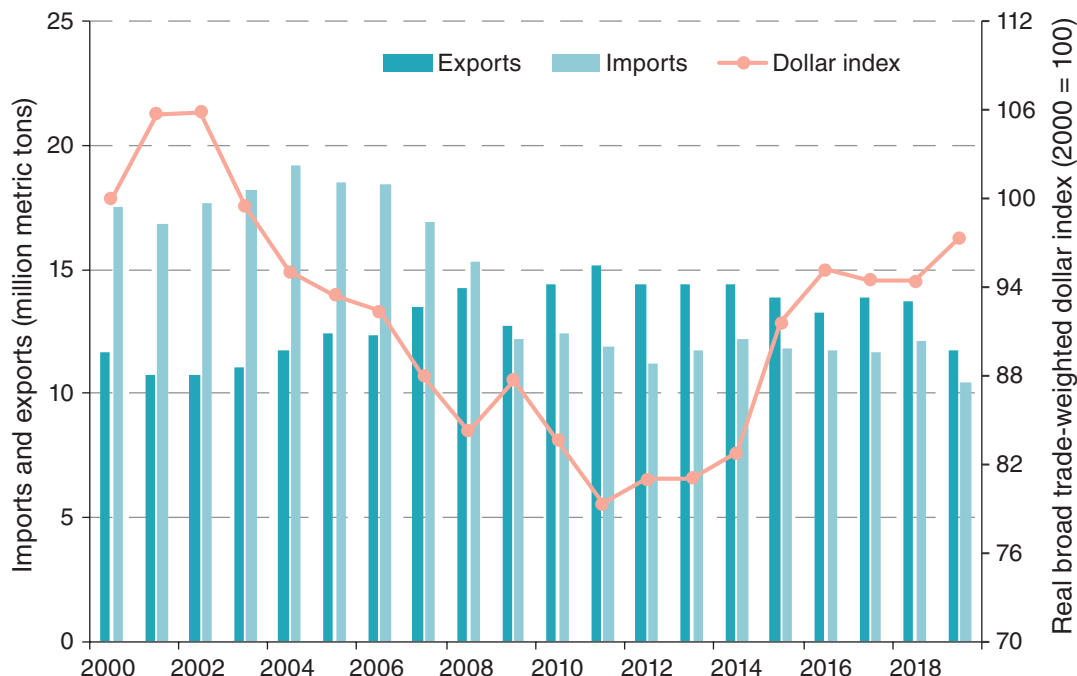


Figure 27—U.S. trade for paper and paperboard products and real trade-weighted dollar index, 2000–2019. Sources: FRB (2020c); USITC (2020).

Wood Pulp Production

U.S. wood pulp production, which is driven by demand from the pulp, paper, and paperboard industry, is experiencing an overall decline as well (fig. 28). According to AFPA (2019) data, production levels in 2010 had almost recovered to 2007 levels, remained relatively stable the

following 2 years, and resumed a downward trend from 2013, forward. However, U.S. wood pulp production decline occurred at a slower pace in the recent decade, with an average annual rate of change of -1.1 percent between 2010–2019, compared to -2 percent over the 2000–2009 period. Paper and paperboard manufacture

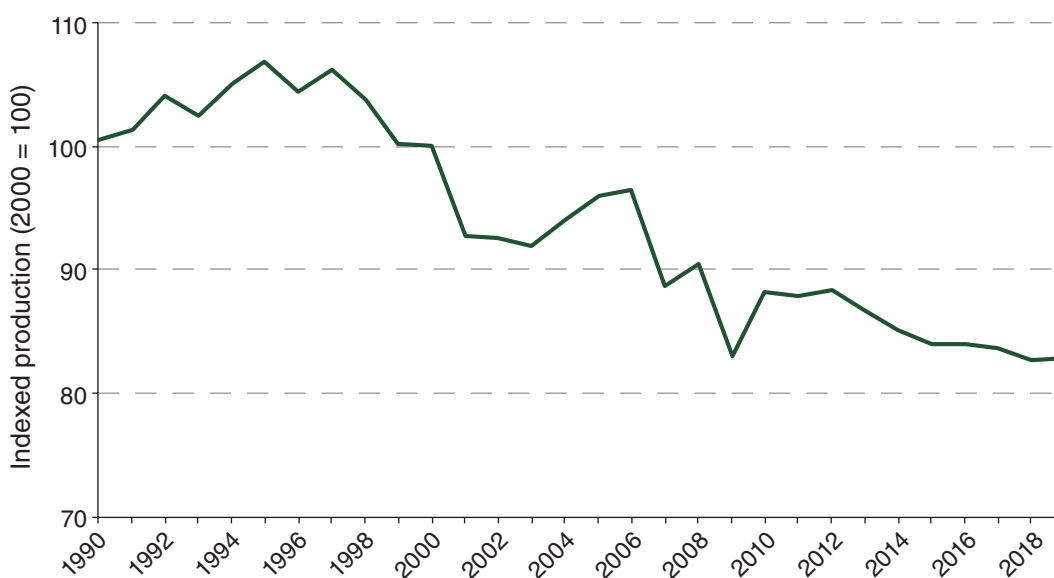


Figure 28—Annual U.S. wood pulp production index, 1990–2019. Sources: AFPA (2019); Howard and Liang (2019).

use wood pulp and recovered paper as well as minimal amounts of other fibers (cotton linters, rags, textile waste, etc.). Although wood pulp is the primary fiber used in the manufacture of paper and paperboard, recovered paper has made small gains in market share in recent years due to decreasing wood pulp production paired with slight increases in the recovery rate of recovered paper (fig. 29). Fiber used in 2018 included 39 percent recovered paper, a 3-percent increase compared to the 2010 fiber mix (AFPA 2018). The drop in wood pulp production was accompanied by a mill capacity reduction. Between 2010 and 2018, the number of U.S. wood pulp producing mills declined by 22 percent (USDA 2019), with close to an 8-percent estimated loss in production capacity (AFPA 2018).

Pulpwood Consumption and Prices

Pulpwood, which refers to small-size and/or low-quality roundwood, either whole logs or chipped, used in the production of paper and paperboard, accounted for nearly 46 percent of all U.S. roundwood consumption in 2017 (Howard and Liang 2019), representing a 4-percent increase in the share of total production,

compared to the roundwood product mix of 2000. As shown by figure 30, U.S. pulpwood consumption declined slightly over the recent decade, with approximately 3 percent less pulpwood consumed in 2017 compared to 2008. However, different U.S. regions experienced varying levels of change. In the South, pulpwood consumption was almost 3 percent higher in 2017 compared to 2008, while in the North and West regions pulpwood consumption was 26 percent and 37 percent lower, respectively.

Pulpwood prices (fig. 31) were estimated using quarterly regional prices published by Wood Resources International (2020), which were weighted by volume and species mix to calculate a U.S. estimate. Prices were deflated using the producer price index for all commodities (USBLS 2020a). We observe real prices dropping between 2006 and the first quarter of 2008 and fluctuating between US\$ 32 and US\$ 36 per oven-dry metric ton from 2008 to 2010. Prices trended upward between 2012 and 2016 and started declining again after the first quarter of 2016. Overall, the real price was 13 percent lower in the last quarter of 2019 compared to the third quarter of 2006, the first available observation in the series.

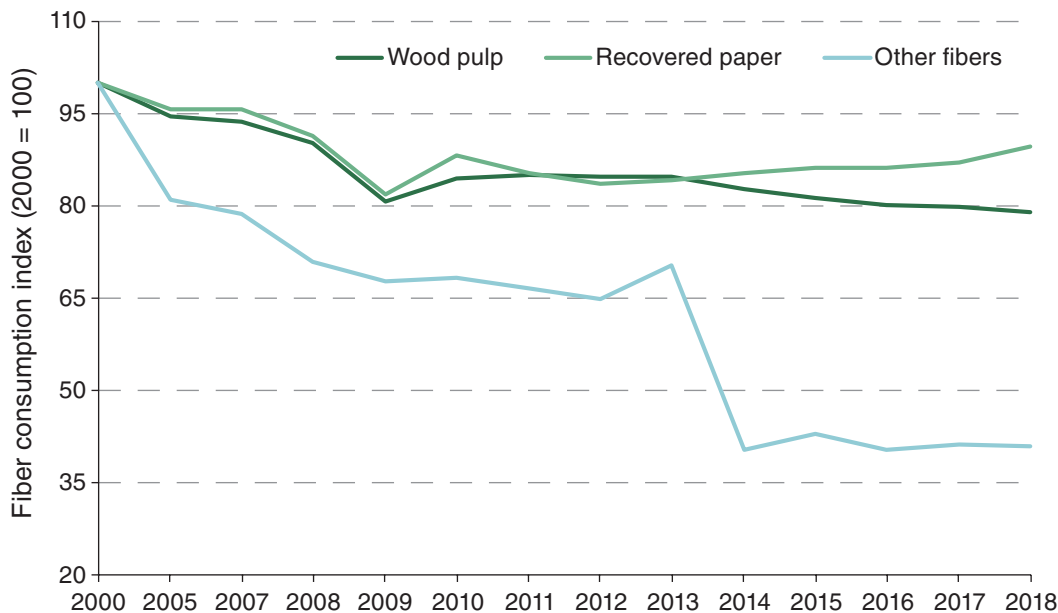


Figure 29—Fiber consumption in manufacture of paper and paperboard by fiber type, 2000–2018. Source: AFPA (2018).

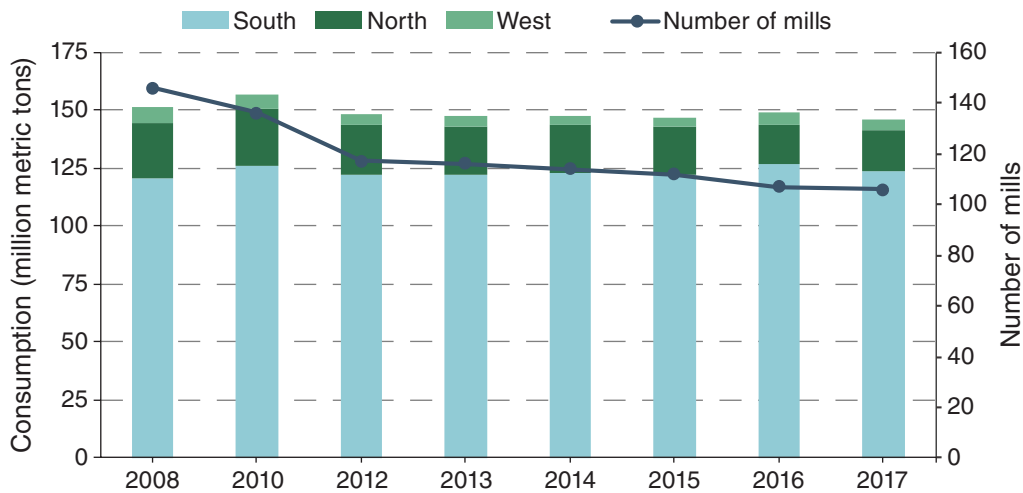


Figure 30—U.S. pulpwood consumption by major region and total number of U.S. wood pulp producing mills, 2008–2017. Source: USDA (2019).

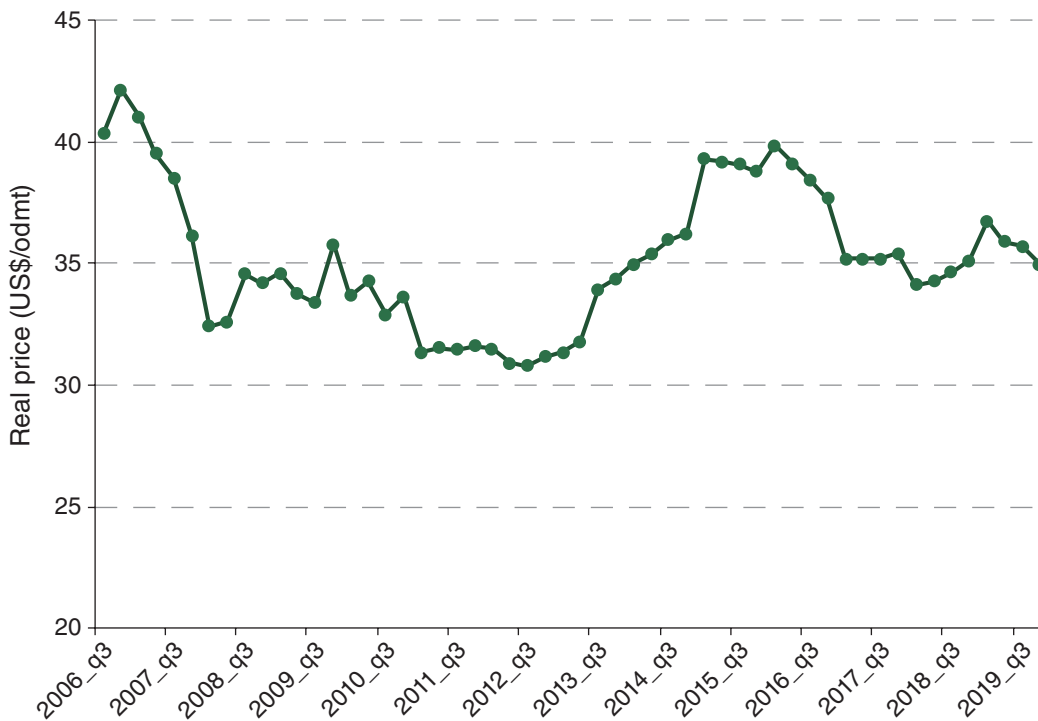


Figure 31—Quarterly U.S. real pulpwood delivered price, weighted average (odmt = oven dry metric ton), 2006–2019. Sources: AFPA (2018); WRI (2006 to 2019, quarterly issues); USDA (2019).

Other Uses for Pulpwood-type Material—

Pulpwood-type material (i.e., small-size as well as low-quality roundwood, either whole logs or chipped) is also used in the production of OSB and wood pellets. Approximately 3 percent of the U.S. roundwood volume consumed in 2013 was used for OSB production (Oswalt and others 2019, table 49). Construction is the primary U.S. market for OSB panels. As such, OSB

production and consumption declined during the 2007–2009 economic recession and began recovering in 2012 (fig. 32), amid improving housing market conditions. Between 1998 and 2007, production represented nearly a 61-percent share of consumption with the remaining share covered almost entirely by imports from Canada. U.S. OSB imports reached a low of 2.4 million m³ in 2009 (almost 60 percent lower than 2007

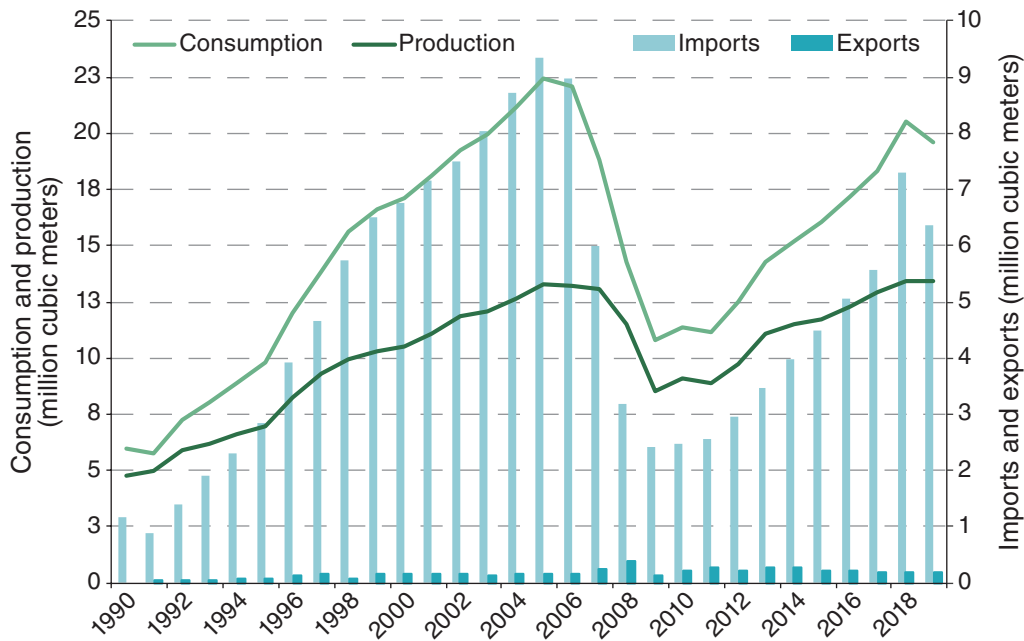


Figure 32—Consumption, production, and trade of oriented strand board (OSB), 1990–2019. Sources: APA (2019); Howard and Liang (2019); USITC (2020).

levels) and remained under 3 million m³ during 2010–2012 (fig. 32). Production share of consumption increased to an average 73 percent over the 2008–2019 period. Imports increased alongside production during the 2012–2018 period. However, declining U.S. panel market prices led to a drop in consumption and imports, with mill closures and curtailments in both the United States and Canada, while production increased slightly to reach a peak level across the 2000–2019 period (fig. 32). The narrowing gap between U.S. production and consumption improves the outlook for future consumption of pulpwood-type material.

Wood pellet mills using pulpwood-type material are located across the Southern United States and include larger capacity mills producing utility-type pellets for export markets. Wood pellet production accounted for nearly 3 percent of all roundwood consumed in the Southern United States in 2017 (USDA 2019). Increasing market demand for wood pellets has resulted in growing U.S. mill capacity and use of pulpwood-type material in wood pellet production. In 2019, the United States produced approximately 8.9 million metric tons of wood pellets using roughly

Pulpwood-type material is utilized in the production of wood panel, wood pellets, and wood pulp.



23 percent pulpwood material in the feedstock mix, up from 6.4 million metric tons production and 20 percent pulpwood used in 2017 (EIA 2020b). Announced mill expansions and startups (Copley 2019, Voegelé 2019) will likely increase the amount of pulpwood-type material used for wood pellet production in the future.

Summary of Pulp, Paper, and Paperboard Consumption, Trade, Production, and Prices

U.S. paper and paperboard consumption declined substantially over the past two decades (2000–2019). Downward shifts in industrial production in the early 2000s, lower demand from an economic recession in 2007–2009, and changing consumer preferences all contributed, to some extent, to the observed decline. Production decreased sharply for paper products, dropping 45 percent between 2000 and 2019. Paperboard production showed a slight fluctuation over that time period, with an overall gain of nearly 3 percent. Consumption in 2019 was 26 percent below that of 2007 pre-recession levels, mostly due to lower paper consumption. However, paper and paperboard products maintained a

trade surplus which began in 2009 and extended through 2019.

U.S. wood pulp production capacity declined as the industry adjusted to changes in the demand patterns for paper products. Approximately 30 wood pulp producing mills closed during the 2010–2018 period, representing close to an 8-percent reduction in capacity (AFPA 2018). Pulpwood prices, in real terms, although increasing 3 percent between 2018 and 2019, remained under 2006 levels. A growing timber supply will likely continue deferring major gains in prices moving forward. However, price effects will likely vary by U.S. region. Demand for pulpwood type material by other industries such as OSB and wood pellets, although growing, continue to represent a small part of pulpwood consumption.

WOOD ENERGY CONSUMPTION, TRADE, AND PRODUCTION

Wood is consumed to produce energy by five broad sectors of the U.S. economy—industries, utilities, commercial and social enterprises, individuals, and international trade. This wood is consumed to directly produce energy, to produce intermediate products that are then used to produce energy, and to produce other wood products whereby the processing residues are then used to produce energy. Figure 33 shows a simplified schematic of the wood pathways that are used for energy.

In this section, we discuss the consumption of wood to produce energy, including trade, with most of the data derived from USDOE EIA (2020a, b, c, d), and the USITA (2020). Production data are derived from the U.S. Department of Energy, Energy Information Administration, Modified Biomass Report 63C (2020c), Oswald and others (2019), and Forisk Consulting (2020).

Consumption and Trade in Wood for Energy

The four broad domestic sectors using wood to produce energy have not shown much variability between 1990 and 2018 (fig. 34). The four sectors combined consumed wood energy averaging 2,210 trillion British Thermal Units (BTUs) over 1990–2018, with a high of 2,437 in 1996, and a low of 1,935 in 2009. In 2018, these sectors consumed 2,359 trillion BTUs, an increase of 22 percent since 2009. Over the 29 years of our data, the largest consumer was the industrial sector, with 67 percent overall and 65 percent in 2018. Residential consumption has been steady at 22 percent, and there have been small changes in commercial and electric power consumption.

Industrial consumption is primarily the consumption of processing residues, including both wood-derived solids (chips and bark) and wood-derived liquids (black liquor), which comprise 81–84 percent of total consumption

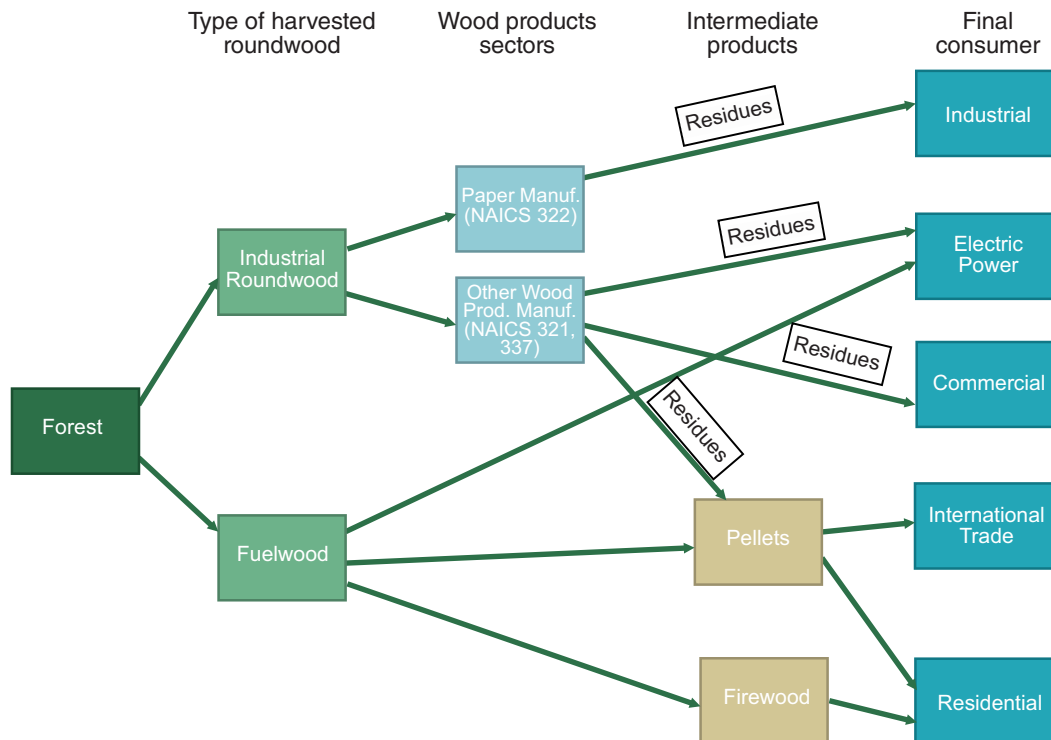


Figure 33—Simplified pathways for wood energy from production to consumption.

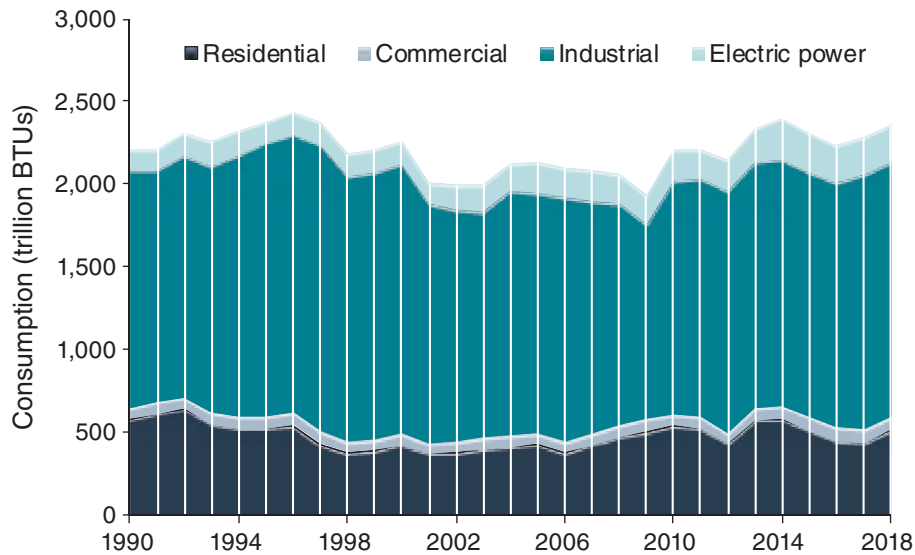


Figure 34—Consumption of wood-sourced energy by four major consuming sectors in the U.S. economy, 1990–2018. Source: EIA (2020c).

from the non-residential sectors. Figure 35 shows the consumption by wood products sectors and by type of processing residues. The 2007–2008 economic recession shows a reduction in the consumption of black liquor by Paper Manufacturing (NAICS 322), although this consumption was still the largest residue category in each of the four years. The second largest residue category was the use of wood-derived solids in Paper Manufacturing, with only small amounts of wood-derived solids consumed by

Wood Products Manufacturing (NAICS 321) and Furniture Manufacturing (NAICS 337). According to Oswald and others (2019, table 42), 51 percent of the solid wood residues used for energy production in 2013 were from bark, with the remainder comprised of coarse and fine residues.

Figure 36 shows the BTUs of wood consumed by the Electric Power Sector (NAICS 22) for both electricity and combined heat and power

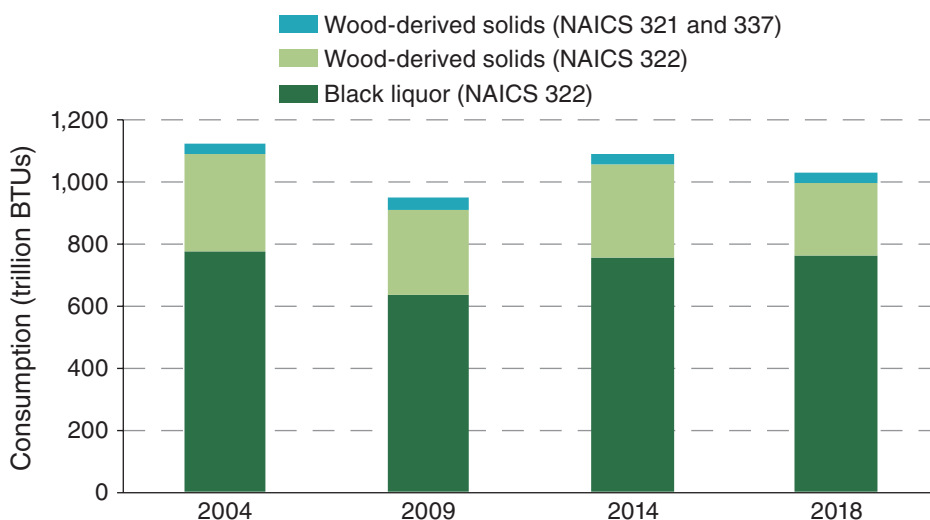


Figure 35—Consumption of wood-sourced energy by Paper Manufacturing (NAICS 322), Wood Products Manufacturing (NAICS 321), and Furniture Manufacturing (NAICS 337) in trillion BTUs for 4 selected years. Source: EIA (2020a).

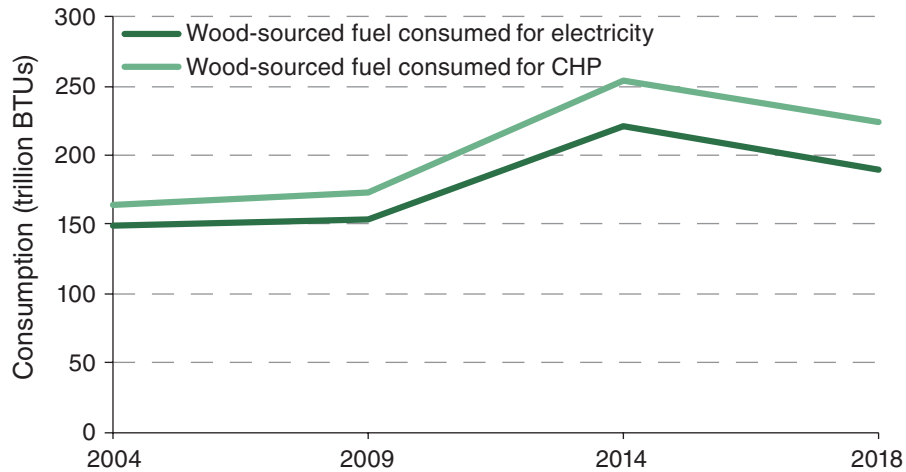


Figure 36—Electric Utility (NAICS Sector 22) use of wood-sourced fuels for electricity and combined heat and power (CHP) in trillion BTUs for 4 selected years. Source: EIA (2020a).

(CHP) over time. Both uses increased from 2009 to 2014, and declined after 2014, although the gap between CHP and electricity increased throughout, with more wood consumed for CHP production over time. Consumption of wood energy by the commercial sector has been steadily increasing, though still comprises only 4 percent of total wood consumed by the four domestic sectors.

The second largest wood energy consumption sector is residential heating, which consumes 22 percent of the total domestic consumption

(fig. 34). The 2018 consumption for this sector was higher than the average over all 29 years, but well below the highest annual estimate of 640 trillion BTUs in 1992.

The most recent RECS in 2015 provides wood energy consumption (in BTUs) for all households by Census region. The Northeast region uses the most total wood to produce main space and secondary heat, followed by the South region (fig. 37). This figure also shows that the Northeast uses more wood per wood-using household than the other regions. Figure 38

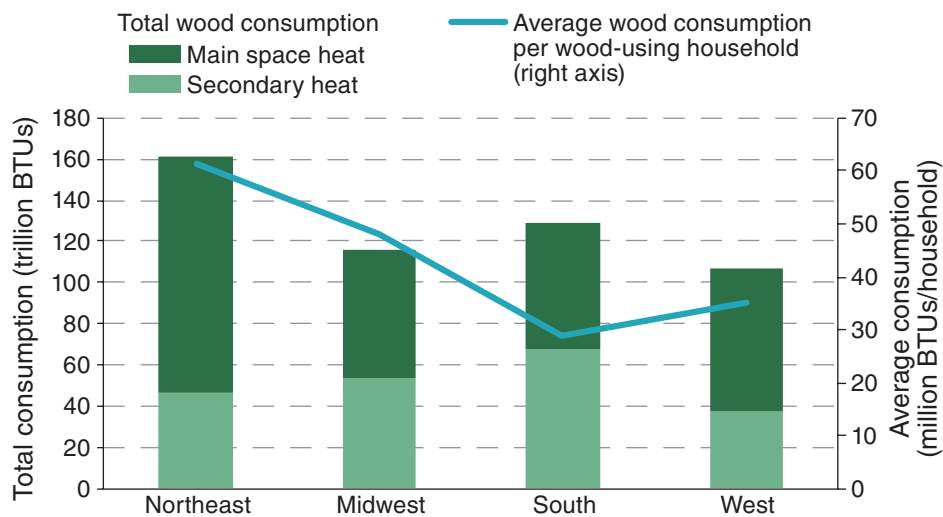


Figure 37—Total wood consumption by households using wood for main and secondary space heat, and average wood consumption per wood-using household, by Census region in 2015. Source: EIA (2015).

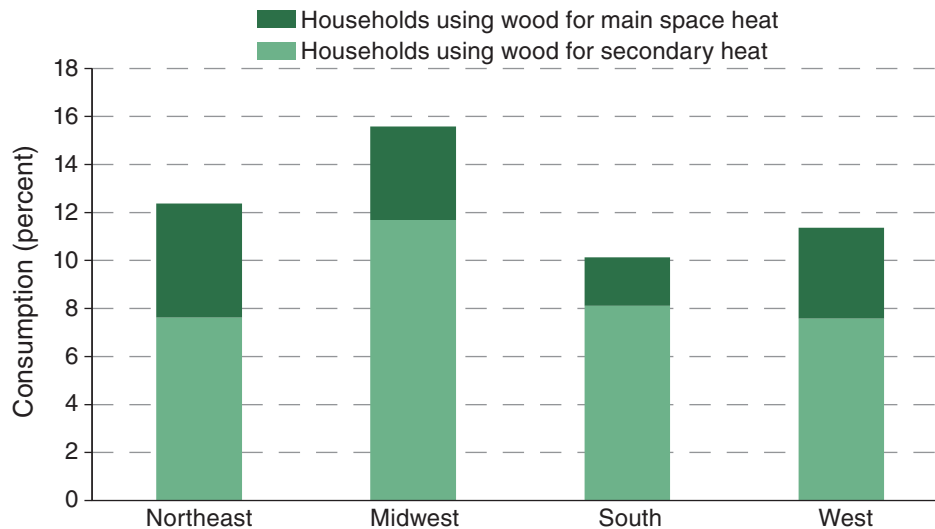


Figure 38—Percentage of households using wood for main space and secondary heat by Census region in 2015. Source: EIA (2015).

shows that the percentage of households using wood for any type of heat is highest in the Midwest, though much of this is from secondary heat. The South has the lowest percentage of households using wood for heat; the lowest percentage using wood for main space heat, and the lowest wood-use per wood-using household (fig. 37).

The final consuming sector in our discussion is international trade. In general, wood energy products are low valued, and thus because of their low unit value relative to their cost of transport, are not heavily traded internationally. However, in 2010 the EU adopted the Renewable Energy Directive, with the requirement that 20 percent of all energy sources in the EU should be from renewable sources by 2020 (Abt and others 2014). Subsequently, the law was extended and updated to apply through 2030. One approach to achieving compliance with the Directive used by several countries was the conversion of coal-burning power plants to burn wood, with a primary source of wood coming from wood pellets manufactured in the U.S. South. Because a Harmonized Trade Sector code for wood pellets was not adopted until 2012, we have data from 2012 to 2019 that document an average annual percentage increase of 16 percent per year (fig. 39)

(USITC 2020). Wood pellet exports from the United States are primarily shipped to the United Kingdom and other European countries, with the rest of the world currently accounting for only 2.5 percent of U.S. pellet exports. Despite years of policies and discussion regarding exports of U.S.-produced wood pellets to Pacific Rim countries, these countries currently account for $4/100$ of 1 percent of U.S. pellet exports. This could change, however, if pellet production increases on the West Coast or if these countries enact laws favoring the use of wood for energy.

Production of Wood for Energy

Three sources of wood are used to produce energy—roundwood, processing residues, and intermediate products such as pellets or other agglomerates such as briquettes, charcoal, or liquid fuels.

In total, roundwood harvested for fuelwood is estimated to account for 15 percent of total roundwood harvests in the United States in 2016 (Oswalt and others 2019, table 41). By region, this varied from 6 percent of Southern roundwood harvest to 35 percent of Northern roundwood harvest in 2016 (fig. 40). Fuelwood comprised the largest single use of roundwood in the North, with sawlogs in the West and pulpwood in the

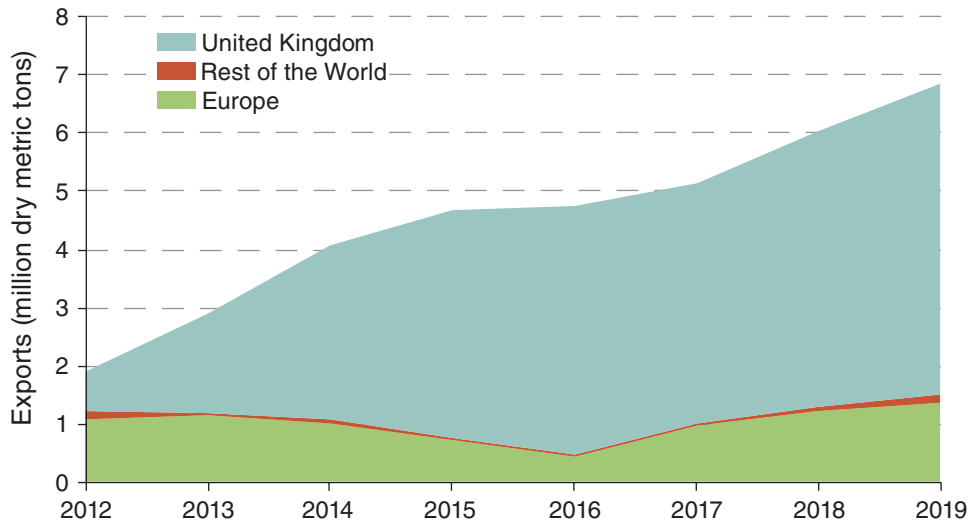


Figure 39—Total volume of pellets exported from U.S. ports to Europe, the Rest of the World, and the United Kingdom from 2012 to 2019 in millions of dry metric tons. Source: EIA (2020b). November and December 2019 values were estimated based on 2019 to date exports and trends in previous years.

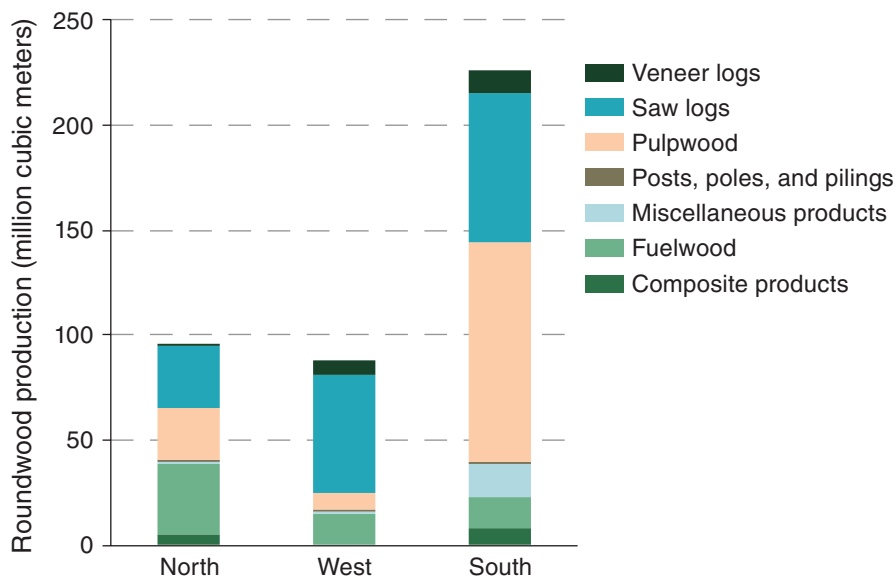


Figure 40—Total roundwood production by region and final product type, 2016. Source: Oswalt and others (2019, table 41).

South dominating the use of roundwood for products. More recent data for the South would likely reflect the 42-percent increase in industrial wood pellet production between 2016 and 2019 (EIA 2020b).

Most of the processing residues used to produce energy are used onsite where they are produced as by-products. All of the black liquor, and most of the bark, are low-valued products that might

not be worth the cost of transport. Other residues from wood products manufacturing, however, are highly sought after because they are clean, dry, and ready for use in other processing. Most of these coarse and fine residues can be used for producing other wood products (such as paper or pellets) or could be used to generate power and heat if alternate, higher valued uses are not located nearby. Figure 41 shows estimated solid

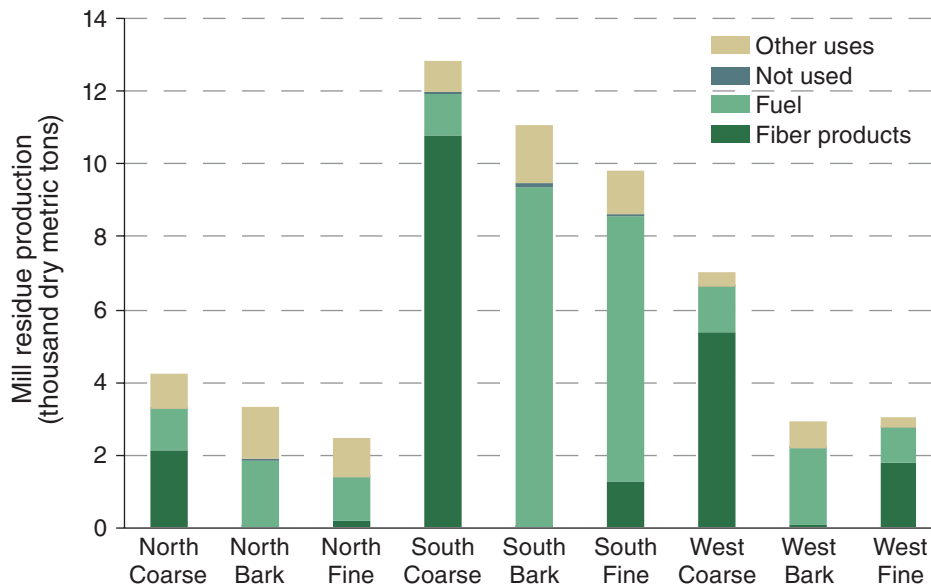


Figure 41—Estimated residue production by type and region, 2016. Source: Oswald and others (2019, table 42).

wood residue production by type (coarse, fine, and bark) and by region (North, South, and West) in 2016 (Oswald and others 2019, table 42). In figure 40, residues used for fuel comprise the largest use for bark in all three regions, and the largest use of fine residues in the South and North. Fine residues in the West are mostly used for fiber products.

Production of black liquor from pulp processing is relatively fixed in proportion to the amount of pulp produced.² Some variation occurs from the type of paper being produced (white paper vs. brown paper) and the type of wood input (hardwood vs. softwood), but there has been little change over time in these production proportions otherwise. Thus, small changes in the quantity of black liquor produced, and therefore used for energy, could result from changes in the demand for paper qualities or from changes in the supplies of pulpwood. Because black liquor is also a pollutant, it must either be disposed of properly at some cost or used to produce energy—most is used for energy if possible. Thus, the

consumption of black liquor is effectively the same as production—which is shown in figure 35 for NAICS sector 322—Paper Manufacturing.

Wood pellet manufacturing has grown so much in recent years that EIA developed a survey to keep up with the industry (the Monthly Densified Biomass Fuel Report 63C, EIA 2020b). This survey is conducted monthly of all producers of more than 10,000 dry short tons of pellets per year—smaller producers respond only annually. Figure 42 shows the production of two kinds of pellets—premium/standard and utility. Premium/standard pellets are produced primarily for domestic residential consumption and are mainly bagged pellets. Utility pellets are produced primarily for export and use in utility scale boilers to produce energy. In 2019, and in all previous years, utility pellets have been produced only in the U.S. South, with some production of premium/standard pellets as well. The North and West regions produce only premium/standard pellets.

² Personal communication. 2020. Carl Houtman, Research Chemical Engineer, USDA Forest Products Laboratory, Madison, WI 53726.

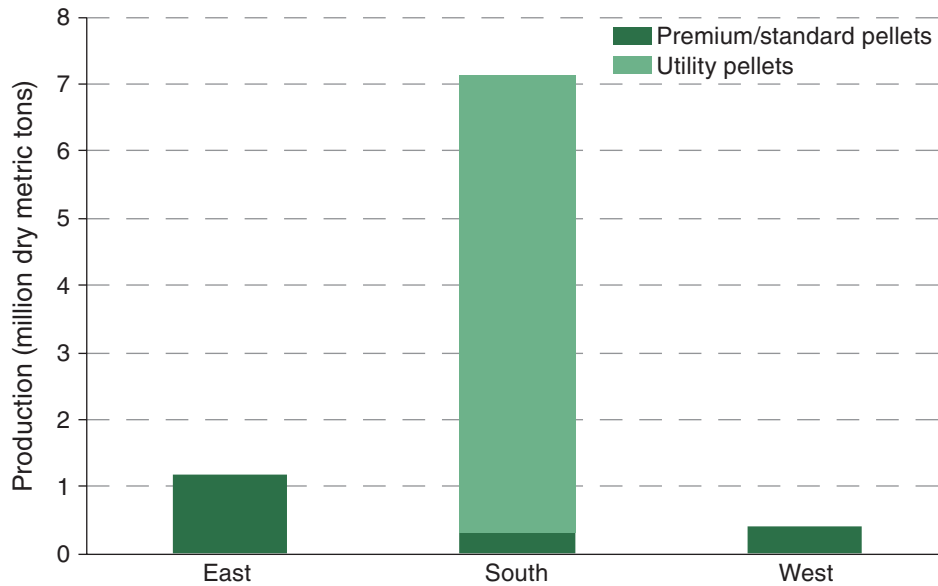


Figure 42—Production of wood pellets by region and by type (premium/standard and utility) in 2019. Source: EIA (2020b).

Figures 43 and 44 are derived from Forisk Consulting’s Wood Bioenergy U.S. survey, updated quarterly (Forisk Consulting 2020). The values from these surveys are based on capacities rather than production and include producers of other types of wood energy beyond just pellets. These other producers are included in other EIA data, such as the EIA-923 surveys. Forisk reports the existing capacity of both operating wood-using energy plants and announced new capacities and quantifies the input types for each plant based on survey responses and total capacity.

Figure 43 A-C shows million green metric tons of wood use capacity for different types of energy producing plants by region for three operation plant statuses—open and operating; announced and more likely to be built; announced and less likely to be built. Forisk makes these determinations based on their assessment of recent activity such as permits and construction starts.

The three figures show that wood used for energy is dominated by the South, and the South is dominated by pellet production and announced

pellet production; the total current wood use capacity is estimated at 35.6 million green metric tons, with 63 percent of that capacity in pellet production. The North uses wood primarily for electricity, domestic pellets, and CHP, with total current capacity at 19 million green metric tons, while the West has similar product emphases, with total current capacity at 11.2 million green metric tons.

Environmental groups and scientists have raised concerns over the sustainability of forest resources in the U.S. South under the current capacity for pellet production, and additional capacity from announcements has exacerbated these concerns. Current capacity for pellet production in the U.S. South is 22.7 million green metric tons of wood input, with 62 percent of that wood input coming direct from the forest (fig. 44). Mill residues make up only 38 percent of current expected feedstocks, and lower proportions of the announced feedstocks. Softwoods dominate the current feedstocks with softwood mill residues and pulpwood comprising 67 percent of inputs. Softwood is expected to continue to dominate the feedstocks if the announced mills are completed.

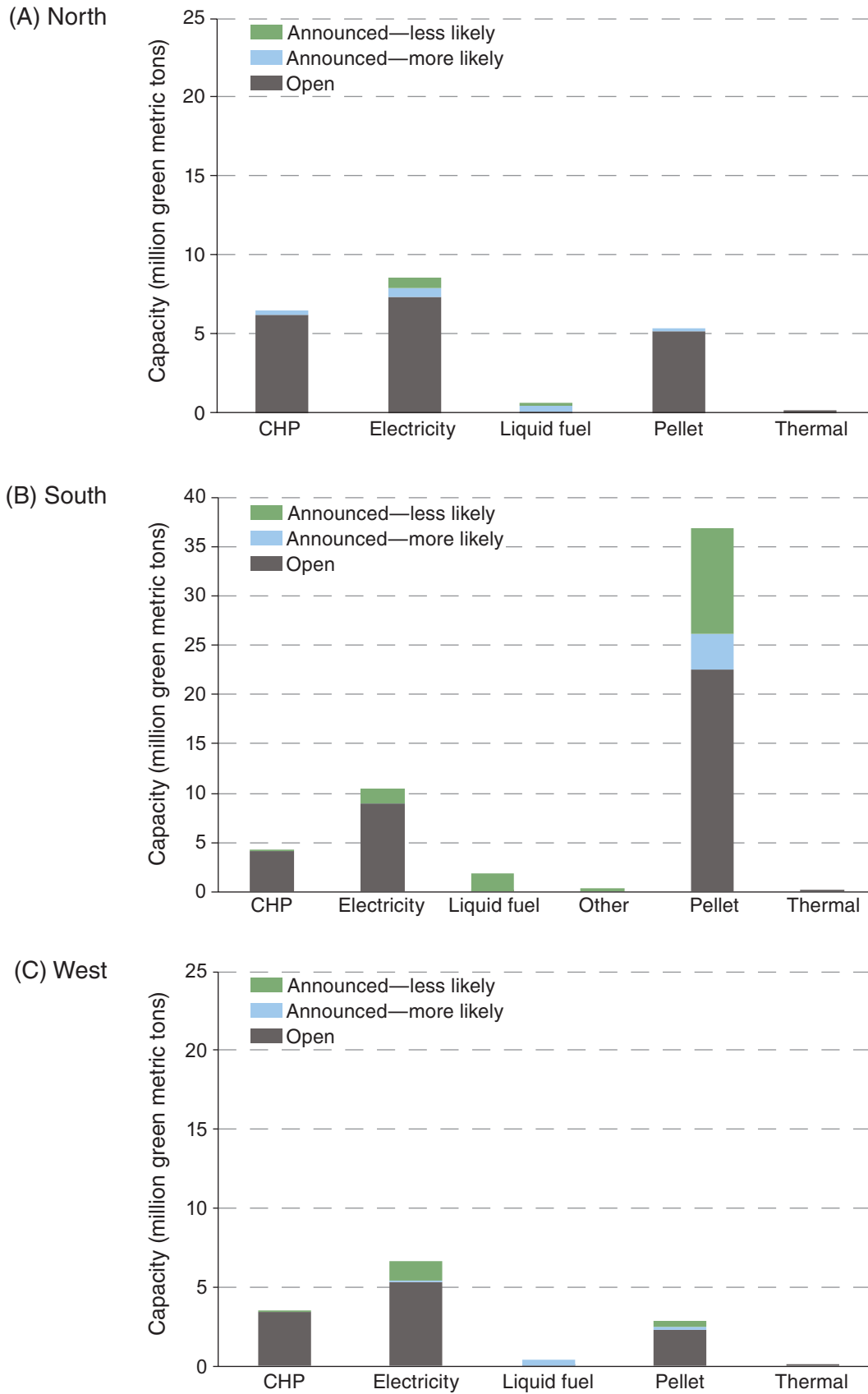


Figure 43—Annual capacity for wood use for all wood energy types by region (A) North, (B) South, and (C) West in 2019. Note the scale differences across the three regional figures. Source: Forisk Consulting (2020).

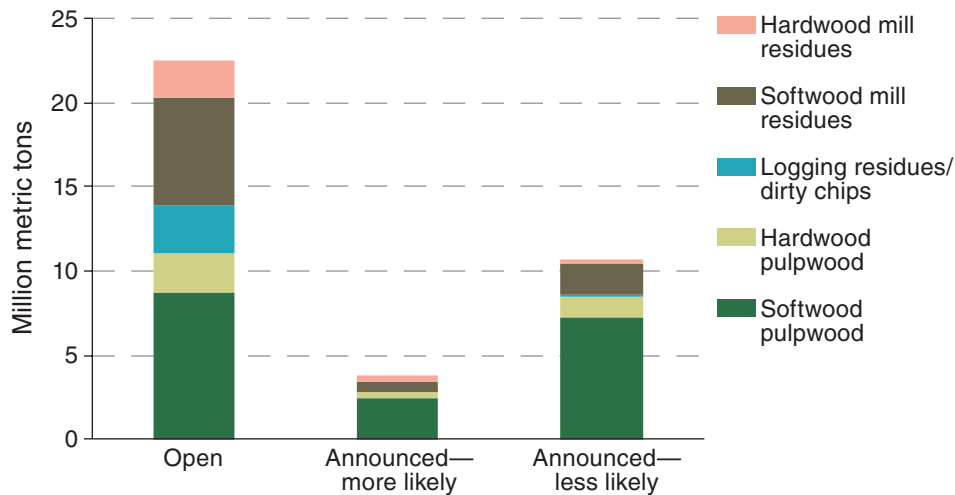


Figure 44—Annual volumes of wood by source for use in pellet production in the South by operating status in January 2020. Source: Forisk Consulting (2020).

Summary of Wood Energy Consumption, Trade, and Production

Data on current use of wood for domestic energy production does not exhibit any notable trends up or down. However, because wood energy is susceptible to impacts from policies related to energy security and/or carbon and climate, this could change if major policies were implemented to promote the use of wood for energy or to prohibit the use of wood for energy. Changes in market prices for alternative energy sources, such as oil, natural gas, solar, or wind, could also lead to changes in the use of wood for energy.

In some policy suggestions to address climate change, researchers have suggested that solid wood residues from wood products manufacturing, as well as logging residues from harvests, could provide carbon neutral energy feedstocks (Perlack and others 2005). However, there are several complications with this suggestion including (1) logging residues may not be desirable as a feedstock for all energy products, (2) processing residues are currently almost fully utilized (see fig. 41 “not used”), and as a result, (3) incentivizing the use of processing residues in energy production as opposed to their current use in fiber products (e.g., pulp and paper) will

result in an increased use of roundwood harvest as feedstock for fiber products, with likely only small changes in overall production levels. This is not likely a carbon neutral outcome.

Logging residues are defined as what is left on a harvest site after the sold timber has been harvested and transported. Logging residues are often cited as a potential “source” feedstock for wood energy production (Stokes and others 2016). In Forest Service, U.S. Department of Agriculture data, however, there are no logging residues in use because the “formerly named logging residues” are now classified as a timber product (e.g., sawlogs, pulpwood, or fuelwood). Logging residues could be converted into timber products at a higher rate than is currently done, but this adds costs to the harvest and may provide only dirty chips, which will reduce their value for producing pellets, pulp, or wood energy and may not be desired feedstock for any of these uses. It is not clear if the increased use of logging residues will harm soils at logging sites and if the market will demand additional logging residues as fuelwood. If not policy driven—additional use of logging residues as fuelwood will be market-driven, and our only confirmation that this is occurring will be through tree utilization



Logging residue in thinned loblolly pine plantation. (photo by Tony G. Johnson [retired], U.S. Forest Service)

studies such as those carried out by the Forest Service, Forest Inventory and Analysis program, which document the physical presence of logging residues from current harvest sites (e.g., Wall and others 2018).

The use of U.S. timber to produce wood pellets for nondomestic utility consumption is a still-growing wood products sector in the U.S. South. These pellets are produced from softwood and hardwood roundwood and mill residues, and compete with domestic pulp producers for these feedstocks. Such competition has the potential to increase or provide a floor against decreasing timber prices, thus improving the probability that

landowners will keep their land in timber. To date, this sector is entirely policy driven, primarily through the EU Renewable Energy Directive. In addition, policies in the Pacific Rim countries could also lead to increased exports of wood pellets to these countries, although the trade data indicate that this has not yet happened. If these policies were to change, however, this industry would also change. Current growth projections in this sector show that additional plants are expected to be built, and because these plants have annual wood requirements comparable to a small paper mill, continued impacts on southern forest resources are expected.

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According to the latest available forest resource estimates, approximately 40 percent of the roundwood harvested in the United States is utilized in the production of solid wood products and 38 percent in the production of wood pulp for paper and paper products (Oswalt and others 2019). The demand for solid wood products is motivated by activity in end-use markets such as new housing construction and furniture manufacturing. The demand for paper and paperboard products arises by activity in a wide range of industries, from businesses that need to print paper to the retailer's demand for wrapping paper and boxes used in shipping, among others. This report provides trends in U.S. forest products consumption, production, and trade to assess the forest products sector status to date. We find the U.S. construction sector remains the leading consumer of solid wood products, accounting for nearly 66 percent of all solid wood products consumption in 2019. As such, we observe the production of solid wood products closely following trends in the construction sector activity. Consumption of pulp and paperboard products shows a persistent downward trend due, primarily, to the increasing adoption of electronic media in place of newsprint, writing papers, and printing papers. Paper products consumption per capita during 2019 was nearly 60 percent below the level observed in 1999. Paperboard consumption per capita has declined as well, but at a slower rate.

Keywords: Forest products, forest sector, lumber, paper and paperboard, trade, wood energy, wood panels.



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