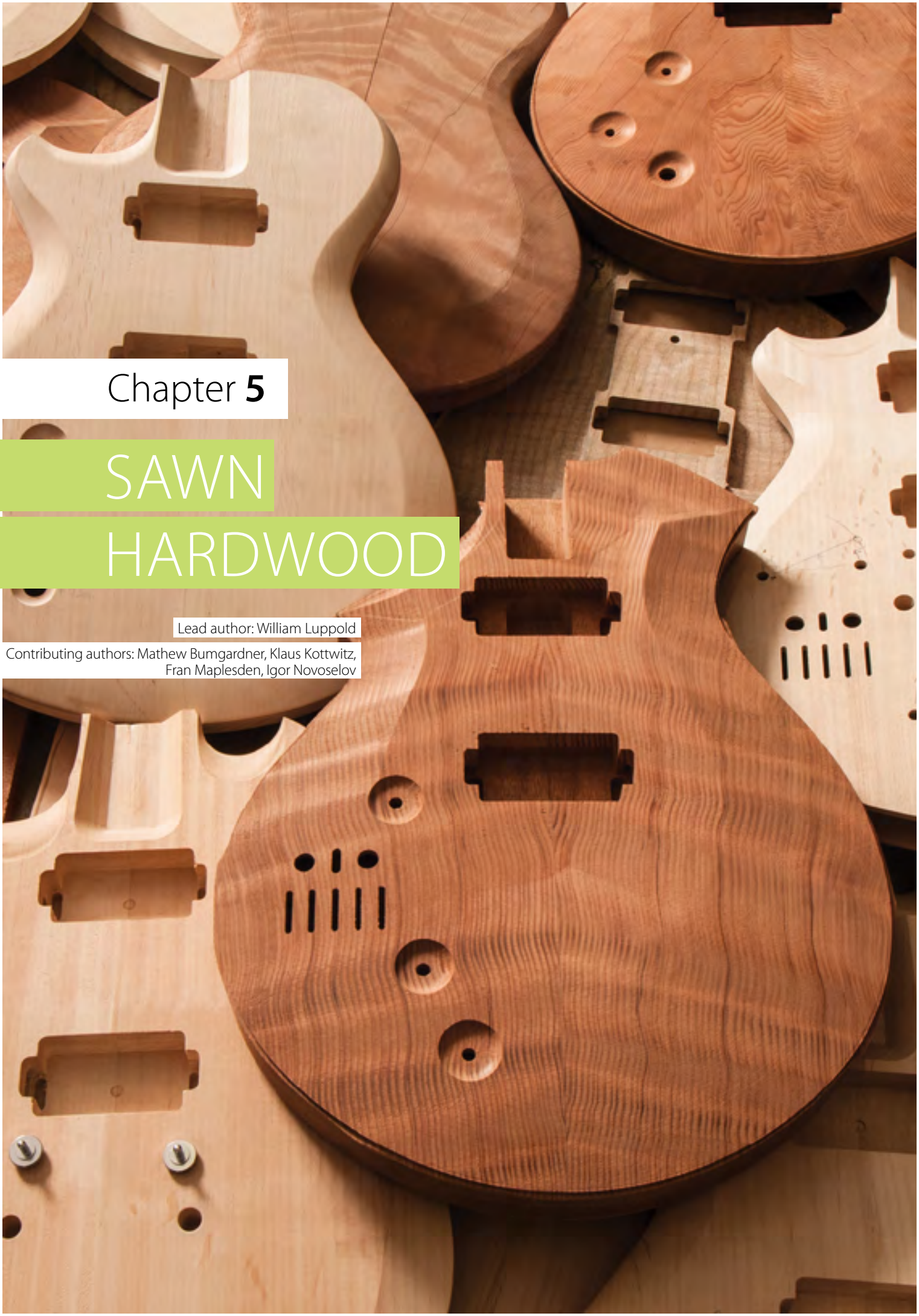


Chapter **5**

SAWN HARDWOOD

Lead author: William Luppold

Contributing authors: Mathew Bumgardner, Klaus Kottwitz, Fran Maplesden, Igor Novoselov

Highlights

Oak is still the most fashionable hardwood species coming from the UNECE region. Birch, on the other hand, is the CIS's number-one most-exported sawn hardwood species.

Sawn hardwood exports in the UNECE region reached an all-time high in 2017, at 13.7 million m^3.

The consumption of sawn hardwood in the UNECE region dropped by 3.2% in 2017 to 34.4 million m^3, with both Europe and North America reducing consumption by a combined 1.3 million m^3. Only the CIS region showed an increase (+11.1%).

Sawn hardwood production in the UNECE region was relatively flat in 2017, at 41.7 million m^3, with slight or no increases in Europe and North America and a rise in the CIS.

European and North American producers are increasingly concerned by a shortage of raw materials caused by increased Chinese demand for hardwood logs (particularly oak).

Apparent sawn hardwood consumption fell by 3.8% in Europe in 2017, to 12.6 million m^3. Production was relatively flat and the export volume was its highest since 2007.

The Russian Federation exported 1.27 million m^3 of sawn hardwood to China in 2017, an increase of 10.2% over 2016 and the largest quantity of Russian sawn hardwood ever shipped to China.

About 55% of China's sawn hardwood imports are from tropical countries, and volumes have grown rapidly in recent years.

Outside the UNECE region, trade in tropical sawn hardwood continues to focus on the Asia-Pacific region, with China dominating global imports and Thailand and Malaysia the major exporters.

Hardwood is slowly making inroads into timber construction through high profile architectural and engineering projects. Many hardwoods have superior strength-to-volume ratios compared with those of softwoods.

5.1 Introduction

The decrease in sawn hardwood consumption continues in the UNECE region in 2017, dropping by 3.2% to 34.4 million m^3, the lowest value in the last four years. Sawn hardwood production in the UNECE region was relatively flat, at 41.7 million m^3, with slight or no increases in Europe and North America and a rise in the CIS.

Global demand for hardwood remained strong in 2017, enabling sawn hardwood producers to ship record volumes to markets outside the UNECE region, mainly China. Sawn hardwood exports in the UNECE region reached an all-time high in 2017, increasing by 9.6% to 13.7 million m^3.

Strong demand for sawn hardwood enabled producers to maintain production. Global demand for hardwood logs was even stronger, with prices up significantly in 2017. European and North American producers are increasingly concerned about a shortage of raw materials caused by increasing Chinese demand for hardwood logs (particularly oak).

Outside the UNECE region, the Asia-Pacific region continued to dominate trade in tropical sawn hardwood in 2017, with China the major global importer and Thailand and Malaysia the biggest exporters.

5.2 Europe

5.2.1 Consumption

The apparent consumption of sawn hardwood fell by 3.8% in 2017, to 12.6 million m^3 (table 5.2.1). Apparent consumption in Turkey, the subregion's largest national market for sawn hardwood, fell by 6.2%.

TABLE 5.2.1

Sawn hardwood balance, Europe, 2016-2018
(thousand m^3)

	2016	*2017*	*2018f*	*Change (%) 2016-2017*
Production	13,986	13,952	13,979	-0.2
Imports	4,918	4,924	5,036	0.1
Exports	5,835	6,308	6,339	8.1
Apparent consumption	13,068	12,569	12,676	-3.8

Note: f = 2017 Committee on Forests and the Forest Industry forecast.

Source: UNECE/FAO, 2018.

Hardwood is slowly conquering timber construction through high profile architecture and engineering projects. The American Hardwood Export Council is active and successful in Europe, promoting wood materials and heat-treated wood products made from red oak and tulip wood.

Many European countries are using research to increase markets for hardwood in construction. There are now glulam beams and cross-laminated timber (CLT) made with beech, including in combination with softwoods as hybrid carriers. Such products will likely only serve niches for the foreseeable future, however.

Furniture consumption – another important source of demand for sawn hardwoods – grew by 2% in the main markets of France, Germany, Poland, Spain and the UK in 2017. Europe continued to lose market share to Asia in both production and consumption. The value of furniture production nearly doubled in Asia and the Pacific between 2008 and 2017, from $122 billion to $239 billion, but changes in production value were comparatively minor in other regions. More than half the world's furniture production took place in Asia and the Pacific in 2017 (CSIL, 2018). Chapter 9 on value-added wood products provides more in-depth analysis of the furniture market.

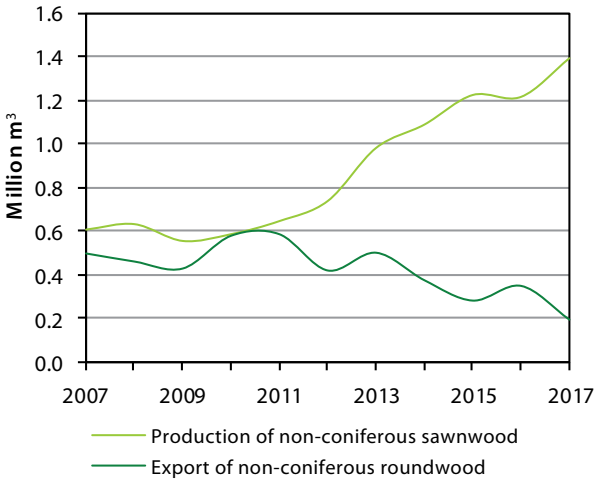
In general, parquet consumption continues to grow in the EU, benefiting from an encouraging economic environment and positive trends in the construction sector; nevertheless, Germany – the biggest European market for parquet – reported a significant decline in parquet demand. Consumption in the European Federation of the Parquet Industry (FEP) area was up marginally (by 0.3%) in 2017, at about 79.2 million m^2. Germany's market share was 21.2%, followed by France (10.7%) and Sweden (10.0%) (FEP, 2018).

5.2.2 Production and capacity change

European sawn hardwood production declined by 0.2% in 2017, to 14.0 million m^3; on the other hand, production increased by 1.6% in the EU28, to 10.6 million m^3. This divergence is explained by a major drop (-6.3%) in production of 169,000 m^3 in Turkey, which is not an EU28 country.

GRAPH 5.2.1

Ten year trend of Croatian non-coniferous sawnwood production, 2007-2017



Source: UNECE/FAO, 2018

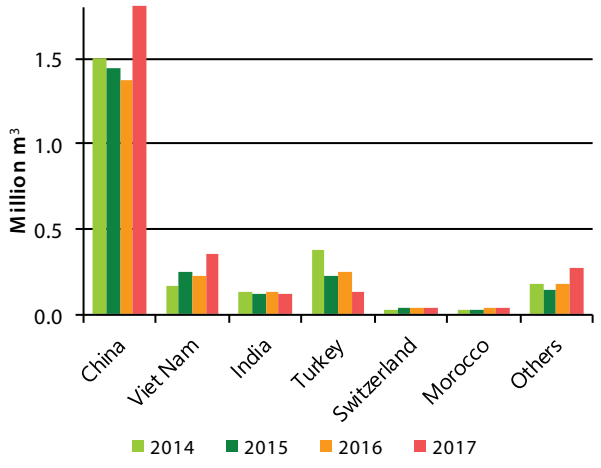
Sawn hardwood production in Croatia grew by 89% in the five years to 2017, to 1.4 million m³, accounting now for 10% of European production. Croatia's non-coniferous roundwood exports declined significantly between 2007 and 2017 (graph 5.2.1).

A continuing shortage of hardwood supply is exacerbated by heavy dependence on European oak. Thirty percent of hardwood sawmills in Belgium, France and Germany have closed in the last ten years (EOS, 2018), with increasing overseas log exports partly to blame (Indufor, 2017).

Graph 5.2.2 provides an overview of the main export destinations of hardwood logs outside the EU, indicating the strong and increasing role of Viet Nam and especially China.

GRAPH 5.2.2

EU hardwood log exports by destination, 2014-2017



Note: Converted from mt using conversion factor 1mt = 0.91m³.

Source: Eurostat, 2018.

5.2.3 Prices

The strong fashion preference for oak continued to increase European oak prices in 2017 and the first half of 2018. This increasing trend is expected to continue. Log prices are escalating because of increased overseas demand, coupled with export bans in Croatia and Ukraine, which blame infestations of the oak lace bug (*Corythucha arcuata*). This bug, which is native to North America, was first observed in Europe in 2000 (Bernardinelli, 2000). The roundwood export bans have strengthened the domestic timber industries in Croatia and Ukraine, and other European countries are considering similar measures, which could further reduce the international supply of oak logs (ITTO, 2018a).

5.2.4 Trade

5.2.4.1 Imports

Europe's total imports of sawn hardwood increased by 0.1% in 2017, to 4.92 million m³, and their dollar value increased by 1.6%, to $3 billion.

5.2.4.2 Exports

Europe's sawn hardwood exports increased by 8.1% in 2017, to 6.3 million m³, and higher prices meant an even greater increase (8.8%) in the dollar value, to $2.85 billion. Exports of sawn hardwood from Europe reached their highest point (in volume terms) since the peak in 2007, growing significantly in France (+25.5%), Croatia (+11.2%) and Poland (+55.4%) in 2017. The export volume from these three countries increased by 293,000 m³, which was more than 60% of the subregion's overall increase in exports in 2017.

Belgium (-10.9%) and Slovakia (-21.1%) were the only countries recording significant decreases in sawn hardwood exports in 2017, with a combined reduction of 80,000 m³.

5.3 The CIS subregion

The apparent consumption of sawn hardwood in the CIS increased by 11.1% in 2017, to 1.5 million m³ (table 5.3.1). The Russian Federation, which accounts for about two-thirds of apparent consumption in the subregion, reported an increase of 8.1%, to 1.09 million m³. Sawn hardwood production increased by 8.5% in the CIS in 2017, to 3.7 million m³. The Russian Federation produced 2.76 million m³ of this volume (up by 10.3% over 2016); according to Rosstat data,

TABLE 5.3.1

Sawn hardwood balance, CIS, 2016-2018
(thousand m³)

	2016	*2017*	*2018f*	*Change (%) 2016-2017*
Production	3,381	3,668	3,772	8.5
Imports	111	109	109	-2.2
Exports	2,176	2,314	2,314	6.4
Apparent consumption	1,317	1,463	1,567	11.1

Note: f = 2017 Committee on Forests and the Forest Industry forecast.

Source: UNECE/FAO, 2018.

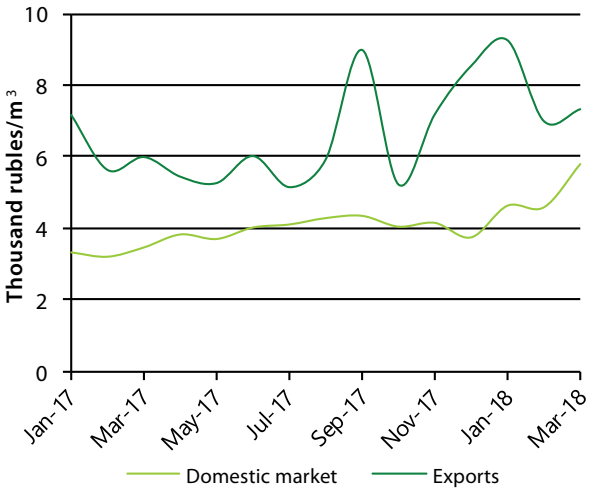
however, Russian sawn hardwood production amounted to 1.8 million m³ in 2017 (normally Rosstat does not collect data from small-sized companies). Most of this volume was produced in the country's western regions (71%), with the east (the Siberian and Far Eastern federal districts) accounting for 29%.

Weighted average prices for sawn hardwood in the Russian Federation in 2017 were 3,862 roubles ($66.2) per m³ in the domestic market and 6,368 roubles ($109.2) per m³ for export sales (graph 5.3.1).

Rovial (in the Tuymen region) launched a wood-processing complex in 2017 with the capacity to process 60,000 m³ per year of hardwood and softwood logs. Technomodel (also in the Tuymen region) announced a project with a capacity of 297,000 m³ hardwood logs per year.

GRAPH 5.3.1

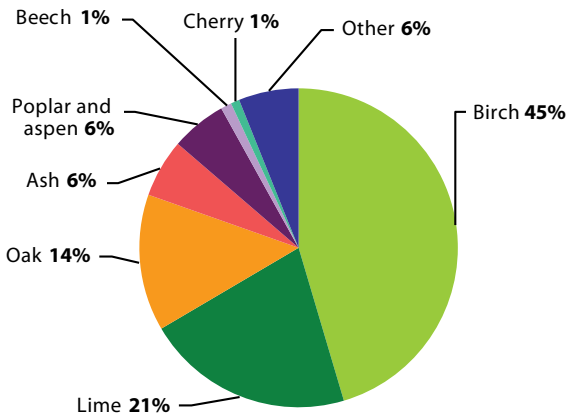
Monthly prices for sawn hardwood in Russian Federation, 2017-2018



Source: Rosstat, 2018.

GRAPH 5.3.2

Sawn hardwood exports by species from Russian Federation in 2017.



Source: WhatWood, 2018.

5.3.1.1 Exports

The Russian Federation exported 1.7 million m³ of sawn hardwood in 2017, up by 11.7% over 2016. Exports to China were 1.27 million m³, an increase of 10.2% over 2016 and the largest quantity of Russian sawn hardwood ever shipped to China (WhatWood, 2018). Birch, lime and oak accounted for 80% of all sawn hardwood exports from the Russian Federation in 2017 (graph 5.3.2).

5.4 North America

5.4.1 General overview

Apparent sawn hardwood consumption in North America decreased by 772,000 m³ (-3.6%) in 2017 (table 5.4.1); sawn hardwood imports fell by 188,000 m³ (-12.1%). In 2017 Canadian sawn hardwood consumption declined by 230,000 m³ (-14.1%) and in the US by 542,000 m³ (-2.8%). North American sawn hardwood exports climbed by 593,000 m³ (+13.2%) in 2017, with large increases in both Canada and the US. Sawn hardwood production continued to increase slowly in 2017; nevertheless, it was still well below levels achieved before the global financial crisis in 2008.

Total housing starts in the US increased moderately (by 2.5%) in 2017. Single-family starts jumped by 8.6%, but this was partially offset by a 9.7% decrease in starts for multifamily units (US Census Bureau, 2018). Both single-family and

TABLE 5.4.1

Sawn hardwood balance, North America, 2016-2018
(thousand m^3)

	2016	*2017*	*2018f*	*Change (%) 2016-2017*
Production	24,101	24,110	24,179	0.0
Imports	1,557	1,369	1,399	-12.1
Exports	4,493	5,086	5,204	13.2
Apparent consumption	21,165	20,393	20,374	-3.6

Note: f = 2017 Committee on Forests and the Forest Industry forecast.

Source: UNECE/FAO, 2018.

multifamily housing starts increased in early 2018, along with gross domestic product. Economic growth in the US is now relatively robust, however, North American sawn hardwood production and consumption are expected in remain flat in 2018 (table 5.4.1).

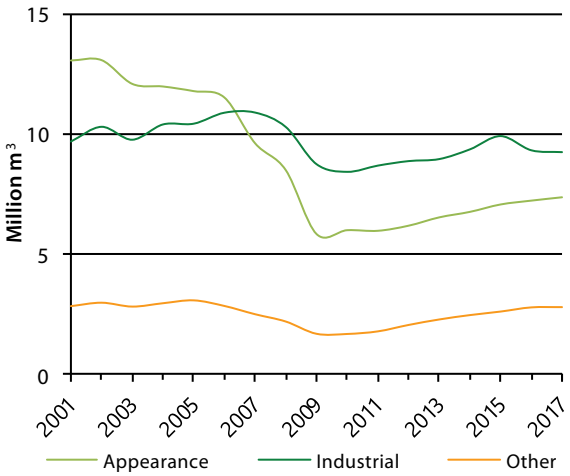
5.4.2 Consumption

The primary North American markets for sawn hardwood are appearance applications (e.g. cabinets, furniture, millwork and flooring), industrial applications (e.g. pallets and sleepers), and other sawn products (e.g. staves, structural building products and musical instruments). Combined consumption in these three market segments has grown since the global financial crisis but remains below the levels achieved in the early 2000s. Moreover, the relative levels of consumption in these individual market sectors have changed.

Historically, North American sawn hardwood consumption in appearance applications exceeded consumption in industrial uses by a wide margin. Since 2007, however, sawn hardwood consumption has been higher for industrial uses than for appearance applications (graph 5.4.1).

GRAPH 5.4.1

US sawn hardwood consumption by segment, 2001-2017



Source: Luppold and Bumgardner, 2018.

This change is the result of several factors. The North American furniture industry declined in the early years of the twenty-first century, causing a downward trend in sawn hardwood consumption in appearance applications. This was partially offset by increased consumption in the cabinet, millwork and flooring industries, with home construction continuing to increase in the US in the early 2000s. The US housing market collapsed in 2006, however, followed by the global financial crisis. These two economic events caused a decline in US domestic sawn hardwood consumption in the appearance market of nearly 50% between 2006 and 2009.

Sawn hardwood consumption by the largest industrial user, pallets, single-handedly exceeded consumption in appearance applications between 2009 and 2012. Industrial consumption increased from 2009 to 2015 but has declined since due to the greater use of sawn softwood for pallets and to inventory adjustment in the sleeper industry.

North American consumption of sawn hardwood in appearance applications will be influenced in the next decade by factors such as growth in home construction and remodelling, substitute products, and disposable income. Home construction and remodelling is important, but a wide range of materials can be used in the production of flooring, millwork and cabinets, with sawn hardwood generally the most expensive. Less-expensive engineered flooring products are similar in appearance to solid wood floors but contain no sawn hardwood. Painted and laminate cabinets can serve the same utilitarian function as more expensive cabinets with sawn hardwood fronts. Thus, while construction products made using sawn hardwood may be preferable, the extent

of income growth among North American consumers will be the primary factor determining the volume of appearance-based sawn hardwood consumed in construction and remodelling.

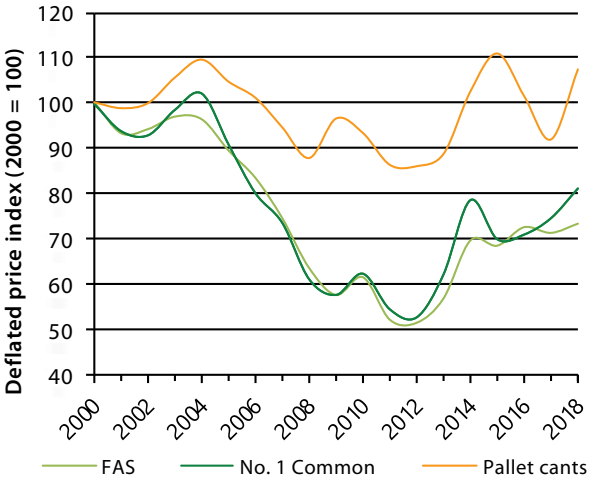
The decline of the North American furniture industry was due primarily to the lower cost of manufacturing in China and Viet Nam. An emerging business model in the North American furniture market is semi-custom manufacturing, which offers consumers choices in species, finishes and hardware style. This is in contrast to the standardized price-point mechanizing model used in furniture retailing for the last century, in which production cost determined which firms remained in business. The degree to which furniture consumers will trade off added expense for more individualized choices will be influenced by income growth.

5.4.3 Prices

Changes in North American sawn hardwood markets since 2000 are reflected in the relative price movements of three major product groups: high-quality lumber (grade FAS); mid-quality lumber (grade No. 1 common); and the most important sawn industrial product, pallet cants (graph 5.4.2). Real prices for high- and mid-quality sawn hardwood have always been cyclical due to inventory adjustments within the production and distribution system combined with variations in economic growth. What appeared to be a general cyclical downturn in these prices after 2004 became

GRAPH 5.4.2

Inflation-adjusted price indices for sawn hardwood product grades, 2000-2018



Note: Deflated by the US producer price index (US Bureau of Labor Statistics, 2018).

Source: Hardwood Market Report (various years), US Bureau of Labor Statistics 2018

a multiyear decline not previously seen in the post-Second World War North American sawn hardwood market. Prices for high- and mid-quality sawn hardwood increased in 2010 in conjunction with economic stimulus in the US, but this was short-lived. Prices fell in 2011 and 2012 due to weak domestic markets for sawn hardwood and the liquidation of inventories as sawmills and secondary-processing facilities continued to close.

Prices for high- and mid-quality sawn hardwood shrank by nearly 50% between 2000 and 2012, but prices for pallet cants declined by less than 15% (graph 5.4.2), reflecting changes in relative consumption of these three product groups. The prices of all sawn products increased after 2012 and commenced cyclical patterns that vary in ways that are unique to their respective markets. The real price of pallet cants in mid-2018 exceeded the price in 2000, but prices for high- and mid-quality lumber were still significantly below their levels in 2000.

5.4.4 Trade

5.4.4.1 Imports

Historically, bilateral trade between Canada and the US has strongly influenced North American sawn hardwood imports. In 2003, more than 50% of US imports (on a value basis) were from Canada, and 95% of Canadian imports were from the US. The US primarily imported aspen, maple and other northern hardwood species from Canada and exported a wide variety of temperate species in both air-dried and kiln-dried forms. Much of the lumber imported by the US was consumed within the US, but a large (but unquantified) proportion of the lumber imported by Canada was subject to additional value-added processes and then re-exported.

More than 90% of Canadian sawn hardwood imports (on a value basis) were from the US in 2017, but the Canadian share of the US import market was down to 27% (from 50% in 2003), reflecting decreased demand for sawn hardwood. Historically, the most important tropical sawn hardwood

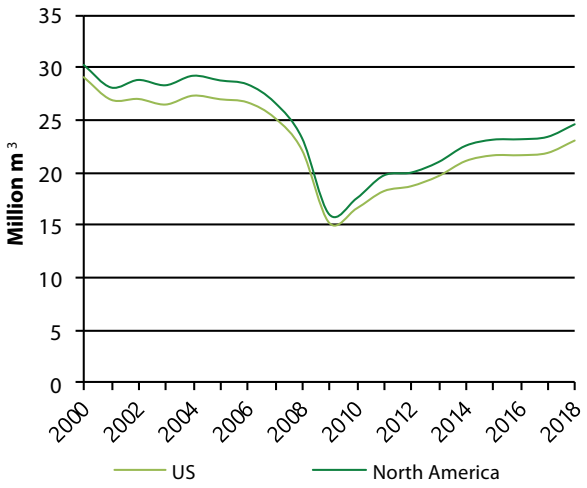
GRAPH 5.4.3

North American exports, excluding bilateral trade between US and Canada, 2001-2017

Sources: USDA Foreign Agricultural Service, 2018; Statistic Canada, 2018.

GRAPH 5.4.4

US and North American Production of Sawn Hardwood, 2000-2018



Source: Luppold and Bumgardner, 2018 (US) and UNECE/FAO, 2018 (Canada).

products imported by the US have been mahogany and other species used in appearance applications. In 2017, however, the major tropical sawn hardwood products were balsa, which has a variety of specialty uses such as in crafts and modelling, and ipé, used primarily for exterior decking.

5.4.4.2 Exports

Exports are the only component of the North American sawn hardwood market that has exceeded levels achieved before the global financial crisis. Similarly to imports, most Canadian and US exports before the global financial crisis were bilateral. Growth in exports since 2009, however, has been mainly in markets outside North America. Graph 5.4.3 shows the value of North American sawn hardwood exports, excluding bilateral trade.

Although the US is still the major market for Canadian sawn hardwood exports, China received more than 20% of Canada's export volume in 2017, up from less than 1% in 2000. US exports to China and Viet Nam in 2017 accounted for 64% of total exports, in a value terms, and Canada received 10%. The growth in exports and decline in domestic consumption in appearance applications in the US means that exports accounted for at least 40-50% of higher-quality lumber sales by US sawmills and distribution yards in 2017.

5.4.5 Production and capacity charges

North American sawn hardwood production declined by nearly 50% between 2000 and 2009 as domestic consumption declined and (associated with this) prices for mid- and high-quality sawn hardwood fell. The US typically produces more than 90% of North American sawn hardwood, and the decline shown in graph 5.4.4 is therefore associated primarily with production in that country. The volume of sawn hardwood produced in the US in 2009 was the lowest since the early 1960s. North American production has increased steadily since 2009 but was still 3.6 million m^3 less in 2017 than in 2006, the peak for home construction in the US.

The decline in sawn hardwood production in North America has caused a large reduction in the number of sawmills and in production capacity – although the number of mills producing hardwood sawnwood that have gone out of business since 2007 is unknown. Most of the mills built since the global financial crisis are for the manufacture of staves and industrial products.

5.5 Extraregional influences affecting the UNECE region

Outside the UNECE region, Asia and the Pacific continues to dominate the trade in tropical sawn hardwood, with China the largest importer globally and Thailand and Malaysia the major exporters. About 55% of China's sawn hardwood imports are from tropical countries; its tropical sawn hardwood imports grew by 29% in 2016 (to 6.6 million m^3) and by 1.5% in 2017 (to 6.7 million m^3) (table 5.6.1). Growth in Chinese demand for tropical sawnwood is in response to a decline in the availability of tropical logs (with producer countries imposing restrictions on log exports) and rising manufacturing costs in China, which have made tropical

sawnwood imports more competitive with domestically produced sawnwood. Nevertheless, China's sawn hardwood import volume declined overall (by 14%) in 2017 due to a significant (48%) drop in imports of birch from the Russian Federation. Sawn hardwood demand is increasingly driven by consumption in China's interior joinery and furniture sectors, which are servicing a rapidly growing domestic middle class.

Ninety-two percent of China's tropical imports in 2017 were from five countries - Thailand (72% by volume), Gabon (6%), the Philippines (5%), Indonesia (5%) and Malaysia (4%); smaller quantities were imported from Cambodia, Cameroon, the Congo, the Lao People's Democratic Republic and Peru. China's tropical sawn hardwood imports from the Lao People's Democratic Republic fell by 30% in 2017 in response to export restrictions imposed in 2016, but the per-unit value rose by 62%. Imports from Thailand are predominantly of lower-value rubberwood, but Africa's supplies are mainly of high-value specialty timbers for high-end markets. China's sawn hardwood imports rose by 15% in volume terms in the first quarter of 2018, year-on-year, with tropical sawn hardwood imports up by 25% in volume and by 32% in value.

Viet Nam is an important emerging market for sawn hardwood, although imports declined in 2015 and 2016, with tropical sawnwood accounting for most of the decline (data on Viet Nam's sawn hardwood imports for 2017 were unavailable at the time of publication). The Lao People's Democratic Republic supplied 63% of Viet Nam's tropical sawn hardwood imports in 2015, but that country's supply was affected by an export ban in May 2016. In contrast to China, Viet Nam's sawnwood imports are used predominantly in products destined for export. Thailand is the third-largest importer of sawn hardwood outside the UNECE region, importing mainly structural-grade material from Malaysia.

Thailand remains the top-ranking exporter of hardwood sawnwood outside the UNECE, most of which is plantation

TABLE 5.5.1

Major importers and exporters of tropical sawn hardwood outside the UNECE region, 2015-2017

	2015	*2016*	*2017*	*Change (%) 2016-2017*
MAJOR IMPORTERS				
China	5,113	6,579	6,680	1.5
Thailand	700	868	871	0.3
India	269	285	309	8.4
Viet Nam	896	545	n.a.	n.a.
Philippines	218	306	304	-0.7
MAJOR EXPORTERS				
Thailand	3088	4161	n.a.	n.a.
Malaysia	1982	1968	2154	9.5
Cameroon	653	800	700	-12.5
Lao PDR	624	272	50	-81.7
Viet Nam	558	403	n.a.	n.a.

Note: n.a. = not available.

Sources: COMTRADE 2018; ITTO 2018c; China Customs, 2018.

rubberwood. Between 2012 and 2016, tropical sawnwood exports continued to rise year-on-year, increasing by 35% in 2016 to 4.2 million m^3. The trend follows activity in China's furniture industry which is the major destination of Thailand's imports. Although total import volumes are unavailable for 2017, Thailand's exports to China were up 16% to 4.82 million m^3. Thailand's exports were overwhelmingly (99%) to one market – China – and the remainder to other Asian markets. Malaysia's exports increased by 9.5% to 2.2 million m^3 in 2017, destined for a wide range of markets, notably (in descending order, by value) Thailand, China, the Philippines, India, Sri Lanka, the Netherlands and Yemen (COMTRADE, 2018).

Sawn hardwood exports from Africa recovered some lost ground in Europe in 2016 following significant increases in shipments to China to 2015. Sawn hardwood exports to EU destinations fell sharply in 2017, however: the biggest drop (-24%) was in Cameroon, the largest exporter in the region (at 316,000 m^3), but there were also declines in exports from Gabon, the Congo, Côte d'Ivoire, the Democratic Republic of Congo and Ghana. The fall in EU imports of tropical hardwoods has been attributed to a number of supply-side issues, including the intensification of enforcement of the EUTR and, in some countries, the challenge and expense of conducting legality due diligence (ITTO, 2018b).

5.6 Policy and regulatory influences

There is increasing concern in Europe about constraints on sawn hardwood mills due to a shortage of raw materials caused by increased Chinese demand for hardwood logs (particularly oak). Exports of hardwood logs have increased dramatically, mostly to China, which has prompted some European sawmillers to call for government intervention (International Hardwood Conference, 2017). France has regulations on publicly owned logs by way of an "EU label", which specifies that the logs must be processed in the EU; private forests, which comprise 80% of forestlands in France, are not regulated, however. Private forest owners are not averse to increased competition for their logs (De la Hamaide and Chen, 2018).

There are similar concerns in North America, where China increased imports of red-oak logs by 64% during the first three-quarters of 2017, compared to the same period the previous year, to almost 1.6 million m^3. Chinese buyers favour red oak, white oak, hickory and cherry (Woodworking Network, 2017). As of May 2018, there are several outstanding issues with China that have the potential to affect trade in hardwoods (both raw logs and products), including: a ban on hardwood logs imported from the US unless they are fumigated before leaving the US and the possibility that hardwood logs and processed forest products exported from the US to China could be impacted by the ongoing trade dispute between the US and China (Michigan Department of Natural Resources, 2018).

Recent research by Padua University on "global primary tropical timber trade trends of national and regional market legality regulation" shows that the consumption of tropical wood has shifted from developed countries with strict import rules to developing countries with less-restrictive regulations (International Hardwood Conference, 2017).

From 1 July 2017, Russian sawn hardwood producers (alder, ash, aspen, beech, birch, linden, oak, poplar and other hardwood species) have been obliged to enter data on transactions into the Unified State Automated Information System of Timber Accounting and Timber Transactions (Ministry of Natural Resources and Environment of the Russian Federation, 2017). The government has stated that this will become the instrument for timber legality assurance and will help decrease illicit timber trade.

5.7 Innovation in the sector

There is substantial interest in the use of hardwoods in structural applications: hardwoods were once commonly used in construction but have long been supplanted by softwoods. Many hardwoods have superior strength-to-volume ratios compared with softwoods, and their use in products such as structural beams, cross-laminated timber and glue-laminated timber is being investigated. Oak was used recently to produce 23m-long, 4-tonne glulam beams for a roof structure at the Lord's Cricket Ground in London, UK. Also in the UK, Maggie's Oldham Centre was built with cross-laminated timber panels made with hardwoods (De Zeen, 2017).

In addition to product advances, innovations in processes are improving the efficiency of sawmills. One of the most promising of these is the use of computed tomography scanning to map and measure internal log defects. This technology allows mills to optimize grade yields and even to determine optimal log uses – such as for veneer, sawnwood or barrel staves.

Note: The statistical annex of the *Forest Products Annual Market Review 2017-2018* is available at: www.unece.org/forests/fpamr2018-annex

5.8 References

Bernardinelli, I. 2000. Distribution of the oak lace bug, *Corythucha arcuata* in northern Italy. Redia LXXXIII, 157-162.China Customs. 2018. General Administration of Customs People's Republic of China. Available at: http://english.customs.gov.cn

COMTRADE. 2018. UN COMTRADE database. New York. Available at: http://comtrade.un.org/db

CSIL. 2018. World furniture outlook. Organized by CSIL Milano. Centre for Industrial Studies (CISL). Available at: www.worldfurnitureonline.com/research-market/world-furniture-outlook-0058524.html

De la Hamaide, S. and Chen, Y. 2018. China's love affair with oak a mixed blessing for France. Reuters Business News. Available at: www.reuters.com/article/us-france-china-oak/chinas-love-affair-with-oak-a-mixed-blessing-for-france-idUSKCN1J30FU

De Zeen. 2017. dRMM builds Oldham Maggie's Centre around a courtyard with rippling glass walls. Available at: www.dezeen.com/2017/06/21/drmm-maggies-centre-centre-care-architecture-courtyard-oldham-manchester-uk

EOS. 2018. Annual report. European Organization of the Sawmill Industry (EOS). available at: www.eos-oes.eu/en/sawmill_industry_annual_reports.php

Eurostat. 2018. Comext database. Available at: http://epp.eurostat.ec.europa.eu/newxtweb

FEP. 2018. The European Parquet Market consolidates its positive trend. European Federation of the Parquet Industry (FEP). Available at: www.parquet.net/files/FEP_PRESS_RELEASE_-_June_2018.pdf

Hardwood Market Report. 2018. Various issues. www.hmr.com

Indufor. 2017. European hardwood sawmilling: state of play and industry outlook.

International Hardwood Conference. 2017. Press release: Challenges and potential in focus at International Hardwood Conference. Available at: www.ihc2017.info/wp-content/uploads/2017/12/International-Hardwood-Conference-Press-Release-Full-Report.pdf

ITTO. 2018a. Market Information Service, 1-15 May 2018. International Tropical Timber Organization (ITTO). Available at: www.itto.int/market_information_service

ITTO. 2018b. Market Information Service, 16-31 March 2018. International Tropical Timber Organization (ITTO). Available at: www.itto.int/market_information_service

ITTO. 2018c. Statistical database. International Tropical Timber Organization (ITTO). Available at: www.itto.int/annual_review_output

Luppold, W.G. and Bumgardner, M.S. 2016. US hardwood lumber consumption and international trade from 1991 to 2014. Wood and Fiber Science, 48(3): 162-170.

Luppold, W.G. and Bumgardner, M.S. 2017. Changes in eastern US sawmill employment and estimated hardwood lumber production from 2001 to 2015. Forest Products Journal, 67(7/8): 408-415.

Michigan Department of Natural Resources. 2018. Forest Utilization and Marketing. Newsletter, 28 June 2018. Available at: https://www.michigan.gov/documents/dnr/FRD_MKTUTILIZE_summer_2018_626403_7.pdf

Ministry of Natural Resources and Environment of the Russian Federation. 2017. Available at: www.mnr.gov.ru/press/news/proizvoditeli_pilomaterialov_s_1_iyulya_2017_g_budut_obyazany_vnosit_dannye_o_sdelkakh_v_egais_/?sphrase_id=20416

Rosstat. 2018. Federal Service of State Statistics (Rosstat). Moscow. Available at: www.gks.ru

Statistics Canada. 2018. Canada's national statistical database. Available at: www.statcan.gc.ca

UNECE/FAO. 2018. TIMBER database. Available at: www.unece.org/forests/fpm/onlinedata

US Bureau of Labor Statistics. 2018. Statistics on affecting inflation. Available at: www.bls.gov

US Census Bureau. 2018. Housing starts in United States. Available at: www.census.gov/construction/nrc

USDA Foreign Agricultural Service. 2018. Global agricultural trade system. Available at: https://apps.fas.usda.gov/gats

WhatWood. 2018. Russian forest sector in 2017-2018. Available at: www.whatwood.ru

Woodworking Network, 2017. Exports of red oak rise dramatically, market tightens. Available at: https://www.woodworkingnetwork.com/wood/pricing-supply/exports-red-oak-rise-dramatically

Food and Agriculture Organization of the United Nations

UNECE

Forest Products
Annual Market Review 2017-2018

UNITED NATIONS

Forest Products Annual Market Review 2017-2018

The *Forest Products Annual Market Review 2017-2018* provides a comprehensive analysis of markets in the UNECE region and reports on the main market influences outside the UNECE region. It covers the range of products from the forest to the end-user: from roundwood and primary processed products to value-added and innovative wood products.

Statistics-based chapters of the *Review* analyse the markets for wood raw materials, sawn softwood, sawn hardwood, wood-based panels, paper, paperboard and woodpulp. Other chapters analyse policies, trade measures, markets for wood energy, value-added wood products and housing. Underlying the analysis is a comprehensive collection of data.

The *Review* highlights the role of sustainable forest products in international markets. Policies concerning forests and forest products are discussed, as well as the main drivers and trends. The Review also analyses the effects of the current economic situation on forest products markets.

The *Review* provides a foundation for the Market Discussions held at the annual session of the UNECE Committee on Forests and the Forest Industry, and it also provides valuable and objective information for other policymakers, researchers and investors.

Further information on forest products markets, as well as on the UNECE Committee on Forests and the Forest Industry and the FAO European Forestry Commission, is available at: www.unece.org/forests.

The *Review* has a statistical annex, which is available at: www.unece.org/fpamr2018.html

Information Service
United Nations Economic Commission for Europe

Palais des Nations
CH - 1211 Geneva 10, Switzerland
Telephone: +41(0)22 917 12 34
Fax: +41(0)22 917 05 05
E-mail: unece_info@un.org
Website: http://www.unece.org

ISBN 978-92-1-117174-7

Designed and Printed at United Nations, Geneva – 1825125 **(E)** – September 2018 – 1,341 – **ECE/TIM/SP/46**