



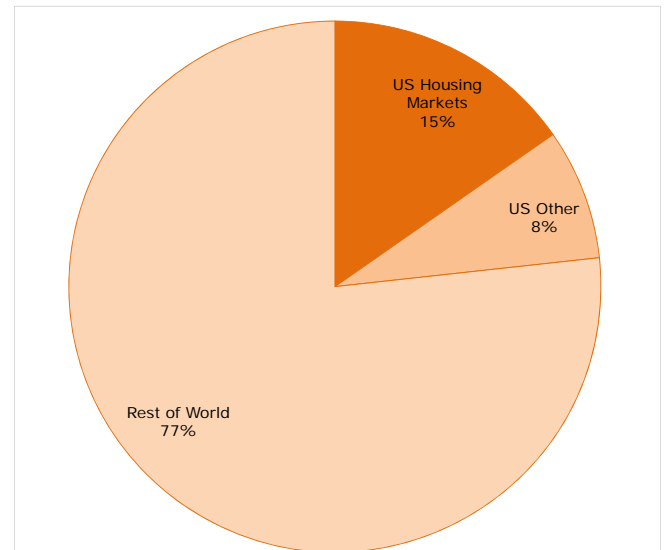
## Wood Use in US Housing

We have written about the importance of the US housing market to timber growers around the world (see, for example, Vol 5 No 2 *Why the Focus on the US?*). US housing consumes about 15% of the world's lumber (Figure 1). That percentage was a little higher before the collapse in housing starts that was a part of the global financial crisis.

### US Housing Starts

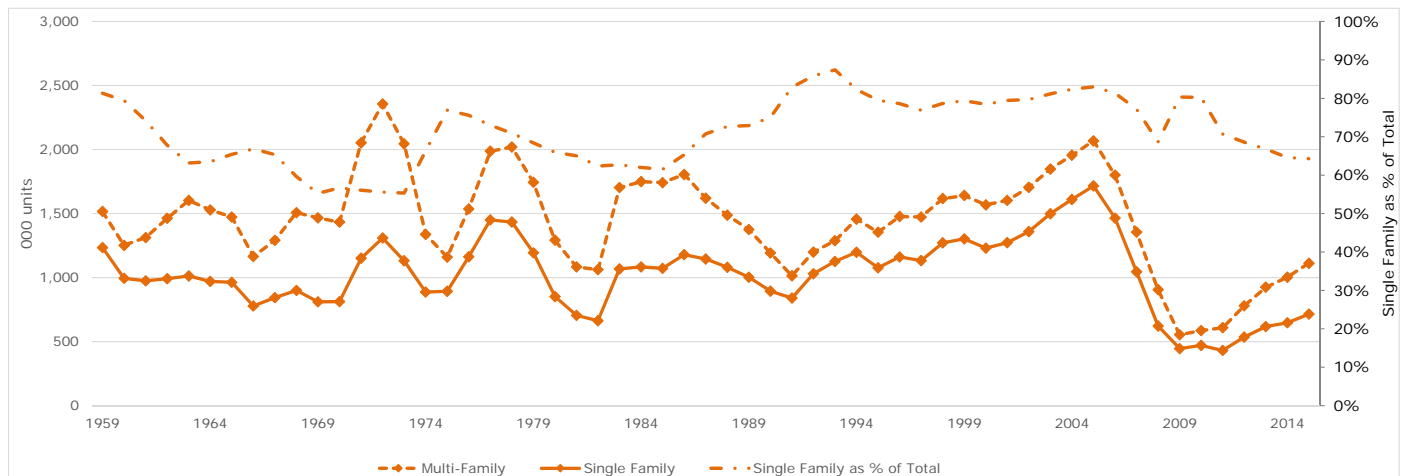
Figure 2 shows housing starts are still significantly below the pre-crash long-term average of 1.5 million starts per year. Single-family homes use more lumber per unit than multi-family homes because they are bigger and don't share walls with other units. Single family units are falling as a percentage of starts (back to historical levels) as Millennials appear to prefer urban living (at least, those who can afford to move out of their parents' homes). So we might expect consumption to be down. And it is, based on the amount of timber being stored on the stump in the US South as we showed in the previous Forest Research Note (Vol 12 No 4).

Figure 1. US Lumber Consumption as a % of World Total



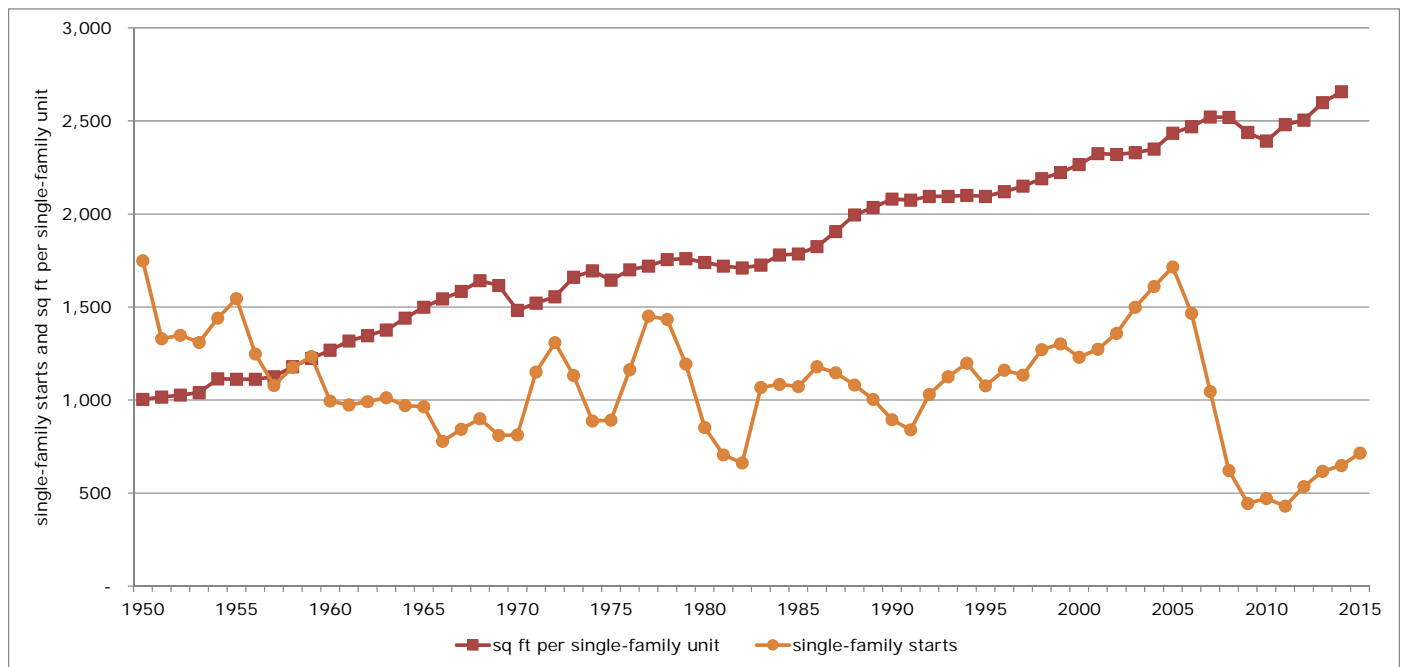
Source: UN FAO

Figure 2. US Housing Starts



Source: US Bureau of the Census

Figure 3. US Single-Family Housing Starts and House Size



Sources: US Bureau of the Census, McKeever and Howard 2011, *Characteristics of New Housing*

But single-family houses in the US are getting bigger—as they usually do. Figure 3 shows that the average size of new single-family homes fell slightly in 2009 and 2010, but they have continued to grow since then. Single-family homes being built now are over 2.5 times larger than the houses built in 1950.

(The average house size is getting larger in part because builders are not building many “starter” homes. The cost of buildable land, impact fees imposed by local governments, and expanding subdivision regulations are making it challenging to build inexpensive homes.)

So if houses are getting bigger, lumber consumption may not be down as much as we might expect based on the number of houses alone, right?

Well, no. Figure 4 shows lumber used in single-family homes over the past 65 years. The total volume per unit started at 9.0 MBF in 1950 and peaked at 15.3 MBF in 1990 (a 70 percent increase). It has declined gradually ever since. With house size rising faster than wood use per unit, the amount of wood used per square foot of house has steadily declined from 8.9 BF of wood per square

foot of house in 1950 to 5.6 BF per square foot in 2010 (a decrease of 37 percent).

There are some trends in US housing that are causing the amount of lumber used in building them to decline.

## House Design

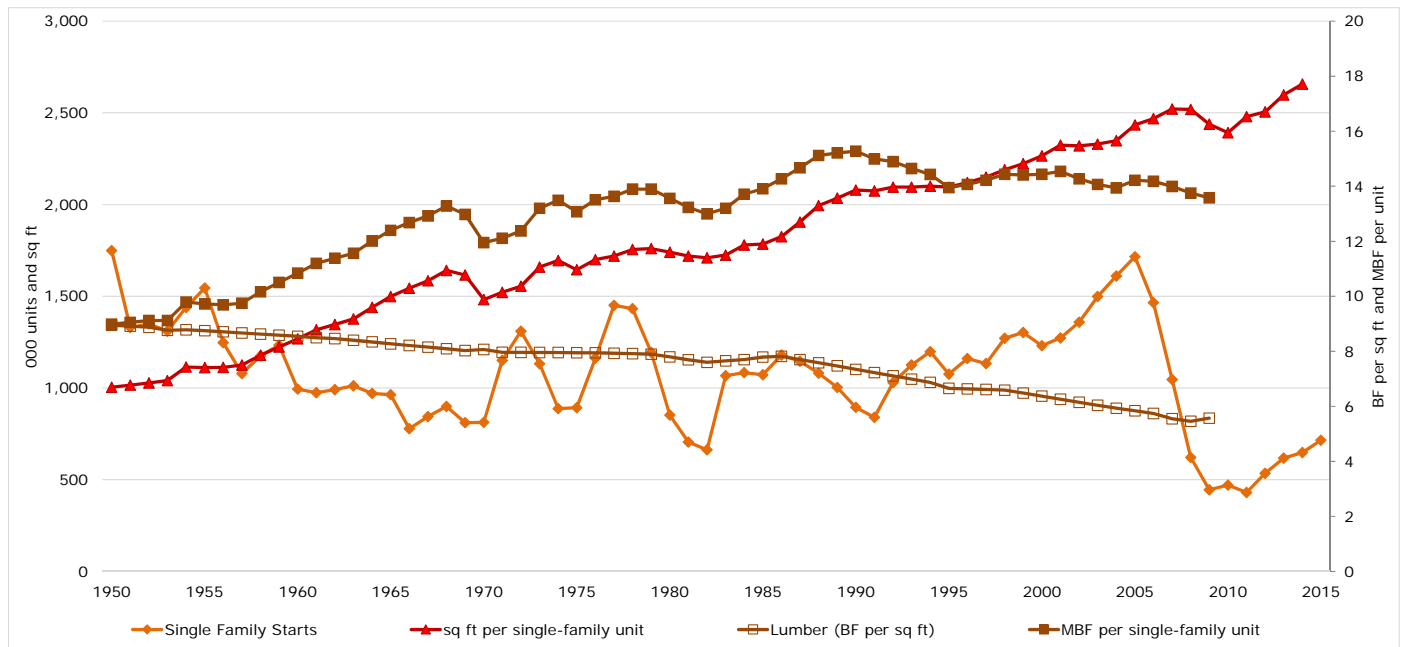
### Room Size

Figure 3 (above) shows the average new house is getting bigger. But, in addition to the houses themselves, rooms are getting bigger. A bigger room needs less lumber per square foot of room—bigger volume needs less area on the outside (Box 1).

#### Box 1. Wood for Walls

A 10' x 10' room has 100 square feet of floor space and 40 linear feet of wall with studs every 16" and top and bottom plates.—which adds up to about 235 board feet of 2x4s. A 12' x 12' room has 144 square feet of floor space and 48 linear feet of wall and just over 275 board feet of 2x4s. The floor space is 44 percent greater but the volume of 2x4s is only 18 percent greater.

Figure 4. Lumber Used in Single-Family Houses



Sources: US Bureau of the Census, McKeever and Howard 2011, *Characteristics of New Housing*

### Open Concept

As houses got bigger, they also became more open.

In the *old days* (i.e., the 1980s), there would have been a kitchen and a dining room and a living room on the first floor, each with four walls and some doors to the other rooms. Those walls were load-bearing walls—they kept the second-floor floors from sagging. The rooms had doors so they could be closed off to reduce heating and cooling effort and cost.

With better insulation and stronger materials (see below), it is more common for large areas of the main floor to have few walls. The open concept house may have no walls separating the functional areas. Fewer walls (and doors) means less lumber is needed—but stronger materials are needed to keep the second floor from sagging.

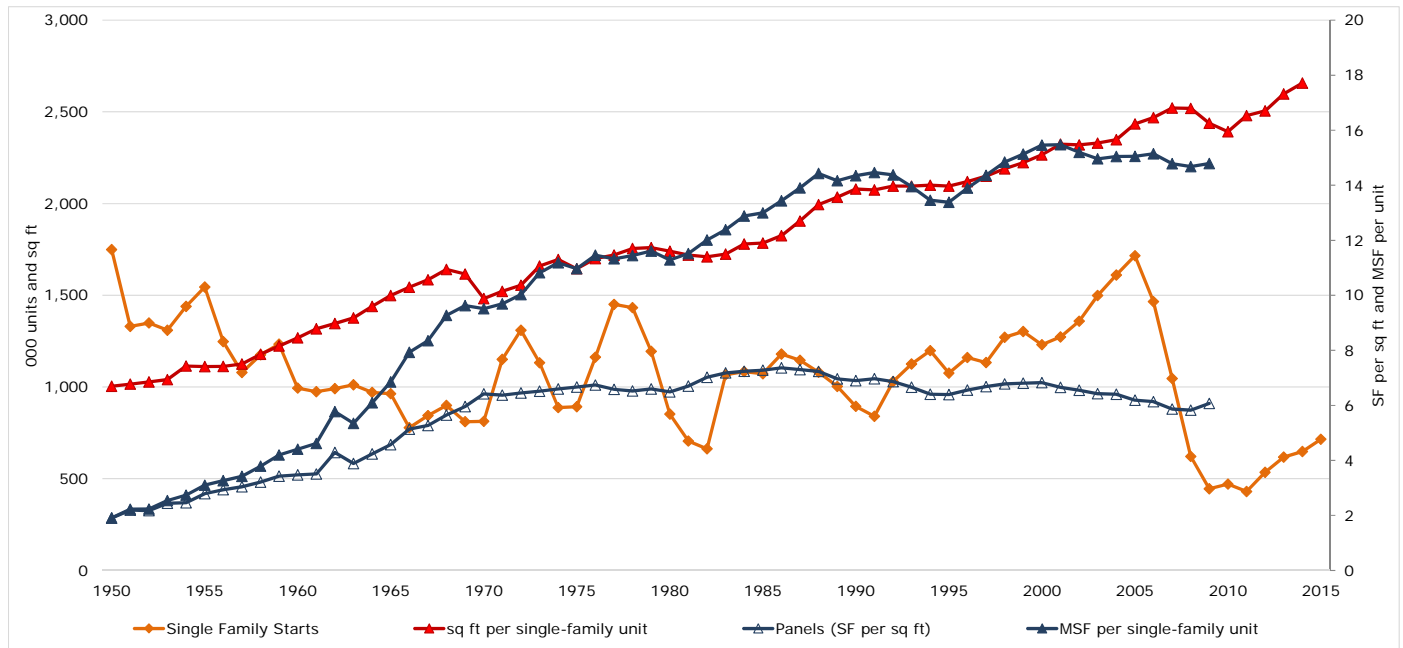
### Product Substitution

#### Panels and Engineered Wood Products

Some lumber is being replaced by wood in other forms. Panels, first in the form of plywood and then in the form of oriented-strand-board (OSB) replaced lumber in subfloors and walls (sheathing). Interestingly, the square feet of panels per square foot of floor area has remained fairly constant since 1970 (Figure 5).

Some solid wood is being replaced by engineered wood products. While these products are classified as lumber and are included in Figure 4, less volume of wood is needed when they replace solid wood. For example, I-joists are replacing 2x10s and 2x12s as floor joists—they use less wood and are lighter and stronger.

Figure 5. Panels Used in Single-Family Houses



Sources: US Bureau of the Census, McKeever and Howard 2011, *Characteristics of New Housing*

**Alternative Materials**

Solid wood floors have historically competed with carpeting, linoleum/vinyl, slate and tile. But now vinyl and wood composites are replacing lumber in exterior applications. On many new houses, the siding and trim is all vinyl. The windows are vinyl-clad and the doors are steel or fiberglass. The porches and decks are composite materials and the railings are plastic. Much of the trim in the interiors is painted medium density fiberboard (MDF), not solid wood (lumber).

**Summary**

The volume of wood used in building US single-family homes has declined slightly since 1990. The volume of solid wood (lumber) has declined, but this has been offset to some extent by the increasing use of panels and other engineered wood products.

Some of the decline is due to the historically low level of starts since the global financial crisis. Some is due to changes in home design and the substitution of non-wood materials, especially in exterior applications, which has reduced the volume of wood consumed per square foot of house.

**References**

McKeever, David B and Howard, James L., 2011, *Solid Wood Timber Products Consumption in Major End Uses in the United States, 1950-2009*, USFS Forest Products Laboratory, General Technical Report FPL-199.

US Department of Commerce, 2014, *2014 Characteristics of New Housing*, and prior issues.

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